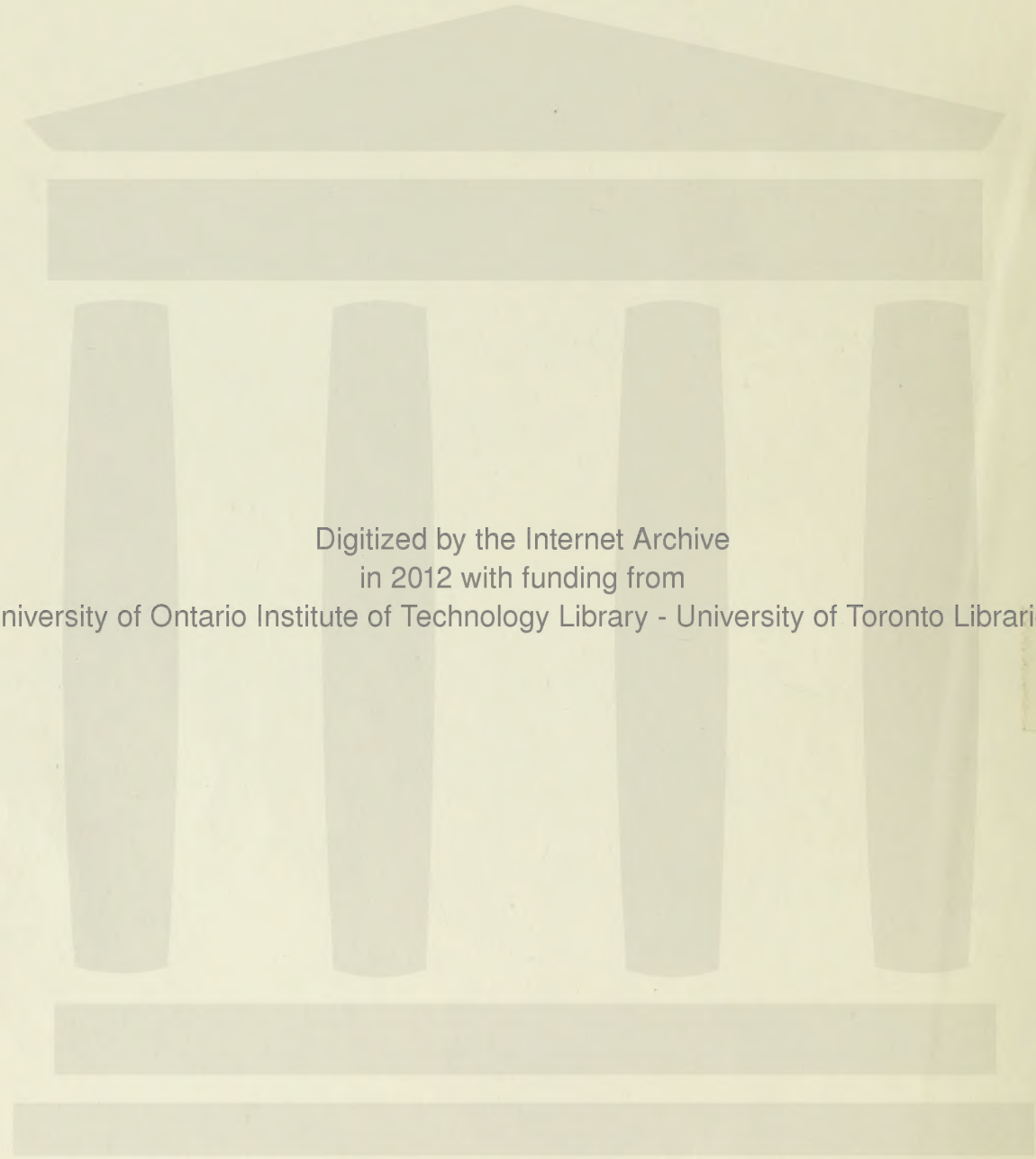

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THE ENGINEERING JOURNAL

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

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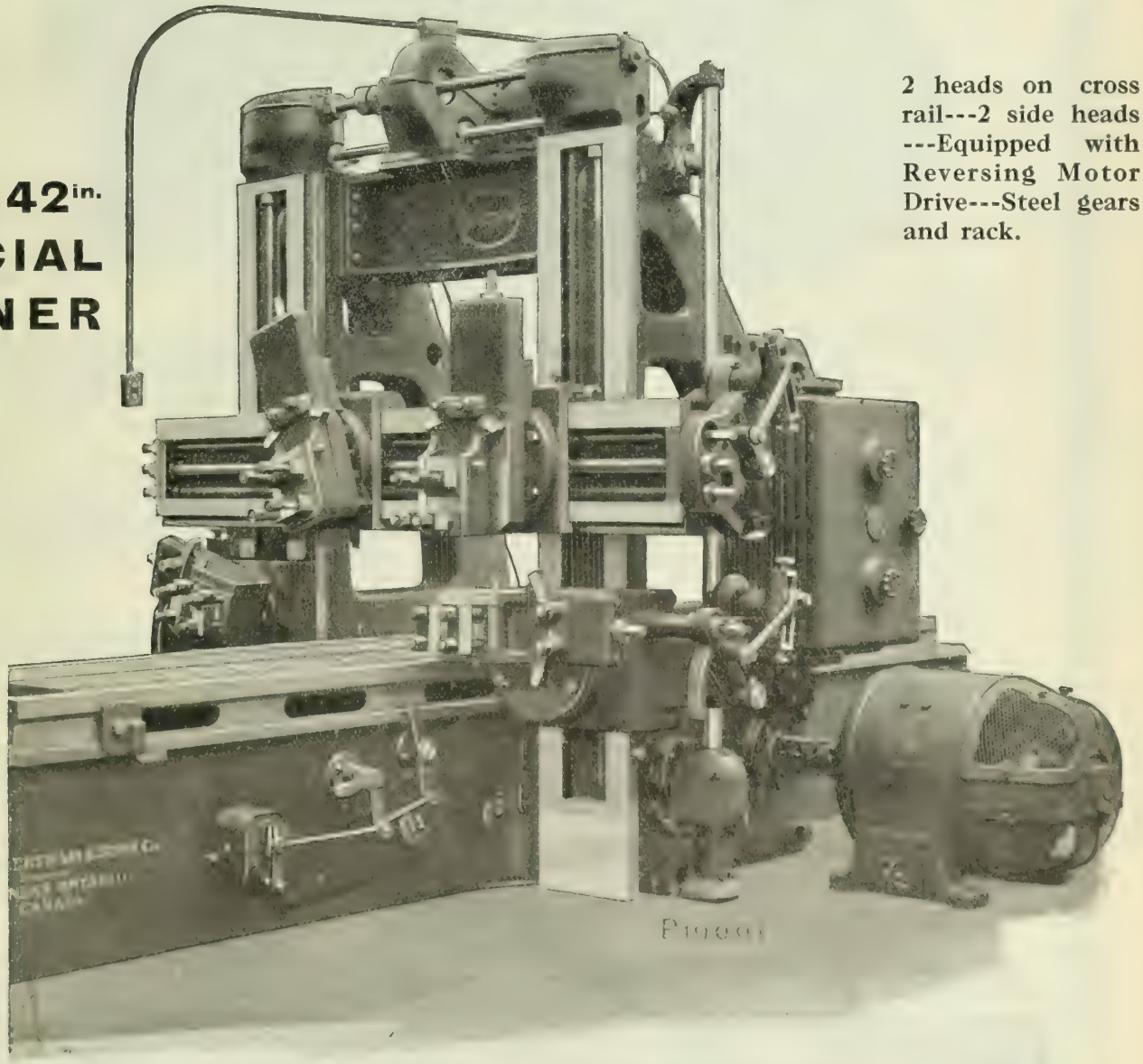

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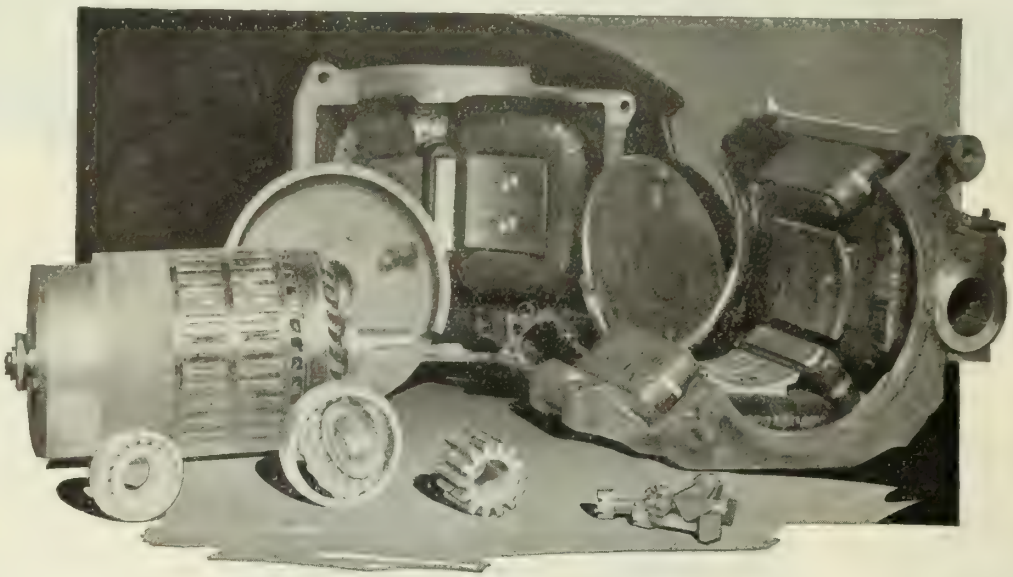

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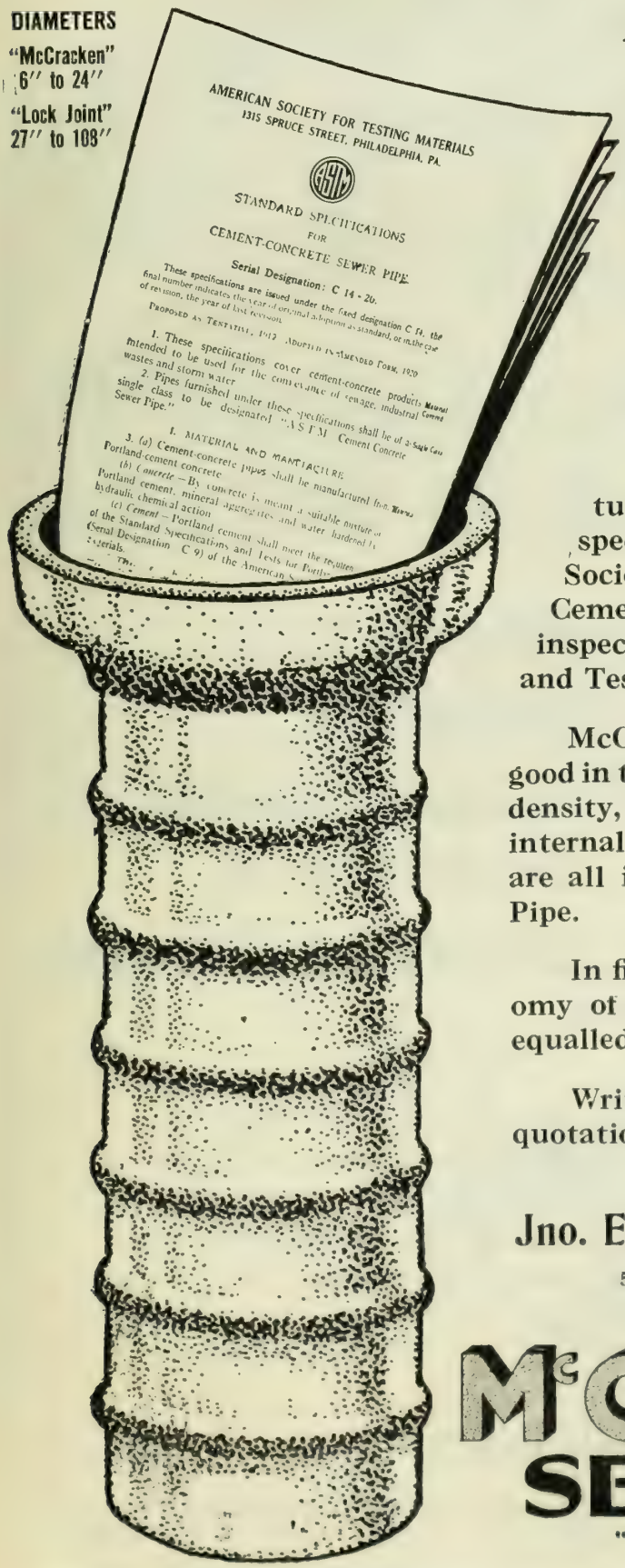

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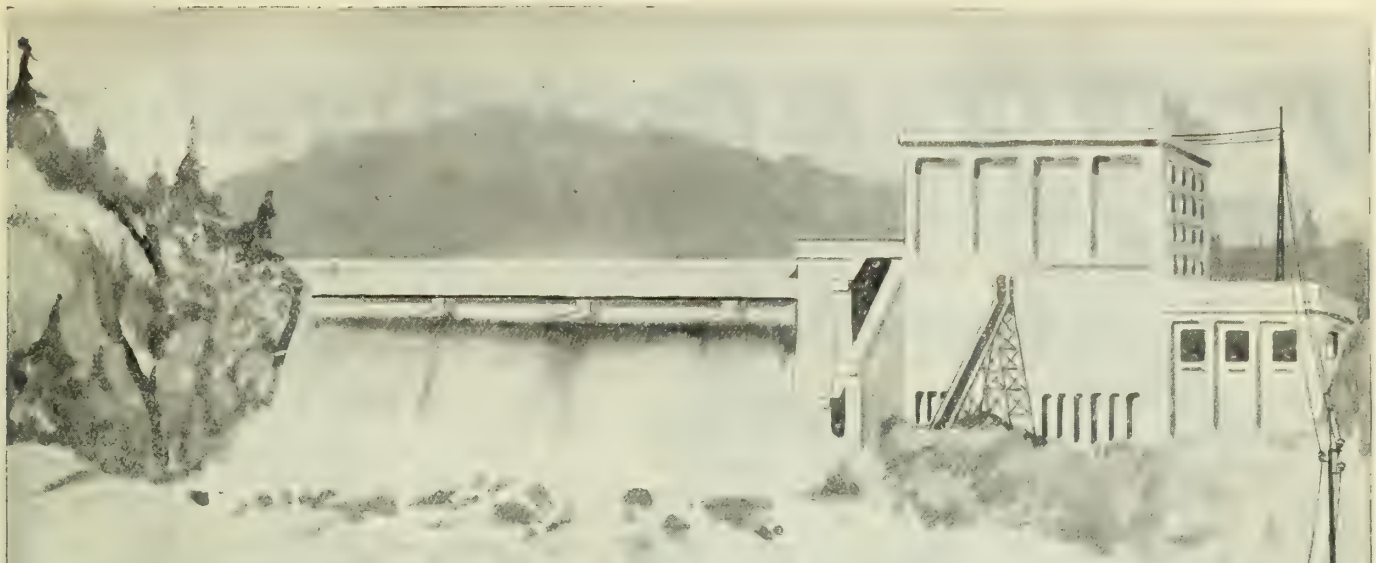

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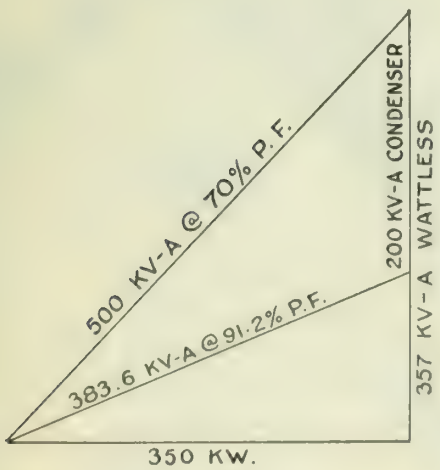

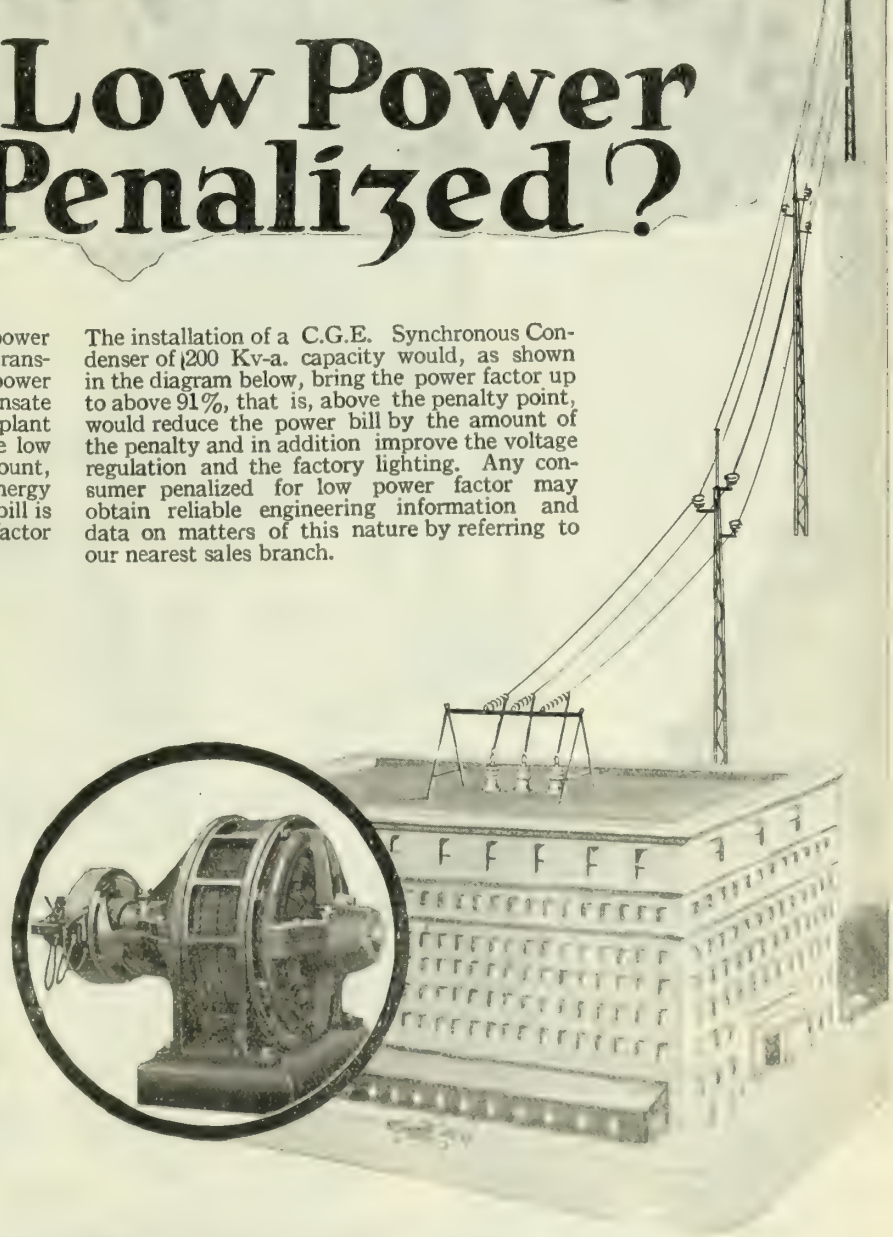

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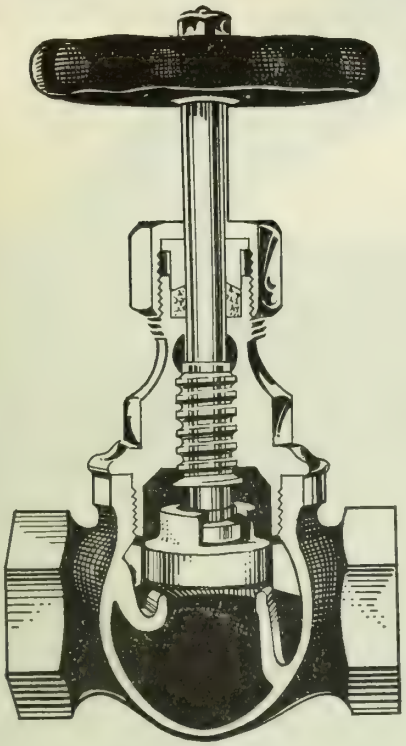

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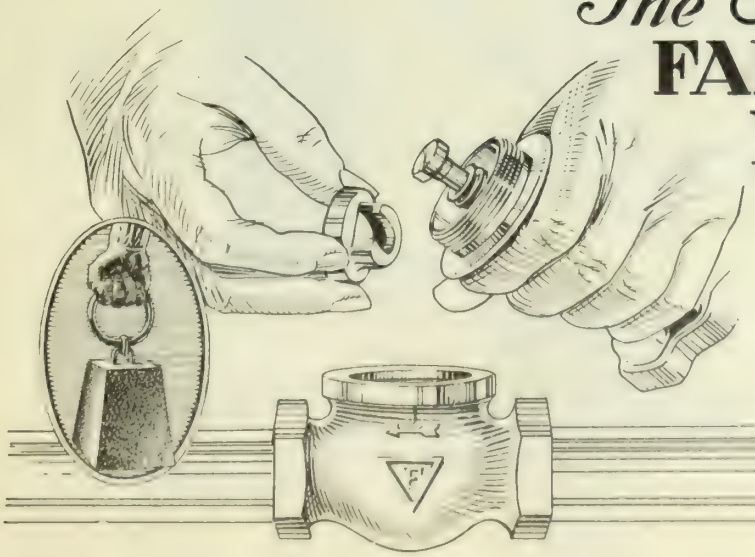

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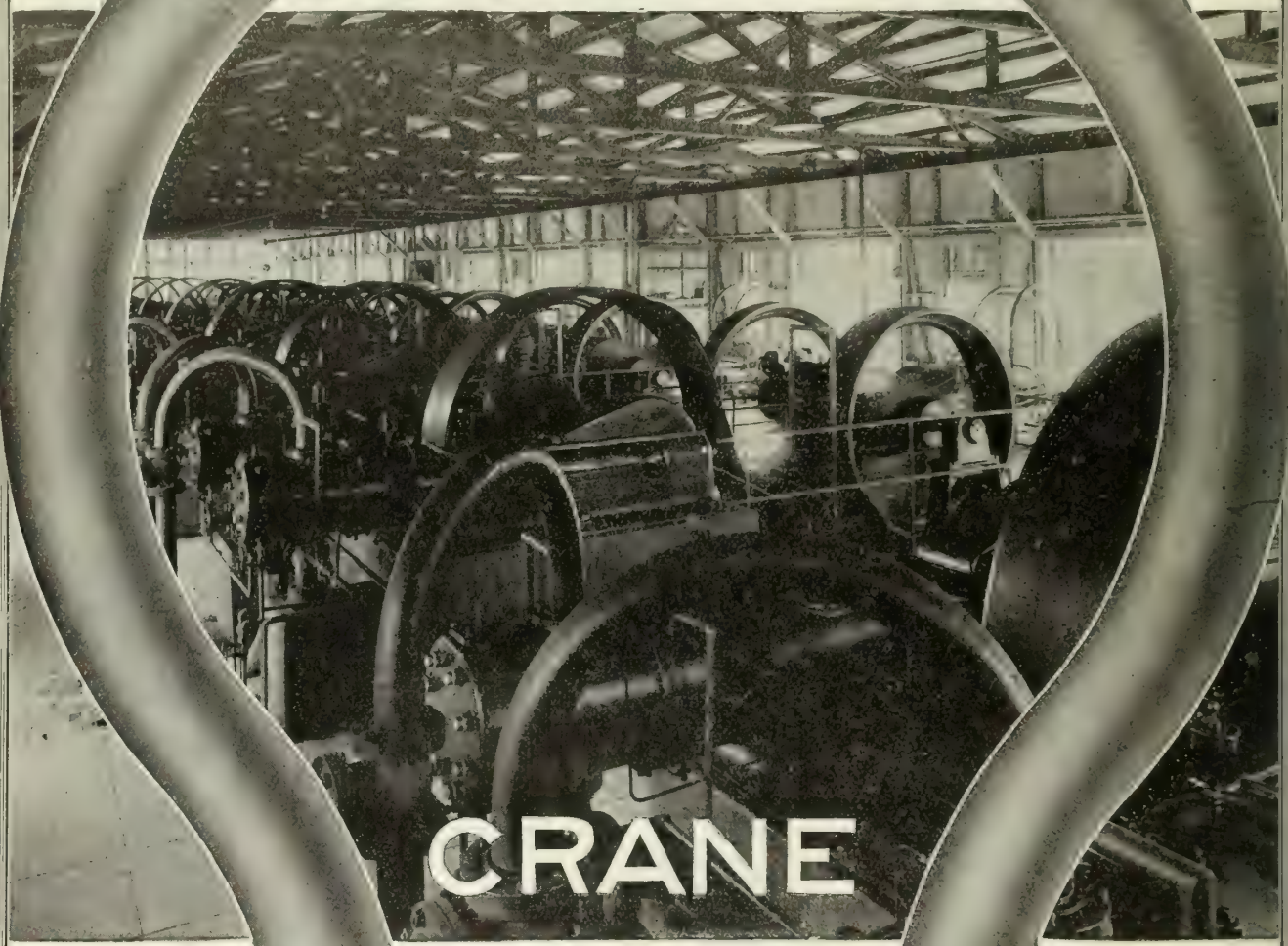

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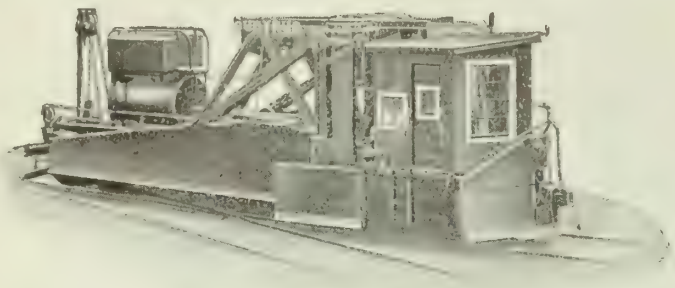

The Bucyrus Spreader Plow

Can dispose of more snow and ice than several thousand men in the same length of time.

It flanges snow and ice (even solid ice) to a depth of 2½″ below top of rails from end to end of tie.

Can handle easily a 6 foot bank of snow, and has sufficient weight to hold rails.

With its wings, a yard may be opened up and cleaned of snow with speed and dispatch.

Greater capacity to spread earth, rock and other materials than any spreader ever built.

Here are a few other special features.

The Bucyrus spreader plow is heavier, stronger and more massive in construction than any spreader built.

Weight 68 tons, 60% steel casting.

Greater maximum width of spread than any spreader built—12 to 22½ ft.

It cuts from any point from 24″ below to 19″ above the rail.

Will operate on ordinary train line pressure of 70 lbs. of air and has operated with as low as 50 lbs.—full pneumatic control.

Embankments or fills may be built to any height in 7 ft. lifts in practically the same area.

Think of the saving in timber, labor, reduction in grades, fuel and wear and tear on your equipment.

Capacity—100,000 lbs. draw-bar push.

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Cold Storage Warehouse and Power Plant, August 30, 1920.

Construction of Cold Storage Warehouse, June 16, 1921.

Montreal's Magnificent Cold Storage Warehouse

The completion of the new Cold Storage Plant, provides Montreal with Warehouse facilities worthy of her other splendid harbour equipment.

The building—a Reinforced Concrete structure of ten stories height—rests upon three thousand foundation piers, each pier capable of supporting a working load of 40 tons.

3,600 cubic yards of Concrete went into the foundation piers—18,000 cubic yards into the reinforced Concrete Super-Structure.

Form Lumber was used on an average of four times. This was made possible by special attention to uniformity of detail in design; by highly systematized method of scheduling forms; and by the use of specially-designed Form Clamps and Hoops.

50 Feet distant from the Warehouse Proper, is the Power House Building, consisting of a Reinforced Concrete Mattress Slab, supported on a number of Concrete Piles, on which the Walls and Columns of the House and Machinery Beds are built.

The Warehouse is one of the most imposing structures of Montreal's new Harbour Development; and every known convenience for efficiency has been provided.

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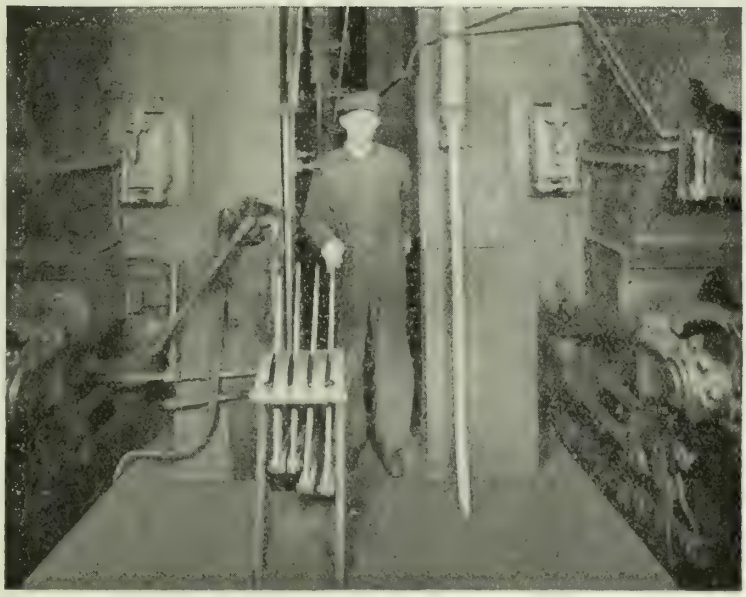
THE POWER DUMP

The Power operated dumping plate was first successfully used on the Taylor Stoker. It resulted in positive discharge of ash at the will of the operator and in freeing the bridge wall of slag adhesions. It reduced the labor and time required for cleaning fires. It increased the average furnace efficiency and capacity. It made possible the burning of low fusing coal, and operation with narrow aisles.
Notice how many stokers now include this idea.

In the Station of Northern Ohio Traction Company at Akron. circumstances made it necessary to use arger boiler units than originally planned for. This resulted in very narrow aisles between boilers. No chance there for a slice bar.



15,600 rated boiler horsepower all Taylor Stokered, furnishes the steam which makes the "juice" in this Station. The load averages 170% of rating with peaks running up to 250% or more.

The Taylor Stoker

doesn't need any help from slice bars in order to maintain good combustion and high ratings.

Furthermore it isn't necessary to use brute force when cleaning fires. The Taylor Power Dump does the work, — quickly, easily, without fuss, and thoroughly.

Money can't buy a better Stoker.

Ask today for a copy of our new booklet, The Rotary Ash Discharge.

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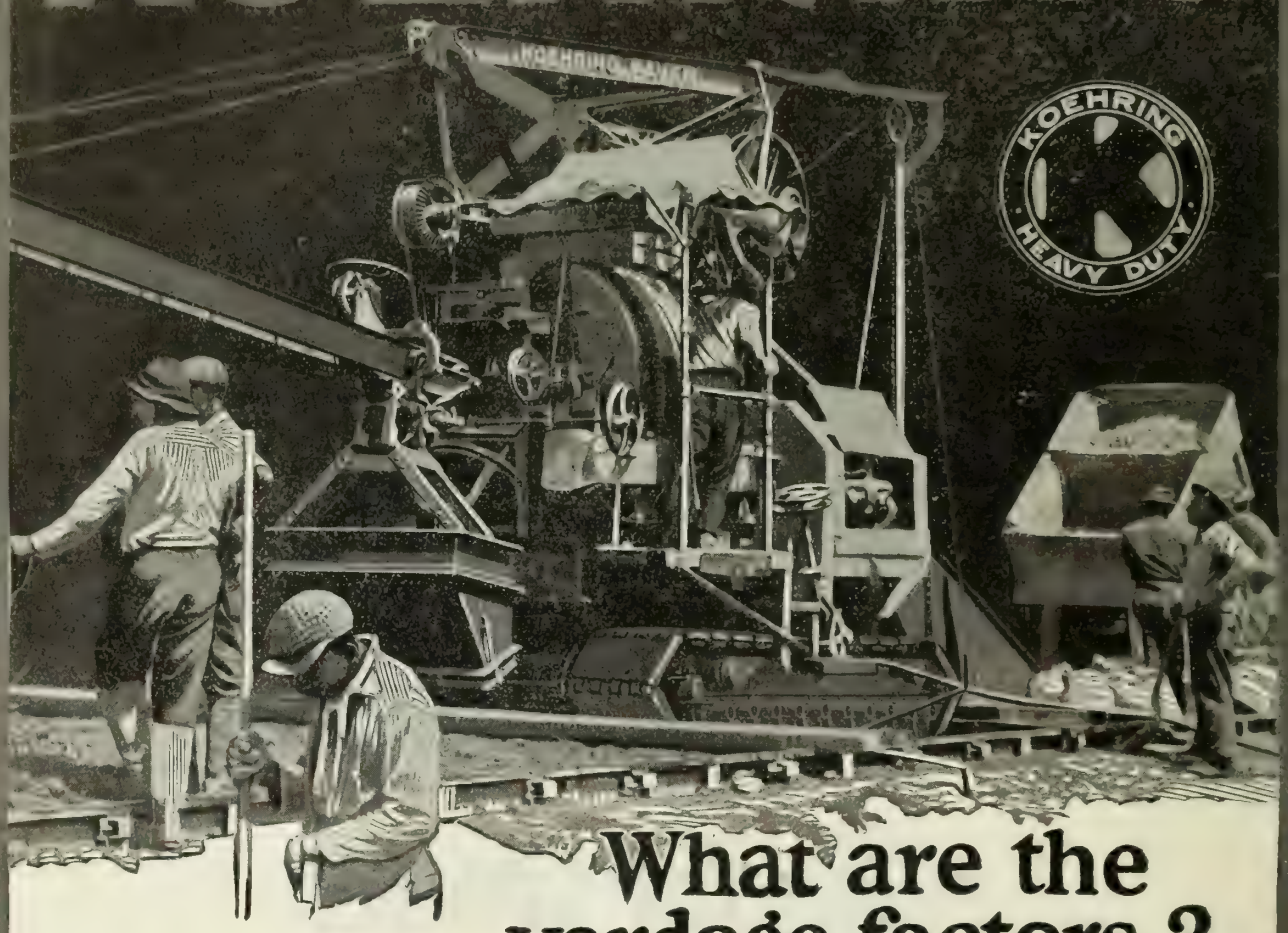

What are the yardage factors ?

Speed in getting materials into the drum, and uniform mixed concrete on the subgrade.

—*speed,* which because of automatic actions, and simplified control can be *maintained* every minute of the working day.

—*speed which does not penalize by breakdown and delays.*

The Koehring paver is not only the mixer of speed in the chain of operations from charging skip to placement on the subgrade—but, it is the mixer of heavy duty construction that minimizes breakdowns and delays—that delivers at the season's end, the volume of low cost yardage which mean profits. Write for Koehring Paver catalog P 00.

Capacities

Pavers: 7, 10, 14, 21, 32 cu. ft. mixed concrete. Write for catalog P 24.

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete. Write for catalog C 24.

Dandie: Light mixer, 4 and 7 cu. ft. mixed concrete; power charging skip, or low charging platform. Light duty hoist. Write for catalog D 24.

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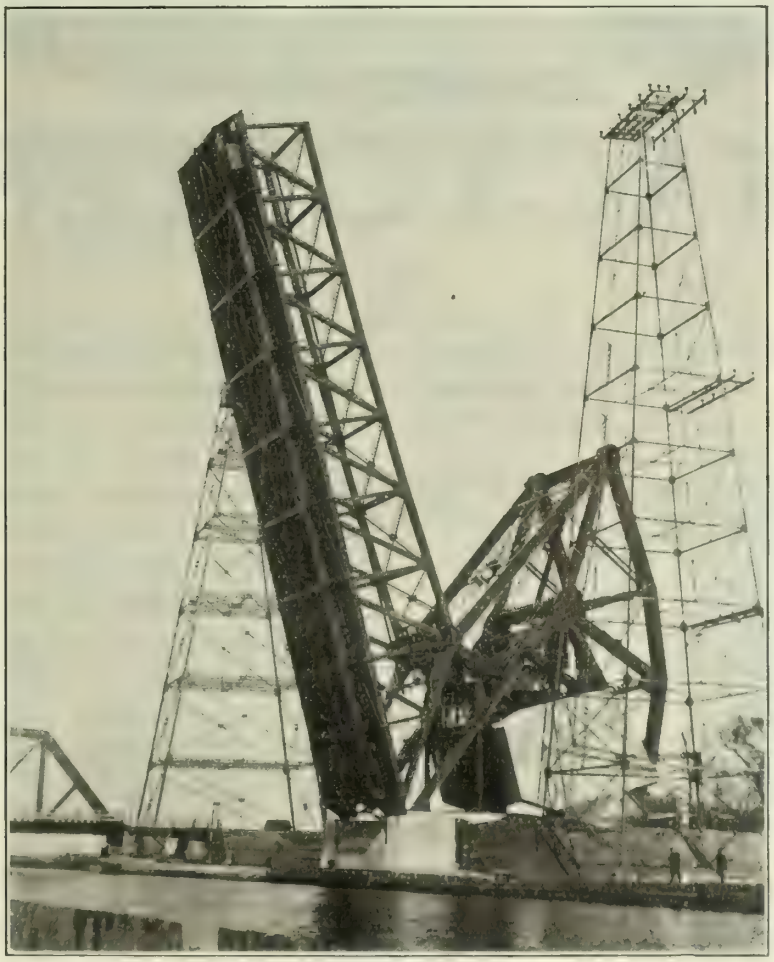

We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

The advertiser is ready to give full information.

FACTORIES

IF you are thinking about factory construction you may be confronted with many problems.

Shall the building be of reinforced concrete or steel frame? If the latter what walls shall be used? What type of construction is the best for a particular purpose? Can more efficient routing and handling methods be provided in the new building?

Let us help you with your problems. We are specialists in *all* types of construction, and our advice is based on long experience in the design and construction of a wide variety of industrial plants of reinforced concrete, steel and mill construction.

We offer a complete service including design, construction and installation of equipment, or we will construct from the plans of other engineers. If you contemplate construction of any character we would like to discuss it with you.

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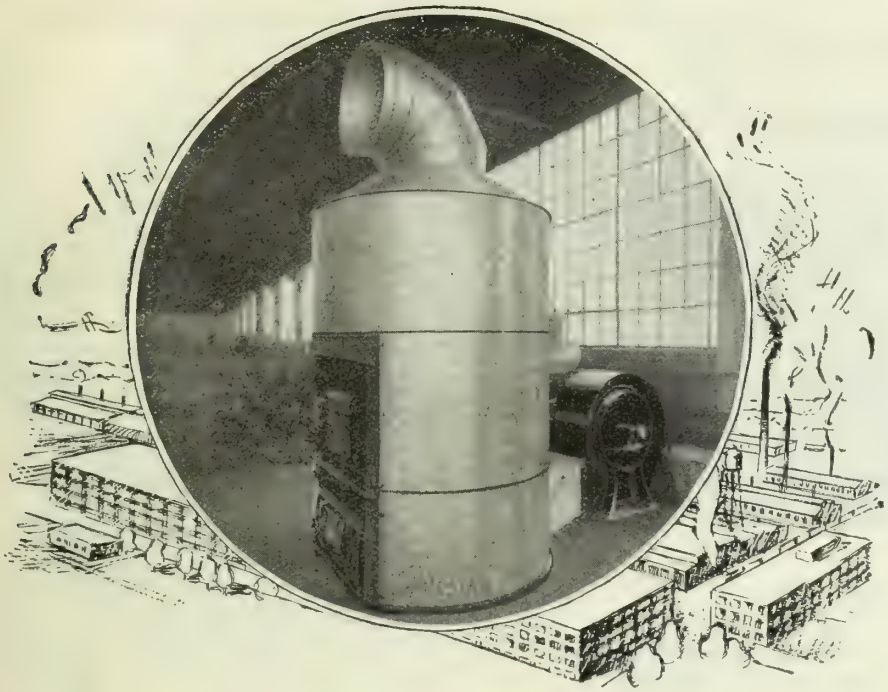

The "Sirocco" C S C Direct Fired Heater is fool proof and safe; easily installed; burns coal, coke or wood and is operated with no more attention than given an ordinary furnace.

Fired Like An Ordinary Furnace

For the factory addition—new buildings, warehouses, foundries, halls and auditoriums—the "Sirocco" C S C Direct Fired Heater solves the heating problem economically and satisfactorily—particularly where steam is not available.

The "Sirocco" Heater draws the cold air from near the floor level, forces it around the heated firepot and then gently diffuses it into the open building area where it thoroughly warms every cubic inch of space.

During the summer months, by suitable connection to outdoors, cool, fresh air may be circulated and the building ventilated.

With its low first cost and economical operation the "Sirocco" C S C Direct Fired Heater reduces the ultimate cost for an efficient heating system to the lowest possible point.

Complete information regarding the "Sirocco" Heater will be sent you upon request.

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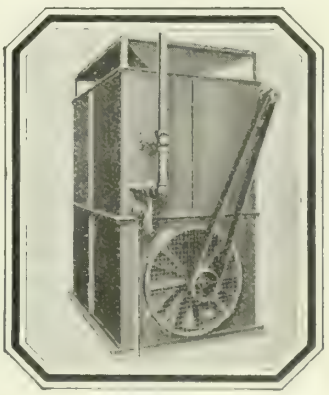

Built as an individual unit with a series of pipe coils which are heated with exhaust or live steam, the "Sirocco" Portable Heating Unit maintains comfortable working conditions without disturbing floor dust or creating drafts. The fan, which draws the cold air into the unit may be operated by any power available.

"Sirocco" Products

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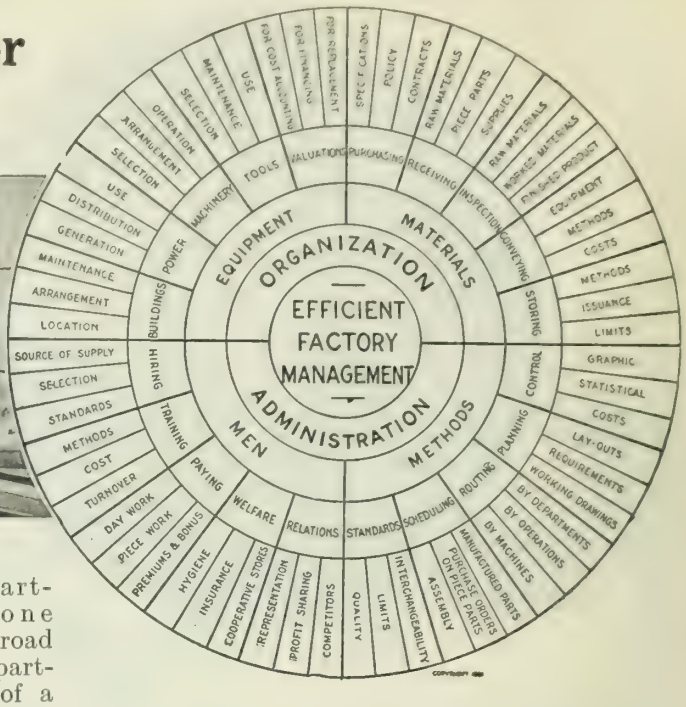
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

"Must I Look Outside for a General Manager"



John Brewster Carson — Vice-President in charge of Production—was "up against it". He needed a General Manager to replace Ridley who had resigned because of illness.

Ridley had been the main cog in the smooth running machinery of this great industrial corporation. His value lay in his ability to detect and eliminate waste. He could tell at a glance whether any particular department of the organization was functioning efficiently.

Wanted the "All Department Man"

Ridley could do this because he was an "all-round man". He understood the basic principles of industrial management and could apply them to practical conditions.

Carson wanted to pick Ridley's successor from the men who were already inside the company. He thought of Mallory, but Mallory didn't know "costs" or anything about distributing "overhead" expenses. Simpson might do, if only he understood more about power-plant and equipment problems. Then there was Bartlett—he was an expert on accounting, but he didn't know the first thing about executive statistical control, including the methods of presenting facts graphically. Edwards knew about purchasing and storing of materials, but wouldn't recognize a "floor layout" if he saw one.

Name after name came to mind, but always it was the same story—capable, promising men, yes, but each of them knew only his own particular department. Not one possessed that broad grasp of all departments required of a General Manager.

Carson's dilemma is a common one. Industry is insistently calling for industrial managers—men who know the principles which govern factory organization and administration, the selection and layout of buildings and equipment, the planning and routing of work, wage systems and bonus plans, cost accounting, the generation and use of power, the valuation of property and statistical control.

Let These Experts Teach You

A few years ago you couldn't have obtained this kind of knowledge except through years of grinding experience in some industrial plant.

But today there is a shorter, surer way. Sixty of the nation's leading industrial specialists have co-operated to produce the "Factory Management Course and Service of the Industrial Extension Institute". Big business gladly pays these experts enormous fees for professional advice. But through the "Course and Service" the combined experience of men like Babson, Gantt, Going, Ficker, Steinmetz, Franklin, Bloomfield, Towne, etc., has been systematically arranged so that you can acquire at slight expense the training you need in order to qualify for the bigger jobs ahead.

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THE JOURNAL OF
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OF CANADA

JANUARY 1923 Volume VI, No. 1

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Electric Furnaces for Heat Treatment of Steel

Special features of Design and Operation, with particular reference to the furnace of the Transcona Shops of the Canadian National Railways.

A. W. Lamont, A.M.E.I.C.,

Canadian Westinghouse Company Ltd., Winnipeg, Man.

Paper read before the Winnipeg Branch, The Engineering Institute of Canada, November 2nd, 1922.

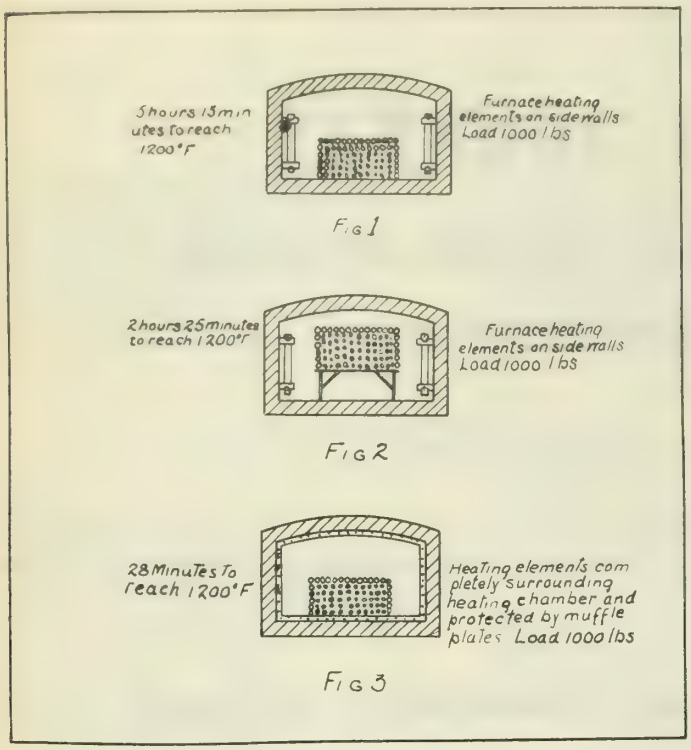
Large industrial electric heat treating furnaces reached a high state of development during the war and to-day their status compares favourably to the electric motor fifteen years ago, both as to connected load and apparatus available. In the application of electric motors to industry among the points taken into consideration are continuity of service, reduced maintenance, ease of operation, increased production, reduction of power costs, increased quality of product due to the ability of the motor to maintain a constant speed. Sufficient installations and applications of electric furnaces for heat treating have already been made to demonstrate conclusively that increased productions, better quality of product and lower operating costs result than from other types of furnaces. It is therefore a field of development of prime importance to both the manufacturer and the power company as surveys that have been made show the potential industrial high temperature electric furnace load to be very large even compared with present motor and lighting loads.

The writer will discuss this subject first in reference to the design of these furnaces and then the operation, and in each case with particular reference to a furnace that has recently been constructed for the Canadian National Railways at their Transcona shops by the company that he represents.

Design of High Temperature Electric Furnaces

The development of heat treating processes to a high plane has been practically impossible in the past due to the nature of the fuels available. To secure a predetermined product, it is essential that the complete time-temperature cycle of operation be under definite control, that the heating be done in a chamber having uniform temperature distribution, in an atmosphere free from products of combustion, and in a minimum length of time. With combustion fuels, these results can be approximated only, and with no definite assurance of duplication day after day of even a fairly uniform product.

The early type of electric furnace was constructed on the principle shown in figure No. 1. The length of time required to bring the entire load to a uniform predetermined temperature in a furnace of this design was found to be excessive and later the principle shown in figure No. 2 was employed with the encouraging results as shown. The most recent development in the arrange-



Figures Nos. 1, 2 and 3.—Development in the Principle of applying the Heating Elements in a High Temperature Electric Furnace.

ment of the heating coils is shown in figure No. 3, and this arrangement is followed out in the Transcona installation. It will be noted that by test the time-temperature cycle has been reduced to 11¼ per cent in this latest type of construction over the original type.

The work for which the Transcona furnace was designed consisted of heating 5,000 pounds of locomotive side rods and main rods from room temperature to 1,650° F, and it was desired to construct the furnace bottom on a car so that the charge could be rolled in and withdrawn on the car. The length of the chamber of the furnace was determined at 15 feet 6 inches so as to take the longest rods. As shown in figure No 3, it was decided to completely surround the charge with heating elements protected by muffle plates and the other dimensions of the furnace were kept at a minimum restricted only by the space required for the charge; the only other consideration being the desirability of making the depth of the charge as small as possible. These dimensions were therefore determined at 48 inches and 20 inches to the spring line of the arch, which necessitated a dimension of 24¾ inches from the floor plates of the car to the inside top of the arch. Figure No. 4 shows the inside of the furnace with the car bottom removed.

There are twenty-four of these coils in the top and sides of the furnace and, as there is provision made for dividing the furnace chamber into two compartments for doing smaller work, there are therefore twelve coils in each section. Each group of twelve coils is connected to give a balanced load on 180 volts, three-phase, four coils being connected in series. In the car bottom there are twelve coils divided into two groups, one for each compartment, and they give a balanced load on 90 volts, three-phase, two coils being connected in series on each phase. On account of the arrangement of coils, any one can be replaced at any time without disturbing any other coil or section of the furnace and in case of a ground, short circuit, or any similar accident to the element, in the majority of cases only one would be damaged and could be replaced in a few minutes at a small expense, whereas if one continuous wire is used on line voltage as is the case in some types of furnaces the whole element is destroyed, causing a loss of thousands of dollars in a large furnace and requiring days to replace.

The coils in the car bottom are held in place by the grooves in the muffle plates which cover them. Over the top of these muffle plates, a floor of cast non-oxidizing ribbed plates is laid. The floor plates rest on supporting fire brick shapes and do not allow any load to rest on the muffle plates of the heating units.

The muffle plates referred to above are a special combination of earths having a thermal conductivity twenty times that of alundum and having a high dialectric strength at furnace temperatures. These plates serve not only to protect the element wire from injury or short circuit but also distribute the heat uniformly over the entire inner surface of the furnace. The latter feature is very important in a heat treating furnace as a more

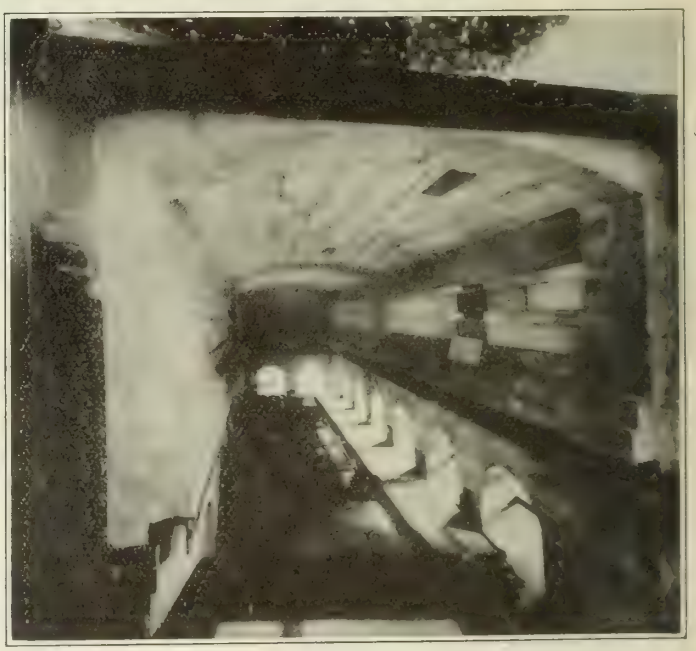


Figure No. 4.—View of Interior of Transcona Furnace with Car removed.

Note exposed heating element on the side. A trough on each side of the car is filled with sand so that when car is run into the furnace, a projecting angle shown on each side of the furnace is embedded into the sand to prevent air leakage from the interior to the exterior of the furnace. This arrangement permits the wheels and structural part of the truck to be outside of the heating chamber.

uniform temperature is maintained throughout the entire surface. As an example of what is attained by the use of these muffle plates, it might be mentioned that in a recent installation for annealing glassware, goblets were successfully placed in parts of the furnace within one and one-half inch from the source of heat. With the same current density, exposed elements would have melted the goblets. The muffle plates also help to exclude a large portion of the oxidizing atmosphere of the furnace from the element wire thus reducing the oxidizing effect on the wire.

The walls of these furnaces are made up of special insulating bricks as follows:

Insulbrix: This is a high temperature brick that goes against the inner lining of fire clay. It is guaranteed by the manufacturers to withstand 2,000°F without shrinkage. It is a good insulator and weighs 3¼ pounds, as against 7 to 7½ pounds, for ordinary fire brick.

Non Pareil Bricks: There bricks are placed on the outside of the wall and are what is known as the low temperature insulation. The manufacturers guarantee them to withstand 1,600°F without shrinkage, and their insulating qualities are very marked as is indicated by their weight of 1¼ pound.

With a 16 inch wall of the above material, temperatures of 1,800°F can be maintained within the furnace and a thermal efficiency of well over 80 per cent attained. Higher thermal efficiencies are quite possible, but for the reasons explained above are not desirable as the cooling part of the cycle of heat treatment would be too long.

Figure No. 5.—General view of the Transcona Car Bottom Type of Heat Treating Furnace.

The inside dimensions of this furnace are 48" wide 20" high from top of car to spring line of arch. Capacity 220 K.W. Terminal voltage of furnace 180, 3-phase Top of car forms the hearth of the furnace; heating elements are mounted directly in the top of the car, thereby heating four sides of the furnace. The door of the furnace drops down on the top of the car affecting a door seal. Current is conducted to the heating elements in the bottom of the car through sliding contactor shoes on the rails. Note the sections of two coils exposed. Coils are protected by means of refractory muffle plates; over the muffle plates are placed a thermalloy cast plate.

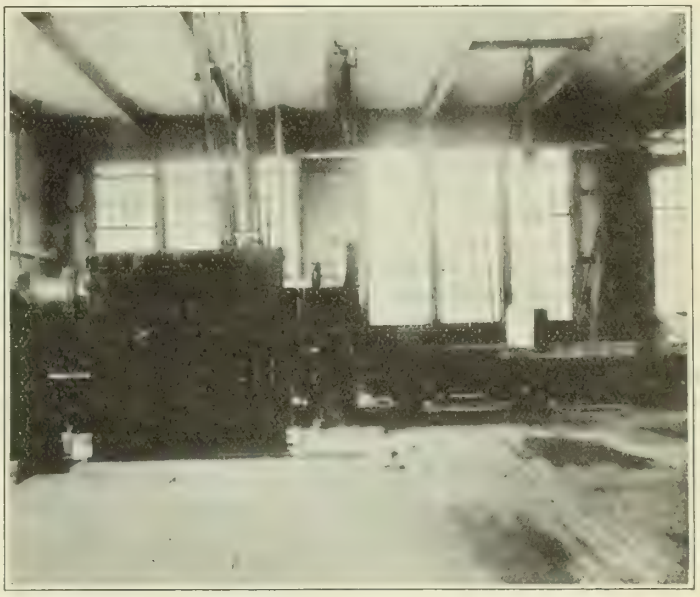


Figure No. 6.—General view of Control Switchboard and Car.

The control panel consists of two 250-ampere contactors and two 500-ampere contactors, with suitable relays and pyrometer for automatic temperature control. The furnace is divided electrically into two sections, so that one half may be operated entirely independently of the other. Note the removable baffle placed on the car for the purpose of dividing the furnace compartment into two sections. A Leeds and Northrup combined recording and controlling pyrometer is used for recording and limiting the temperature automatically.

In the design of the furnace in question, it was desirable that a uniform predetermined temperature be maintained automatically throughout the period that the material was absorbing the heat after this temperature of the furnace had been reached. In order to accomplish this two thermo couples were inserted in the furnace, one in the central portion of each compartment. The couples were connected to a Leeds and Northrup graphic recording pyrometer having two point control. These controls, through suitable relays, operate magnetic contactors which are shown in figure No. 6. When the temperature of the furnace tends to rise above the setting of the instrument, the heating circuit is opened and when the temperature tends to fall below this value it is again closed. A uniform temperature within one-half of one per cent can be maintained with this equipment.

Operation of Transcona Furnace

The operation of the Transcona furnace is best described by references to figure No. 7. A charge of approximately 6,000 pounds of locomotive side rods and main rods were placed in the furnace at 8.10 a.m. At 1.00 p.m., the furnace had reached the predetermined normalizing temperature of 1,200°F, and the pyrometer which had previously been set to operate at this temperature operated the relays which in turn

caused the magnetic contactors to open and drop the load. At this time however the charge had not absorbed sufficient heat to soak it to the centre of each rod. In approximately five minutes the charge had absorbed sufficient heat to reduce the furnace temperature six degrees and the pyrometer again caused the load to be thrown on. This cycle of operation is continued until the charge is completely soaked at the predetermined temperature.

Following the kilowatt curve along, in figure No. 7, it will be noted that at 2.00 p.m., the load thrown on is only 170 k.w. This is accomplished manually by the operator who at this time has connected the 140-volt secondary tap on the transformer to the load, thus reducing the input and also reducing the frequency of the load being thrown on and off automatically. At 3.40 p.m., the operator connected the 90-volt tap thus reducing the total input to 106 k.w. As soon as the kilowatt input balances with the known radiation losses of the furnace, it is then clear that the charge is not absorbing further heat. This is shown on the curve at approximately 4.20 p.m.

The pyrometer and main switch is now opened and the current entirely disconnected. The furnace is allowed to cool until its temperature has reached 1,000° F and then the charge is drawn. This cooling is necessary before the door of the furnace is opened, as the rods would oxidize if drawn at a higher temperature.

In order to make the furnace of maximum efficiency, all things being considered, it was necessary to liberate heat therein just as fast as the charge could absorb it, and also to insulate the furnace so that a minimum of heat is lost by radiation. There is a very definite limit that one can go in connection with this later consideration however, as after the charge has been treated the current is turned off and the temperature of the charge allowed to cool to approximately 1,000° F before the door is opened and the charge removed; this being necessary to prevent oxidation. The radiation losses must therefore be equivalent to the cycle allowable for cooling. The total heating element capacity desirable after considering the above points was determined at 220 k.w., and the radiation losses at 1,650° F were estimated at 48 k.w., giving a thermal efficiency at that temperature of 80 per cent.

The best commercial element yet developed for furnaces of this type is pure nickel chromium (80-20) wire which is practically non-oxidizing up to a temperature of 2,000° F. The question of prime importance in the design of the element is to keep the oxidation of the element down to a minimum as this definitely determines the life of the element. A round wire is therefore chosen as the surface exposed to oxidation is a minimum per unit of weight.

The size of the wire used is made as large as is commercially feasible for the following reasons. If you increase the diameter of a round wire so that the weight is doubled there is only an increase of 41.6 per cent of the current required to produce the same quantity of heat. As the weight of the wire has been doubled, it is obvious that the temperature of the source of heat must be lower. It is therefore evident that the relation of the weight of the element to the work to be performed is of vital importance.

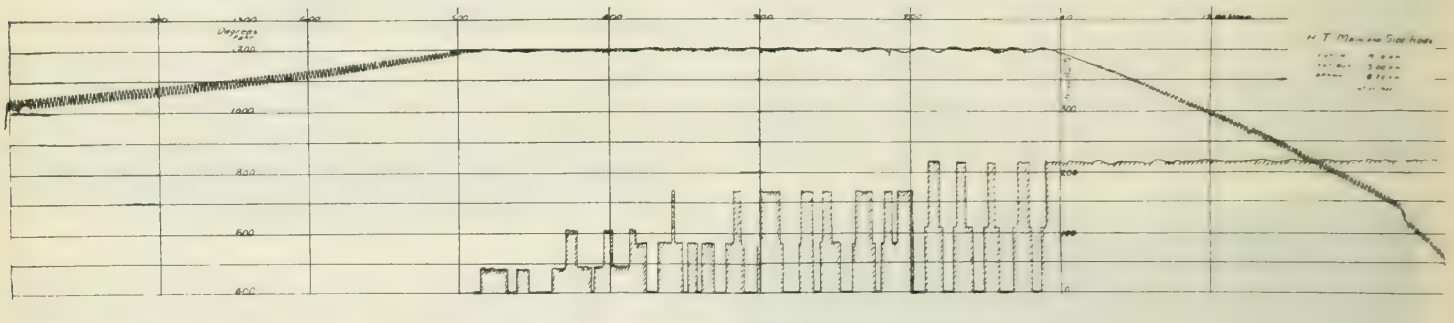


Figure No. 7.—Temperature and Kilowatt Input Curves.

The upper curve shows the temperature of the furnace with a charge of 6,000 pounds, (approximately) of locomotive side rods wire heated and normalized. The lower curve shows the k.w. input at any time during the cycle.

From the above considerations No. 1 B & S round wire was chosen for the furnace under discussion, and each heating unit is interchangeable and consists of six bars each approximately seven feet long with No. 3/0 B.S. wire of the same composition but welded to each end for terminals which are brought at right angles through the wall of the furnace and connected outside by means of frankel connectors to the supply cable. The current density in the 3/0 wire is so low that no appreciable heat is generated herein.

Power Factor

Its Physical Meaning and Commercial Manipulation.

W. G. H. Cam, E.E., A.M.E.I.C.,
Electric and Power Engineer, The Canada Cement Company, Limited.

Paper read before the Montreal Branch, The Engineering Institute of Canada, October 19th, 1922.

The economical control of power factor is a problem which has been injected into the field of engineering science by the commercial application of oscillatory electric currents to electric transmission of power.

In considering how this problem arises, the writer has thought it worth while, first to review his fundamental notions of electricity in the hope of creating a background of agreement with his audience and thereby facilitating discussion of details.

Science and Sense-Data

Electrical science till recent years has rested very largely, more than many other sciences, on conjectural grounds. We are far more familiar with other inanimate powers in nature, such as fire, wind, water, and even steam and gas. For, as first hand evidence of what is happening, we rely entirely on our sense impressions, and we draft our natural laws in accordance with the accumulated evidence of the senses, with the help of a universally accepted axiom, that if a certain group of circumstances will produce the same effect every time that we assemble them, this sequence demonstrates an immutable law connecting cause and effect.

Now, wherein lies the unreality of electrical science as compared with mechanics or hydraulics for example? Surely in this, that regarding mechanical and hydraulic phenomena we collect our data from the concordant evidence of several senses: we can see and feel and hear the agent, and may fairly say that we know the cause of the phenomena. Matter in solid, fluid or gaseous form we are very well acquainted with in a multiplicity of ways, but in electrical science we deal with an agent which is a vehicle of energy just like matter, and yet is invisible; which exhibits momentum and yet is imponderable.

Dealing with water or steam we are on material ground. We are studying the properties of things which are tangible or visible or both. When speaking of the force of a jet of water you can visualize the actual water, which is the agent, but when a jet of electricity blasts a tree, you can only see the accompanying flash of light and the effect of the jet; not the agent itself.

When dealing with the potential energy of a water power station you can see the expanse of high level water, held back by the dam and capable of exploitation by release to the lower level. You can feel, by putting your hand in the stream, the kinetic energy of the current as it flows through the turbines and see the process of transference of potential into kinetic energy. You can realize from a study of the dam wall the extent of the stress due to the pressure of the confined and quiescent upper waters. You cannot see electric fluid dammed in behind insulating barriers. Your mind does not naturally compare a defective insulator or condenser with a leaky dam, for if an electric leak takes place you cannot see what is leaking, though you may hear the drips, and dielectric stress and potential gradient as terms, have something imponderable about them when compared with shearing stress and bending moment exerted on a retaining dam wall.

The Water Analogy

Now we conceive of electric energy residing in an electric field precisely as gravitational energy resides in a gravitational field. An electric field may be a purely local affair, just like a gravitational field, or, — to use a handier analogy, — like an hydraulic power development. In this case what we may call the hydrostatic field is described by the product of hydraulic head and storage capacity, just as the product of electric potential difference and storage capacity describes the electrostatic field. Both fields contain potential energy. Comparing water and electricity in motion, the parallel between the hydrodynamic and electrodynamic field is not so clear. Both fields contain kinetic energy, but the dynamical expression $\frac{Mv^2}{2}$ does not appear to parallel the electrodynamical expression $\frac{Li^2}{2}$. That there is an identity or kinship between mass (M) and induction-coefficient (L), or between velocity (v) and current (i) will not be admitted without evidence.

It is interesting to notice how far we can push the analogy between water power and electric power and where the parallelism breaks down. High potential water, or electricity, at rest, causes a stress on the dam walls or insulating dielectric. The conducted current of water, or electricity, in motion develops mechanical energy at the water-wheel or electric motor in flowing from the level of high potential to the level of zero potential. The current of water, or electricity, overcomes friction in traversing the pipe, or conductor, and dissipates the work in heat. But a current of electricity flowing in a conductor does not behave like a current of water flowing in a pipe if its motion is suddenly arrested. The moving water has momentum or mass-velocity and the sudden stopping of it will cause it to exert a force, (mass-acceleration), in the direction of its original motion. No similar effect accompanies the arrest of an electric current flowing in a conductor. If it did, the conductor would

experience a forward thrust, in the direction of motion of the current, when the current was arrested.

Electric Inertia

Our evidence goes to show that while we can attribute momentum to an electric current, its location is *outside* the conductor in the magnetic field of the current, which, if the current is arrested gives up its kinetic energy in the form of a high pressure impact on the dielectric, which may burst under the strain. The magnetic field then has inertia, and this inertia exerts a counter-force against any change in the current which excites the field.

Developing this idea of the magnetic field as the inertia associated with the velocity of flow of electricity, we may use the picture of a mechanically driven belt, the speed of which is analogous to the intensity of the electric current, driving a shaft on which is a heavy flywheel, representing the field. Increase the speed of the belt and the kinetic energy supplied will be absorbed by the flywheel, being measured by the work done in overcoming its reluctance to change of speed: cut off the supply of mechanical power and the flywheel will persist in motion and keep the belt running until its store of energy has been worked out by friction loss in the form of heat. This is what happens when in shutting down a generator, you short-circuit the field at the same time that you open the field switch. A current circulates through field winding and short-circuit until the energy stored in the field has been dissipated in heat. "Inductance" is the term for the electric inertia of the magnetic field; "capacity", for the storage room in the dielectric field.

Magnetic and Dielectric Fields

The relation between the magnetic field and the dielectric field can be pretty well represented by the analogy of the balance-wheel of a watch and the hair-spring. Assuming either of these fields to contain stored energy, energy of motion in the first case, potential energy in the second case, there will be a cyclic transfer of energy between inductance and capacity, as between balance-wheel and hair-spring. In the gravitational field the motion of a simple pendulum exhibits the same cyclic transfer of energy from the potential to the kinetic field and back again. Pressure is the characteristic of the potential field; motion, or flow, of the kinetic field.

Write 'e' for electric pressure, 'i' for current, 'C' for capacity and 'L' for inductance. Then 'e' is the variable factor of the dielectric field 'Ce', and 'i' is the variable factor of the magnetic field 'Li'. The development of electric power or flow of electric energy depending on the interaction of these two fields, their product is proportional to the power developed. So we resolve electric power, 'P', into two factors 'e' and 'i', which are proportional respectively to the two components of the electric field, the dielectric (Ce), and the magnetic (Li).

Alternating Current Power

"Power = volts × amperes," is true at any instant of the energy supplied to an electric circuit. The integration of this product over a definite period of time will truly express the energy supplied and the time-base average of this energy will be the average power supplied. But the product of the equivalent direct current values of voltage and current will not necessarily express the average power.

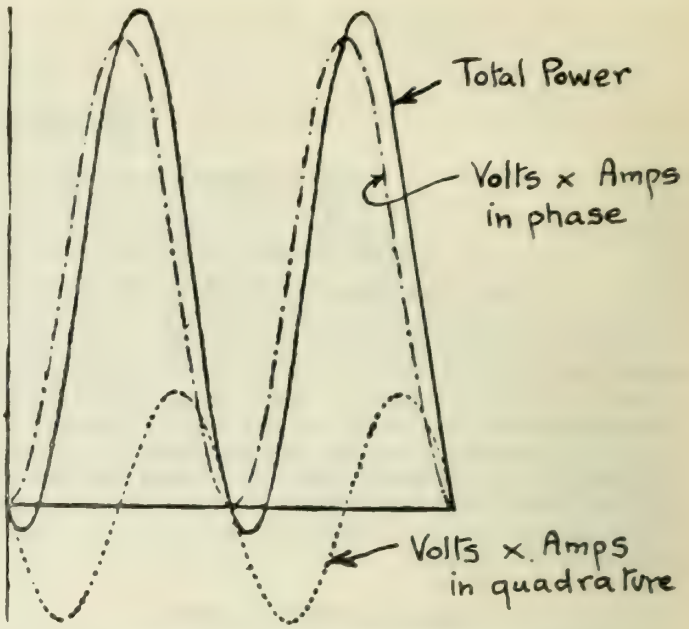


Figure No. 1:—Analysis of Power Curve

Consider a sine wave alternating current and voltage, of definite frequency. If the voltage leads the current by a quarter cycle, the power curve, the ordinates of which are the products of the co-existent instantaneous values of volts and amperes, will be a sine wave of double frequency, and the total energy supplied to the circuit in a cycle, being the sum of equal positive and negative blocks of energy, will be nil. On the other hand if the volts and amperes are in phase, the power curve will have only positive ordinates, and the product of metered volts and amperes will agree with the watt-meter reading.

These then are our limiting conditions; if the current wave is in-phase with the voltage wave:—power = volts × amperes. If the current wave is in quadrature, that is a quarter cycle before or behind the voltage wave:—power = 0. But in no case can the power be greater than the volt-amperes.

Now if the current wave is in any intermediate phase between these two positions how do we get our power? We use the mathematical fact that you can shift the phase of a sine wave by adding or subtracting another sine wave of the same frequency. That is to say we decompose our sine wave of current into two waves, one of which is in phase with the voltage and one in quadrature.

As has been shown, in measuring the power supplied to our circuit we can disregard the component current wave which is in quadrature with the voltage. With regard to the current wave that is in phase with the voltage we now require both current and voltage wave translated into an intelligible form for measurement. This is found by comparing the heating effect of an

alternating current with that of a direct current. Suppose we have an alternating current flowing in a circuit absolutely free from inductance, and of constant resistance, the rate of heating at any moment will be proportional to the square of the current. The mean rate of heating during one cycle will be proportionate to the mean square of the current, and the square root of this quantity will be the equivalent direct current. As E = R. I., the same thing applies to an alternating sine wave voltage. So in alternating current measurements E = R.M.S., volts and I = R.M.S., amperes, and we use D.C., for calibrating our A.C., standard instruments.

In alternating current practice we are dealing with R.M.S., volts and amperes in most of the commercial applications of electric power, and the natural tendency is to lose sight of its physical characteristics. The maximum applied voltage, on which the break-down of a cable or arrester may depend, is root two times the R.M.S., volts. The maximum amperes, on the field of which depends the magnitude of the impact on the dielectric when the current is interrupted, is root two times the R.M.S., amperes. Also by reducing our current and voltage waves to their R.M.S., values, that is straight lines, we lose sight of their phase relationship, and have to introduce a factor to give us the ratio between in-phase amperes and total amperes, that is between power, (watts), and volt amperes in R.M.S., values. This ratio is our *Power Factor*. By referring the total current-wave, component current waves and voltage wave back to the time circle from which they are derived, it is seen that the value of the power factor is the cosine of the angle of difference of phase between total current and voltage.

Development of the Circle Diagram

It will be as well now to consider in detail our time circle diagram, and the derived waves of voltage and current, which make up the picture of conditions in our circuit.

We will assume that a power company is supplying alternating current power over a private transmission line to a town a few miles away and that the town is using this power for public and domestic lighting and for industrial motors. It is a single-phase supply and the motors are induction motors. The power company meter the supply at their switchboard, that is practically speaking at the generator terminals. They generate at 4,000 volts, and the power demand of the town is determined by the watt-meter, but the charge for this power is on a sliding scale dependant on peak load power factor.

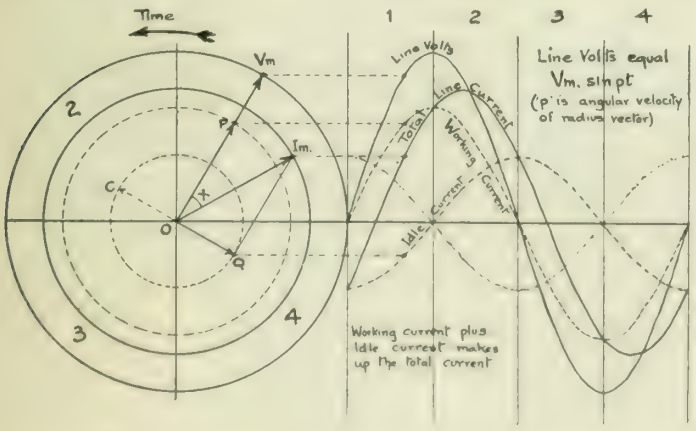


Figure No. 2:—Development of Circle Diagram

Suppose that at peak load we obtain the following readings: — kilowatts 400, volts 4,000, amperes 125. The frequency is 60 cycles per second. We will make a diagram to show what is happening during one cycle, that is 1/60th of a second.

Our instruments read in R.M.S., volts and amperes, so the maximum volts Vm., during the cycle are 4,000 root two, and the maximum amperes Im., 125 × root two. Draw a circle with radius Vm., and show the voltage vector in any position OVm. The radius vector OVm., rotating counter-clockwise, makes a complete revolution or cycle in 1/60th of a second. The radius vector OIm., does the same. To find the relative position, (in time), of the voltage and current vectors, we need to derive our power factor. The kilowatt is 1,000 watts: the kilovolt is 1,000 volts.

Our observed data were: — kilowatts 400 = power; kilovolts 4; amperes 125. Therefore kilovolt-amperes 500 = kv.a. By definition, power factor $= \frac{\text{power}}{\text{kv.a.}} = \frac{400}{500}$ = 0.8. This is the cosine of the angle between the current vector and the voltage vector. It is also the ratio of *in-phase current* to *total current*, and the quadrature component of current being at right angles to the in-phase current we have a right angled current triangle of which we know that;—(in-phase current)^2 + (quadrature current)^2 = (total current)^2

In-phase current = 0.8 × total current = 0.8 × 125 = 100; (quadrature current)^2 = $125^2 - 100^2 = (125 + 100)(125 - 100)$ = 225 × 25; therefore quadrature current = 75.

So we have, total current 125 amperes; in-phase component 100 amperes; quadrature component 75 amperes; showing that the ratio of the sides of our right angled current triangle is 5:4:3.

Lay off 4 from the centre to any scale along the voltage vector to show the in-phase current. Lay off 3 from the centre to same scale lagging 90 degrees behind the voltage vector, to show the quadrature current. Complete the rectangle contained between these lines and draw the diagonal from the centre of the circle. The total current has now its correct phase relation to the line voltage in accordance with the data obtained.

We can now describe the circles to represent the travel of these four radius vectors in their time circles, a complete revolution in each case representing the same duration of time, that is 1/60th of a second, so that their phase relationship is unchanged.

Starting from the moment when the voltage vector is horizontal, pointing to the right, we next plot rectangular co-ordinate sine waves, the ordinates being the projections of the moving vectors on the vertical diameter of the time circles, and the abscissae proportionate to the fraction of the circumference separating their instantaneous position from the time zero, where the voltage vector started.

The Wattless Paradox

Now what makes the line current lag? We have analyzed the line current, 125 amperes, into two components, one of which, 100 amperes, the power component, is collaborating 100 per cent with the voltage, and the other 75 amperes, the "wattless" component, appears to be doing nothing. The power component is I. cos X = 100 amperes; the wattless component is I. sine X = 75 amperes; and the total power = V.I. cos X plus V.I. sine X = 400 k.w. plus 0.

The town is getting 400 kilowatts of power from the power company, plus 'nothing', yet this nothing appears to be something and the company grades its charge for power in accordance with the size of the expression V.I. sine X. It appears that V.I. sine X = 0, is a camouflage, for I. sine X is 75 amperes and V is 4 kilovolts. The truth is that in this V.I. sine X component we have separated out a term which arises from the flywheel effect of our current propagation.

As power current decreases with falling voltage, the flywheel effect, that is the magnetic field, produces a current opposing the power current and returns energy to the prime mover. Look at the two curves, power current and wattless current and you can see it happening. If there is any storage capacity in the circuit fed, the flywheel energy which is being returned will first fill up this capacity, like a surge tank, and the balance of the flywheel energy will flow back into the prime mover till the flywheel is at rest, that is the magnetic field of the fed circuit is zero. In the first half cycle the flywheel is run up to full speed ahead, and returns to rest, in the second half cycle it is run up to full speed astern and returns to rest.

Storage capacity of the circuit has been mentioned above. It is clear that if the storage capacity of the circuit is sufficient the flywheel energy of the magnetic field will be taken up entirely into storage, while the in-phase current is falling with the line voltage from its maximum value to zero. In that case we shall have a component current OC in the circuit, equal and opposite to the 90 degrees lagging "wattless" current. That is to say we shall have a wattless leading current with a wave as indicated faintly on the diagram.

Defining our component currents with reference to the applied voltage of our circuit, the "working or power current" is that component of the total current which is in-phase with the voltage; the "magnetizing current" is that component of the total current which is in quadrature with the voltage and lags behind it; the "capacity current" is that component of the total current which is in quadrature with the voltage and ahead of it. "Wattless current" is in quadrature with the applied voltage but may be either lagging or leading, so it may mean either magnetizing or capacity current.

The Energy Balance Sheet

In the supply to the town, which we are considering, the wattless component of current derived from our meter readings is the net total of all the storage capacity and fl wheel effect currents, and it is general experience that this net total lags, though special measures may be taken to provide an excess of storage or a local supply of magnetizing energy.

Now, this transfer of energy to and fro between generator and magnetic field, this oscillation of magnetizing current, does not occur without loss of energy, but the amount of energy in transit as shown by the wattless current power wave is not impaired thereby, for any true loss of energy is bound by definition to appear in the power component of the current wave. So the resistance loss $(I. \sin X)^2 r.$; (r) being the total ohmic resistance of our town circuit starting from the generator terminals; is a part of V.I.cos X; the hysteresis and eddy current losses, wherever iron forms a part of any magnetic circuit involved, are also a part of V.I. cos X. In fact in separating out our V.I. sine X we are separating out mathematically something that physically speaking it is quite impossible to isolate. It is equally true that we cannot isolate V.I. cos X physically.

For example, in order to physically isolate the magnetizing current of an induction motor, we should have to build it of perfectly insulated iron, the molecules of which could be displaced on their axes without any attendant friction loss, and we should have to wind the field with wire having no resistance. Then with the rotor winding open-circuited we could read magnetizing current with an ammeter and our wattmeter would read zero.

It is just as impossible in an alternating current circuit to eliminate magnetizing current from our current measurements, for the current, and with it the energy contained in the attendant magnetic field, is varying all the time no matter whether the field is spread out into space or concentrated in and around an iron circuit.

Any item of magnetizing current then carries inseparably associated with it a component of working current, which is in-phase with the voltage, and every item of working current carries with it a magnetizing current component and a capacity current component, which are in quadrature with it, the former lagging, the latter leading, and only the vector sum of these components can be measured as current demand. So, though in the case of our town supply we can obtain the total magnetizing current—often called the reactive current—by mathematical analysis, we can't read it on an ammeter.

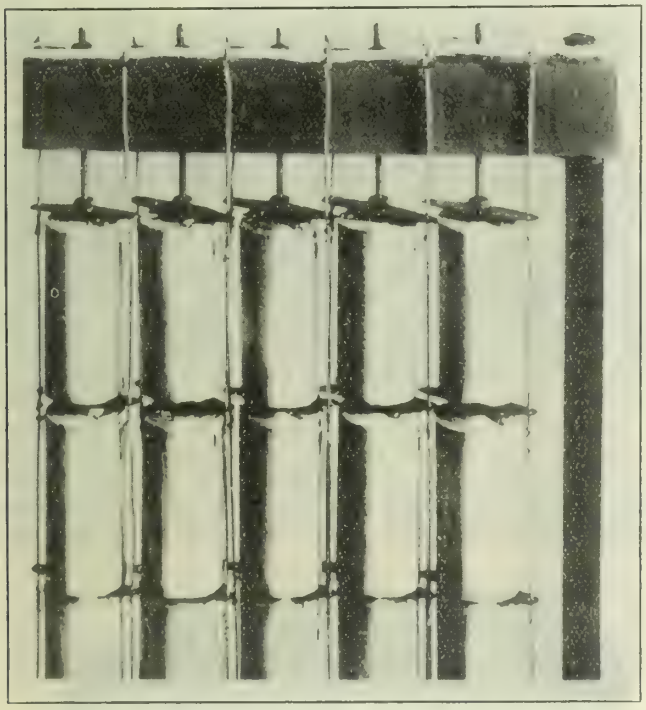
In the case of 3-phase power supply, metered with a two element polyphase wattmeter, it is true that by grouping (a) phase current with (b) phase voltage, and (b) phase current with (a) phase voltage, we can get a reading proportionate to V.I. sin X, or "reactive kv.a.", in current terminology. But our instrument readings are really proportional all the time to the product of two currents in-phase with one another, that is to say, to I′I″ multiplied by the cosine of the included phase angle. To read kv.a., with a wattmeter we have to juggle with the instrument, so that we energize it with watts proportionate to the kv.a., we are trying to measure.

Now what do we know in detail about this 75 amperes of wattless current in our circuit? It is the net total of the magnetizing currents and capacity currents, these two being opposite in sign at any moment. Magnetizing current is demanded by the induction motor fields, the transformer-fields, the transmission line, the distribution lines in that order of importance, and lastly but least of all by lighting and heating appliances. Capacity-

current is demanded principally by the transmission line, and therefore, in the case of a short line of moderate voltage, such as we have supposed, will be insignificant.

Solution of the Problem

Let us stand for a moment in the position of technical adviser to our town, which is using up in connected useful load and in waste heat of various origins 400 k.w., and is being penalized by the power company for drawing 500 kv.a. to do this. Say their line was built to give them a five per cent drop of voltage with 100 amperes. They are taking 125 amperes, so their drop of voltage is 6.25 per cent plus a small extra reactive drop. Their distributing lines will also contribute an additional ohmic and reactive drop. In fact they are using up a portion of the spare power-capacity of their system and getting nothing for it, and paying the power company good money for the privilege of doing so.



Static Condenser—Frame of Units

The power company is perfectly correct in the matter, for the capacity of their generators is limited by their maximum rate of heat dissipation and the heat to be dissipated depends mainly on the square of the current they deliver, irrespective of the power it represents. What is the remedy? It is a remedy which, under pressure from the power companies, who were the first to feel the pinch, most large users of industrial power are now applying. But it is applicable and should be applied to the small users also. The induction motor is the sinner.

Take for example a 35-h.p., 600-r.p.m., 550-volt, 60-cycle, 3-phase induction motor. At 29 h.p., load its working current is, (in equivalent single-phase quantities), 44 amperes, magnetizing current 31.2, total current 54.4, power factor 0.81. The lower the frequency, or—frequency being fixed—the slower the synchronous speed of your induction motor, the larger the volume of magnetic material to be magnetized, and consequently the larger will be your magnetizing current for the same powered motor. Other things being equal, length of air gap will be the important factor to watch.

In the example cited, if we can supply this 31.2 amperes of magnetizing current, right at the motor, the power line will have to supply only working current, in-phase current, to that motor and to the local generator or storage, which looks after the supply of magnetizing current, to make up any heat losses that mechanically or electrically may be entailed.

Earlier in this paper, an inductance having a capacity bridged across it was compared to the balance-wheel of a watch with hair-spring control. Energize such a system with half a cycle of alternating current, and if inductance and capacity are balanced and there is no resistance in the circuit, and no leakage, the oscillation of energy between inductance and capacity will continue eternally at the imposed natural frequency and amplitude. So by installing a condenser of sufficient capacity as a shunt to the motor terminals we can store the energy of the motor field, instead of allowing it to occupy valuable space in distribution lines. transformers, transmission lines and the power company's generators with idle current. This then would be the line of our advice to the town with a 400 k.w., power demand.

As the power users in such a town would probably be scattered over a considerable area, with no very large demand from any one motor or group of motors, installation of a static condenser of suitable capacity for each motor or group of motors, on the consumer's premises, would meet the case if the cost per kv.a. is reasonable and the apparatus reliable.

Static Condensers

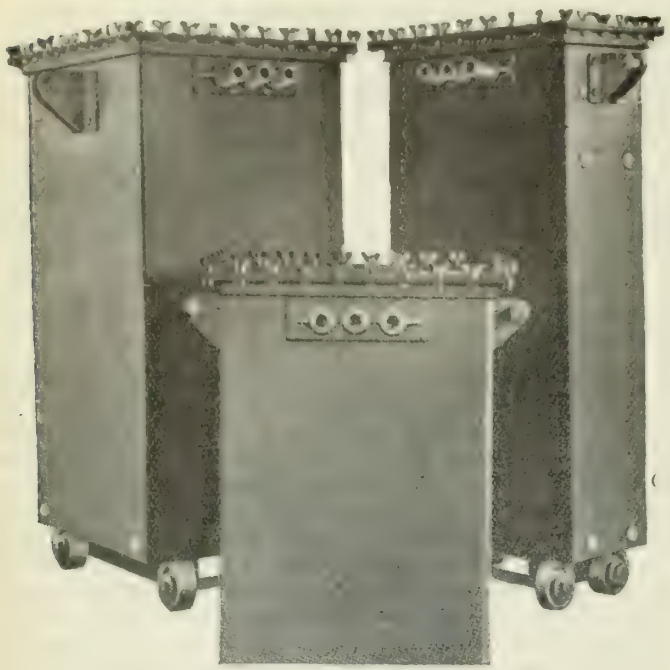
The static condenser is built up of a number of units, generally 100, assembled on a suitable frame. Each unit is built up of sheets of tinfoil interleaved with paper. The required number of frames for a given circuit is fitted in a tank, which has very much the appearance of a static transformer tank. Three-phase condensers are connected in delta, and shunted across the mains through a control switch. The frames of units are immersed in oil, and a great deal of the assembly work in the factory has to be done under oil. The reliability of the condenser depends very largely on the exclusion of moisture, and any breakdowns recorded seem to have been due to the presence of moisture in the oil, either before or after putting into operation.

The capacity in microfarads required to take up the energy of magnetisation is calculated from the formula:

$$\text{microfarads} = \frac{\text{R kv.a.} \times 10^9}{2n \times V^2}$$

where n is frequency and V, voltage.

The efficiency of these condensers is very high, that is to say they waste extraordinarily little energy in heat. In figure No., — is shown a power factor curve with a factor varying 0.0014 to 0.0019, that is 0.14 to 0.19 per cent, over a range of temperature from 70 degrees to 165 degrees,



Tank Type of Static Condenser

and the makers state that the losses at ordinary frequencies and temperatures never exceed ½ of 1 per cent. Temperature rise under working conditions does not exceed 30 degrees F. Nevertheless it is of interest to note that it was found necessary to provide ventilation or circulation spaces in the unit.

The control apparatus of the condenser consists of an oil break switch with no-volt and overload release, and fitted with auxiliary contacts and resistances to short-circuit the condenser when the switch is open, so that it can be handled without fear of shock. For small motor loads a handy wooden-box type condenser is built.

Static condensers then deserve consideration, particularly when they are made an integral part of the equipment of an induction motor. The cost will be found in no way prohibitive, and the space occupied is insignificant.

Phase Advancers

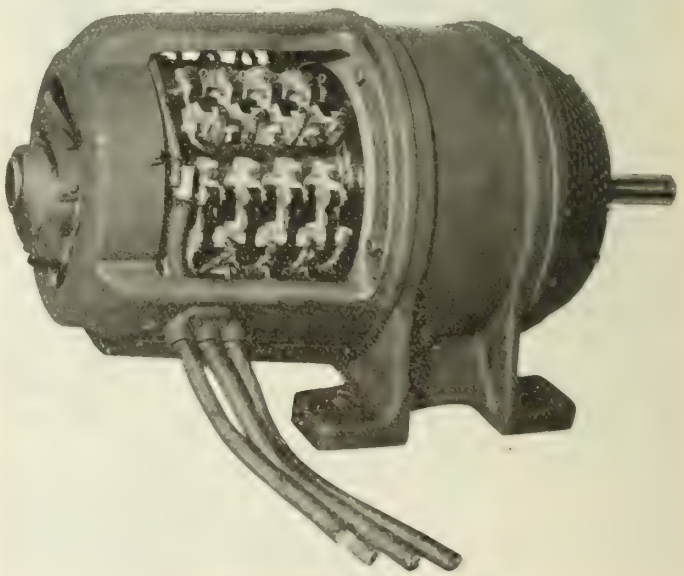
The supply of magnetizing current to large induction motors with wound rotors can also be handled in another way, by supplying excitation current to the rotor circuit. The exciter is belted to the motor, or its line shaft, and looks very much like a D.C., generator, but the stator, though laminated, is a smooth tunnel and carries no winding, the field being supplied by the induction motor rotor current, which has to be carried by the commutator. This means a long commutator. In the July number of the "Electric Journal" F. S. Wheeler, general engineer of the Westinghouse Company, has written an account of this machine which is called a "phase advancer". The rotor current of an induction motor has a frequency proportional to the slip, so the armature of the phase advancer is being driven in a slowly rotating field, and at the right speed will generate enough voltage to circulate wattless current though the rotor circuit, replacing the demand on the line for magnetizing current. About one per cent of the motor rating is required to do this.

This method of handling the induction motor problem is ingenious, but does not appeal to the writer strongly; as other things being equal, cost, reliability, space, etc., stationary apparatus is preferable to running machinery.

Synchronous Condensers

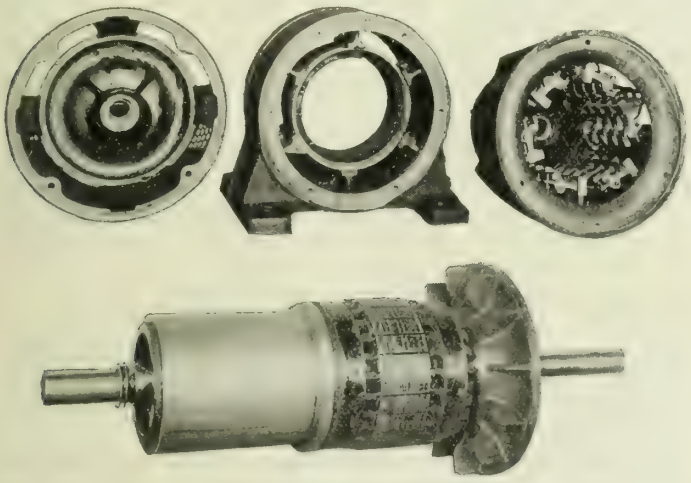
The third method of supplying quadrature current is the one best known and most used in America. The synchronous motor has a rotor field with salient poles, which is separately excited with D.C., and is rotated mechanically up to the speed at which it can "clutch" in with the rotating field of the stator current. Then by increasing the field excitation, quadrature leading current, up to the capacity of the stator winding, can be delivered to the line with a power loss of about 4 per cent of the nominal kv.a.

There are several reasons why the synchronous condenser has been favourably received. The power companies did not start the war against low power factor early enough. By the time they started campaigning, it looked as if results would be obtained quickest by going after the large consumers. For a large power user with a variable motor load — with say twice as many motors installed as he ever uses at a time — purchase of one variable synchronous condenser looks better than installing a crowd of small static condensers. Also the synchronous condenser was employed by the power companies themselves in their substations to recover lost station capacity, and they did their best to familiarize their customers with the synchronous motor. They created a popular demand for synchronous motors, which naturally was encouraged by the manu-



Phase Advancer Assembled

facturers with a flow of suitable literature on the double service that a synchronous motor can perform—namely doing its duty as a purveyor of mechanical energy, while circulating the idle current for induction motor fields.



Phase Advancer Exploded

The most progressive move yet made by any power company is the institution of special power rates for customers who will guarantee 90 per cent leading power factor. In consequence, manufacturers are offering to supply motors designed for 80 per cent leading power factor as standard mill motors for any constant speed drives. By means of a magnetic clutch, the drive can be speeded-up independently of the motor which can run for leading current supply alone or for both purposes.

Conclusions

The induction motor has a number of delightful qualities, which make it a popular favorite among individual power users, and which ensures a permanent place for it in industry, but the synchronous motor plus magnetic clutch will in time deservedly recapture a number of drives, which superior starting torque alone gave to the induction motor.

It is quite imaginable that a time may come when leading power factor will be penalized as well as lagging power factor, and a customer will be held down to 100 per cent power factor with a tolerance of 5 per cent lag or lead.

Long high-tension power lines have their leading current problems at present, so super-power stations of the future may require at certain points of their network lagging kv.a., demands to help their voltage regulation.

But the kernel of the matter is this. It is to the interest of each power user to keep his power factor as near unity as possible. Further the more narrowly he can localize his wattless current circuit, the better for him. If he operates a source of leading current in a substation from which extensive power feeders run to different departments of his plant, he is not saving his local feeders at all, but only his power bill. By locating a static condenser at each motor he will achieve the maximum economy and best voltage regulation; by installing departmental condensers at central points he will make a pretty good compromise, and many of these condensers can be in the form of 80 per cent leading synchronous motors assigned to mechanical duties in the various departments.

The Inspection of Ferrous Materials

A System of Inspection, with Methods of Testing for Various Defects

E. A. Allcut,

Associate Professor of Thermodynamics, University of Toronto.

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It was the author's original intention in this paper to deal with the inspection of materials generally, but on collecting together the necessary materials, he found that the time of three or four lectures would be required to cover the ground satisfactorily, and therefore decided to limit his remarks to ferrous materials, which, undoubtedly, are the most important materials met with in engineering practice. The handling, transportation, inspection and machining of the various forms of iron and steel are of importance in most branches of engineering science, but the *relative* values of these factors vary according to the particular kind of engineering under consideration. In aeronautical work, for instance, the factor of safety is usually so small, and the risks and consequences of failure so great that inspection must be much more severe than it need be in automobile manufacture, and the latter, in its turn, demands greater severity than general engineering practice. The following discussion therefore, must be viewed as an outline only, and the various details will require modification according to the kind of engineering work to which they are applied. It cannot be stated too often that any organization is worth only what it *saves*, and it is useless and wasteful to instal an elaborate system unless this is absolutely necessitated by conditions either of economy or safety.

For the purpose of this paper, ferrous materials may be divided roughly into four classes: — (1) Rolled sections such as bars, billets and sheets; (2) tubes and drawn sections; (3) forgings; (4) castings.

Storage and Handling Proceedure at Works important to Inspection System

In all cases the storage and handling procedure in connection with the raw materials received at the works, is of vital importance to the inspection system, as it is essential that the material shall be readily identifiable from the start, otherwise elements of uncertainty will creep in and may lead to serious results. The author has in mind a number of crankshafts in connection with which identification was incomplete, and when the shafts were found to be faulty, their identity was repudiated by the supplying firm. The matter was only settled by arbitration, after much loss of time and money that could have been avoided by a suitable and simple system of identification at the start. Such a system usually pays for itself in the avoidance of such troubles, as, even if material of a particular kind is all supplied by one maker, it is not always easy to prove this in case of dispute.

The best practice is to put the material into "bond" immediately after receipt. For this procedure to be satisfactory, the bond must be under the control of the inspection department, and no other department must be permitted to withdraw material from it without the written consent of the chief inspector. In cases where it is essential that the material should pass into production without delay, a system of provisional release notes may be instituted, the provisional note to be followed by the final release note after the necessary tests have been made. If this is not rigidly adhered to, the bonding system will be a failure. Care must be taken to follow up any material provisionally released, so that it may be withdrawn from circulation in case the tests are unsatisfactory. Naturally, the chief inspector will use his own discretion by releasing in this way only those brands of material found by previous experience to be generally satisfactory. The time during which the material is lying dormant in the bond need not be wasted, however, as it may be utilized for surface examination or other operations. For instance, bars and billets must be examined for slag seams, piping, straightness, dimensional accuracy, etc.

Defects for which Rolled Sections must be examined

"Slag seams" often appear as very fine lines on the surface of the bars or billets and, if the material has to be used subsequently for drop forging, it is advisable to grind or file a notch in the surface to determine the depth of the seams. It should be remarked that, in forging, such defects frequently work into the finished product to such an extent that, although the original seam may only be one-sixteenth to one-eighth inch deep, it may penetrate one-half inch into the forging. Also such defects are liable to form starting places for cracks during the heat treatment process. Seams are best detected by examining the ends of a sheared billet, as they open out near the sheared area.

"Piping" is a flaw extending up the centre of the bar, and is caused by insufficient cropping of the top of the ingot before rolling. This defect is not necessarily fatal but it may cause considerable trouble by working into an important section of the finished article.

Cold drawn, or rolled bars for automatic machine work should be reasonably straight, and true to the sectional limits stated on the order, otherwise the bars either will not pass through the collets of the machine, or will not be gripped tightly during machining. Oval sections are best detected by means of a gap gauge, but as this can only be used at a few points along the bars, it is advisable to pass a ring gauge along the bars to indicate any local variations in section. Hot rolled bars or billets used for drop forging work must also be checked for sectional dimensions as they are frequently cut to given lengths, and if too small or too large may fail to fill, or may split the dies. As the latter are expensive, and take a long time to produce, the cost and loss of production in such cases may be very serious. For this reason it is useful to install a viewer in the cutting-off shop, to check the material leaving the machines. Sheets, when used for press work, must be viewed for thickness and size, as variations in the former will give trouble in the presses, and in the latter may considerably reduce the number of pressings that can be made from a given weight of material.

Protection from rust or scale is also necessary for bright bars or sheets and bad examples should be returned to the suppliers for free replacement. Lamination is also a prevalent trouble in the case of sheets and plates, and must be severely dealt with. Most suppliers are scrupulous, and will not knowingly send out defective material, but the buying office, often influenced solely by price, is apt to purchase odd lots of steel of poor or doubtful quality. If the inspectors are lenient in dealing with these, there is no end to the trouble experienced in the shops, and in the long run such material is considerably more expensive than reliable steel bought from reputable makers. For this reason, it is advisable to brand each consignment with a "bond number", so that any troubles due to mixed consignments of steel may be traced to their origin. It may be objected that the tensile and impact tests should take care of this, but if, say, ten per cent of medium carbon steel bars are present in a consignment of mild steel, the chances are nine to one that the test pieces will be selected from mild steel bars, and the others escape undetected until the work reaches the finished state, when the parts made from medium carbon steel are liable to smash themselves and many other details at the same time. Thus, not only is the material lost but all the money spent in machining and handling it is wasted. In the case of such important machinery as aeroplane engines the consequences may be still more serious.

Identification Mark for each Consignment

It is therefore necessary to arrange the steel bond or stores in such a way that mixing of steels is practically impossible. Every consignment must be marked clearly with a bond number, name of supplier and identification symbol. The last, is best allocated by the laboratory after the necessary tests and heat treatment have been made. It is advisable to apply to the test piece the heat treatment intended to be used on the bulk of the consignment, and, after the best treatment has been found, the identification symbol can be so arranged that it indicates not only the maker and brand of steel, but also the heat

treatment necessary to obtain the best results; *e.g. Steel BR53 indicates an alloy oil hardening steel supplied by Messrs. Brown and Robinson, Heat Treatment No. 3.*

If this symbol is transferred to the parts during manufacture (or indicated on the "progress cards" accompanying each lot), on their arrival at the heat treatment department, the foreman will refer to *BR53* in his card index and will there have all necessary information regarding the heat treatment of that steel. Also, if defects are observed in course of machining, the faulty steel can be picked out, and the supplier identified, so that further work on this class of steel can be stopped and a further examination made on the unmachined balance of the order.

Inspection of Tubing

The inspection of tubes does not present the same difficulties, as they are usually supplied in the finished state as regards diameters and only have to be cut to length, or other very simple work done upon them. Correctness of sizes, and soundness of material are the two properties principally required. Cold drawn tubes can be made correct to 0.004 inch up to a diameter of 2 inches, but this degree of accuracy is not always specified unless the tubes are to be a press or driving fit on some other part. Soundness is best examined by subjecting sample tubes, (or all in exceptional cases), to an internal water pressure test, but when the tubes are required to be within narrow limits of diameter, care must be taken that the tubes do not expand under the test pressure. In the case of small bore tubes, it is convenient to provide a steam or air jet in close proximity to the testing table to detect obstructions in the bore. The interior of straight tubes may be visually examined, but with curved tubes this is impossible, and the hydraulic test does not indicate the presence of obstructions. If short lengths, (up to about six feet), are being examined, it is advisable to supply the viewer with a machined cast iron table, so that in rolling the tubes over it, any want of straightness will be immediately apparent. Variations in thickness may be detected by the use of a special micrometer, which should have a deep gap to allow the wall thickness to be measured at some distance from the cut ends. Ductility, a very important property in many classes of tube, may be measured by means of compression, bulging, drifting, and flattening tests.

The main points to be observed in drawn sections have already been dealt with, but in connection with this class of work it must be remarked that the outer layers of such bars are deformed by cold working to a greater extent than the inner cores of the sections. The test piece used for obtaining the properties of such material is generally machined, so that the test results do not take into account the hard and comparatively brittle nature of the outside surface. As screw threads are frequently cut into this surface without previous machining, the material of which the thread is composed is liable to be brittle, and the thread itself to strip under shock or suddenly applied loads. The surface defects met with in drawn sections are generally easy to detect and simple to deal with.

Inspection of Forgings during Formation

With forgings, particularly in the case of drop stampings, it is advisable to watch the process of formation, as many of the principal troubles met with are due to faulty heating and hammering. Overheating and burning are very common troubles in the forge. In one drop stamping shop these troubles were so persistent that the author found it necessary to appoint an experienced forge-man as walking inspector. His duties were to put a special stamp on any forging deemed by him to have been forged at too high a temperature, such forgings to have special attention in the cold viewing operation. After that, very little trouble was experienced with overheated forgings, but, judging by the number of forgings (sent in from other firms) rejected for this fault, it would pay to adopt this procedure in all cases where the quality of material is important, or where heat treatment operations are to follow.

The usual forging temperature is about 1,100 degrees C. (2,000 degrees F.) but as the steel flows more easily in the dies and requires fewer blows at higher temperatures, the tendency among men paid by piecework is to use forging temperatures as high as possible to reduce the time taken per piece. This is a dangerous tendency in all cases, but is particularly so with alloy steels, and therefore it is advisable that men accustomed to mild steels, (which are not so sensitive to overheating and are usually worked at higher temperatures), should not be changed over to work on alloy steels without considerable preparation.

Many alloy steels also need to be heated at a slower rate than carbon steels and must be well "soaked" before forging. Overheated steels can be recovered by heat treatment, but if the steel is so baldy overheated as to be burned, recovery is impossible, and the forgings must be scrapped. Frequently, however, the elaborate and expensive heat treatment necessary for recovering overheated forgings costs more than the forgings are worth, and in that case, the procedure is not economical. A good method of detecting overheating in a pile of forgings, is to observe the appearance of the "flash" that surrounds each drop stamping. The appearance of an overheated flash is quite unmistakeable, but after the flash has been removed, the best indication of overheating is given by the appearance of the forging after pickling. The surface of an overheated forging is usually covered with a network of fine cracks readily visible with the aid of a small magnifying lens. The latter is one of the most useful appliances that a material inspector can have, as it enables him to differentiate between defects of various kinds, and assists him in making decisions in doubtful cases.

Forging Defects

The appearance of the flash gives other useful information. A wide flash indicates excessive material and consequently waste, and "working back", with the probable formation of flaws in the forgings, is shewn by a gap in the flash. Such "working back" is generally due to incorrect formation before the material is placed in the dies, and this may result also in local failure to fill the dies, or in "laps" such as those appearing in round sections when incorrectly worked down from larger

sections. Such an instance occurred a few years ago, when the author had to reject a consignment of 16,000 internal combustion engine valves because about 70 per cent of them had laps in the stems. Working down from a large to a small section is apt also to cause unsoundness in the centre of the section, unless very carefully performed.

If a piece of metal is cut from the end of a forging and fractured by a sharp blow, the appearance of the fracture, whether crystalline or fibrous, tough or brittle, will give much useful information. This method of examination was adopted with great success on aero engine propeller shaft forgings when insufficient metal was left for taking tensile and impact tests. With an experienced observer it is frequently unnecessary to take tensile tests on mild steel forgings, as a fracture and brinell hardness test will give sufficient security.

If the operators are working on a piecework or bonus basis, they must be paid on the number of pieces passed as good by the inspectors. This method prevents a good deal of faulty work being done, as, once bitten by stoppage of payment for bad work, the men are very careful not to repeat the offence, and the quality of the work shows a great improvement. In some cases, the principle of payment according to the number of pieces inspected may be adopted for the inspectors themselves. This certainly improves the output per man, but great care should be exercised in its adoption, otherwise hasty and inadequate viewing is liable to result and considerable trouble to be caused at a later stage.

It cannot be too strongly urged that all important forgings, (and castings), should be pickled in dilute sulphuric acid, or sand blasted before inspection. By these means, the scale is cleaned off the surface, and reveals defects that otherwise would be hidden. Machining is also facilitated by the removal of the hard scale which tends to damage the tools. Of the two methods, the author prefers pickling for forgings, but with this method it is necessary to remove the acid from the surface of the forgings by immersing them in a soda bath, the work then being brushed by hand or machine brushes to remove the loosened scale. For very important work this procedure should be repeated after heat treatment.

When the forging dies are first put into work, it is advisable to make from them lead "proofs" that can be marked out and inspected dimensionally before the work proper is started. This marking out is an important item in the inspection organization, and must be performed by an experienced man who can indicate in his sample report any alterations required in dies or patterns to produce the necessary results, or to avoid difficulties in machining. The same man is also employed to inspect and mark out sample castings made from new patterns or by a new foundry.

Offset and eccentric forgings are due to dies being kept too long in use, and, being progressive in their nature can be rectified before the forgings get too bad. Usually, however, the urge for production is so great that no notice is taken of warnings, until the inspectors begin to reject. The point beyond which rejection takes place is decided by the failure of forgings to "clean up" in machining. This trouble, and also eccentricity due to bent piercing tools, was met with extensively in the forging of large shell blanks. For smaller forgings, a spinning table gives quick and convenient indications of eccentricity.

Forgings made by first forming one end, and then turning the bar round and completing the other end, (e.g. motor car front axles), are liable to have serious length and distortion errors. It is, therefore, advisable to have a marked jig or gauge with sliding pieces upon which the various limits are marked, to enable the inspection to be made rapidly and correctly without going to the expense of marking out every forging. In such cases it should be noted that the centres of such forgings are likely to be thin unless carefully watched.

Sometimes, after the rejection of forgings for dimensional defects, the foreman claims the right to re-forge or rectify the faulty work by again putting it under the hammer. Occasionally it is advisable to allow this to be done, but usually, although the original defects may be rectified, others are introduced, and the ultimate cost may be greater than that required for making new forgings. In the author's experience, a loss of 50 per cent on drop forgings rectified in this way is quite common, and therefore the inspector should use his own discretion in allowing rectification of this kind. Distortion in heat treatment is very prevalent, and forgings should again be viewed after this operation.

Tests for Heat Treated Work

Important forgings should invariably be brinell tested after heat treatment, as this test is a valuable indication of *uniformity*. In large forgings, the brinell impression should not vary more than 0.2 mm. in diameter, when tested at any two points on the forging. This is for the standard loading of 3,000 kg. on a steel ball 10 mm. diameter. For thin or fragile forgings, a load of 2,000 or 1,000 kg. should be used, to avoid distortion. The scale must always be removed from the surface before testing.

Tensile and impact tests should always be taken on heat treated work, particularly in the case of alloy steels, and the test pieces should be cut from the forgings themselves, and not from test pieces forged separately. For this purpose, scrap forgings of the same steel should be specially marked, sent to the hardening shop with the rest of the consignment and the test pieces cut from them. In this way none of the good forgings need be scrapped for testing purposes, and in case of failure to meet test conditions, the test forgings may be re-heat treated with the others. Impact tests should not be taken singly but three notches should be cut in each test piece, and the average of three tests taken.

Distortion frequently occurs in machining operations. A case in point was that of a consignment of 2,000 crankshafts of nickel-chrome steel. These were carefully straightened before machining, but most of them required five, six, or even seven straightening operations during the thirty machining operations performed on the shafts. This points to the necessity of frequent checking by spinning between centres and observing the truth of shafts with the aid of a dial indicator. Distortion can often be minimized, or eliminated altogether, by adopting

special methods of quenching in the hardening operation. Oil quenching usually gives less distortion than water quenching, and thin sections should always be dipped into the quenching medium with great care and in the right direction. For instance, shafts should invariably be dipped endways, and flat sections edgeways.

Soft patches on heat treated work are due to unsuitable quenching media or to the presence of scale on the surface of the work. During the quenching operation, the work should be kept moving in the bath until cold, to prevent the adhesion of steam or air bubbles to the surface of the steel. Hard spots also cause considerable trouble in machining and are usually due to faulty heat treatment or to segregation in the material.

The author has found it convenient in many instances, to use a batch or lot number to designate each particular lot of articles put into the furnace and heat treated at the same time, as this facilitates the sorting out of work in the view room when articles are delivered in large quantities. For instance, if the temperature of the furnace is too high, or too low, the whole of that particular lot will be defective and they can be sorted out without individual testing. Also, if work is heat treatep by an outside firm, and passed by samples sent to the works, the batch number is a convenient means of identification.

Inspection of Castings

Castings often present more difficulties in inspection than do forgings, as the possibilities of passing hidden defects are much greater in the former case. Tensile test pieces should be cut from the castings themselves, as the practice of sending test pieces cast separately from the goods themselves is open to many objections. The cooling conditions in such cases are different from those obtaining in the actual castings and so the properties of the material in the test pieces are not identical with those in the castings themselves. Also there is no certainty that the test pieces are cast at the same time, or of the same material as the articles they are supposed to represent. Usually there is at least one casting that is faulty in some respect and from this the test piece may be prepared at little cost.

The valuation of the tensile test results obtained should be dependent on the conditions under which the castings have to work. Generally the higher the tensile figure the harder the casting will be for machining, and the greater will be its brittleness. The author has frequently been approached by foundry managers with the argument that their castings, whether of cast iron, malleable iron, or semi-steel, are the best on the market because they have been successful in obtaining a high ultimate strength. They overlooked the fact that for many purposes *ductility* is a more essential feature than high tensile strength, and that as the latter is usually accompanied by low ductility their metal was actually worse than that usually supplied, quite apart from the greater difficulty and cost of machining it. The attitude of regarding a high tensile strength as the ideal to be aimed at, irrespective of other qualities, is so common that this aspect of the matter needs to be impressed strongly on most users of iron and steel. For this reason, the impact test is valuable, as it is a most sensitive method of detecting want of dynamic or shock strength.

In the case of malleable iron or steel castings, impact tests should be taken in addition to the tensile tests, and those should give results averaging about five foot-pounds in the former and fifteen to twenty foot-pounds in the latter material. These figures refer to the standard Izod test piece with 10 m.m. square test piece and 45 degree notch, 2 m.m. deep. Chemical analysis and microscopic examination are useful in all cases, but are particularly so in the case of castings, to ensure that the various elements are present in the right proportions, and that the various components are correctly arranged.

Pickling and sand blasting before inspection, not only reveal hidden defects and facilitate machining, but also remove surface and core sand that would ultimately shake loose and get into the lubricating oil and between the working surfaces of the machinery, with disastrous results. One of the principal troubles with steel castings is the fact that the high casting temperature causes the sand to penetrate the surface and this sand is very difficult to remove. In extreme cases it is necessary to "dope" the surface of these castings with some adhesive enamel or paint to stick the sand in position, but this method should only be adopted as a last resort. The presence of sand also adds to the difficulties of galvanizing when this is necessary for protection from corrosion or to obtain water tightness, as the zinc will not adhere to a dirty surface.

Prevalent defects in Castings

Flaws and blowholes are very prevalent troubles in all castings, but are particularly common in steel castings. The former are caused by differences in the rate of contraction between the various sections comprising the casting, and therefore it is necessary to keep the section as uniform as possible and to avoid local thickening or thinning and abrupt changes of direction. Moreover, if the section is too thin, the metal may be chilled locally and fail to flow, leaving a gap in the casting. Blowholes are caused by the evolution of gas during solidification. If this gas, or any air present in the mould cannot escape, it remains in the casting and is generally located below the surface so that the blowholes cannot be detected until the surface is machined off. For this reason, it is advisable to section castings occasionally, particularly when obtaining them from a new source of supply or from new patterns. These sections also provide a means of measuring up thicknesses of metal that would be inacessible in the ordinary course, and enable displacement of cores and other faults to be detected.

A good method of locating unsoundness and spongy places, is the application of the hydraulic test, during which such places are disclosed by leakage. When not very bad, these can often be closed up by exposing the castings for a period of several weeks to the weather, or by doping with sal-ammoniac to rust the faulty places. In some instances, (as in monobloc castings), cold water does not reveal the trouble, and for this reason hot water is sometimes substituted, and is a decided improvement in this respect. A more severe test is to fill the casting with air under pressure and then to insert the casting

in water as in repairing a bicycle tire. Spongy places are revealed by air bubbles rising through the water. This test is rather drastic, however, and is only necessary in very special cases.

With steel castings, an annealing process is necessary after casting, and after this operation distortion is very liable to take place In some large pump bends, six feet in diameter, this distortion sometimes amounted to as much as two inches. In small castings, the distortion may be removed by "setting" in a hydraulic press, but this method is apt to injure the material, unless carefully performed.

Hard spots frequently give trouble in the machine shops and are caused by bad mixing or by local chilling in the mould. Hard castings may sometimes be detected by a brinell test, but this is not a safe guide for castings, and should be applied sparingly, as its application in the case of brittle materials is apt to cause cracks to start in the castings.

In the dimensional inspection of castings, and when marking out samples, care is necessary to ensure accuracy at the locating face from which the various machining operations start. Any error at that point may be greatly magnified in subsequent operations.

Periodic inspection of patterns is also advisable, as wear, displacement of cores, and disappearance of loose pieces may cause much trouble when the castings are made. For this purpose a practical patternmaker or moulder may be added to the inspection staff, and sent around to the various suppliers for the purpose of advising them on difficulties met with in the works. The author has always found it a sound and economical policy to anticipate difficulties in this way by giving suppliers plenty of information, so that troubles are avoided and cases in dispute comparatively rare.

The repair of castings by plugging, patching, or welding is quite legitimate, provided it is properly performed, but it is difficult, especially in the case of welding, to decide whether the work has been properly done. The "x-ray" examination is a very good method of detecting imperfections in repaired parts, but unfortunately it is too expensive for works use, save in very special cases. The local heating that is inevitable in welding frequently distorts the casting under repair, and also, although the weld itself may be sound, the material surrounding it is often injured by excessive heating. Hard spots, due to the use of unsuitable welding material, are quite common, and cause much trouble in machining, so that in many cases, grinding is the only satisfactory way of machining a welded surface.

Proceedure following Report of Inspection

Many other aspects of the inspection of ferrous materials might be mentioned, including, case hardening, inspection of material arriving from outside firms in the finished state, tests of springs, chains, and other special material, but time will not permit. It is essential in any inspection organization, that the decisions of the inspectors shall be respected and acted on, and the system adopted should be such as will ensure this. It must not be possible for material rejected by inspectors to get into the finished articles, and as far as possible, defects should be located and dealt with at the earliest moment.

After each inspection operation, the work should be stamped with a special stamp bearing the number, of the inspector. Where there are day and night shifts, it is convenient to designate day-shift men by numbers, and night-shift men, (usually not so numerous), by letters. Also, the different sections of inspection should have differently shaped stamps, so that each man's work can be identified, and any careless viewing traced to the right man. Two sizes of stamps should be supplied for material inspectors, as small stamps are difficult to find on large rough surfaces, and large stamps are unsuitable for small work. Any work rejected should be scrapped outright by defacing it, otherwise production men will search through the scrap heap to replace work spoiled by themselves. This may seem unlikely, but before the author adopted the policy of putting a hammer blow on defective articles, such incidents occurred frequently.

The viewers must have little or no discretionary power, and all articles rejected by them should be sent into the reclamation store and again viewed by the foreman inspector and shop foreman together. This may be done at stated times, say during the first hour of every morning. If the shop foreman claims the right to rectify the work, it may be specially stamped and returned to the shops for this purpose, but otherwise should be defaced or broken forthwith. If this procedure be adopted, there need be little friction between the inspection and production departments, but if the articles are allowed to "hang on" in the reclamation store, there will be strenuous efforts made to use them, unsuitable or not, during periods of temporary shortage.

Material sent in large quantities from outside firms may be inspected before despatch by a local or travelling inspector having considerable discretionary power, and material stamped by him may pass through the bond with less than the customary amount of inspection. In cases of doubt, the outside inspector should send samples of the material in question to the works, for further tests to be made, and will then act upon the decision of the chief inspector.

From the above remarks, it will be seen that the duties of the materials inspector are many and various. In addition to the knowledge of materials and their defects that he must have for his work proper, a considerable acquaintance with machining, grinding, and erection difficulties is also desirable, as his decisions will frequently have a considerable bearing on the cost and ease of manufacture. Also, when the operators are paid on the piece-work basis, there is a tendency to ascribe much of the machining scrap to faulty material, as they are paid for work done upon the latter, but not for parts scrapped by faulty machining or carelessness. It is evident, therefore, that only by careful organization and unremitting vigilance can he escape on the one hand the Scylla of high inspection costs, and on the other, the Charybdis of repeated complaints from the management and shops that their production is being ruined by the bad material constantly passed through by the "inefficient inspection department."

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Council's Message to the Members

Important work has been done for The Institute during the past year, both by Council and by the branches. Branch activities have increased to a degree that makes The Engineering Institute the most active organization in Canada. It is proposed to make every member in Canada a member of a branch, giving greater stimulus to the professional pride that has developed and which is growing stronger and stronger yearly. The Council, in expressing thanks for the good work done, extends hearty greetings of goodwill to every member of our organization.

Annual Meeting Montreal
Tuesday, January 23rd, 1923
Annual General Business Meeting

Sir Henry Thornton cannot attend Annual Meeting

It was hoped to have Sir Henry Thornton present to address the members of *The Institute* on the occasion of the annual meeting, but as will be seen from the following letter it is impossible to arrange this, although it will be noted with pleasure that Sir Henry has promised to address the members at some future date.

CANADIAN NATIONAL RAILWAYS
Office of the Chairman and President
On line: December 18th, 1922.

Dear Sir:—

I am in receipt of your letter of December 11th, and appreciate very much the invitation of the Council of your Institute to address the members at their annual meeting on January 23rd. Nothing would give me greater pleasure than to do this, and to take the opportunity thus offered of becoming acquainted with the members of **The Institute**, if it were practicable; but I expect to be in the West on the date referred to. I feel that it is of paramount importance, and necessary to an intelligent survey of the whole situation with respect to our national railways and the problems to be met, that I personally view the various sections of the system at the earliest possible moment. I am just returning from a trip of inspection of the lines in the Maritime Provinces, and am planning to leave for the West early in January.

Your Council will understand, therefore, that it is hard necessity which compels me to forego the pleasure of accepting the invitation which they have so cordially extended to me, and that it is my sincere hope that I may have an early opportunity of accepting the hospitality of **The Institute** and of meeting its members.

Yours very truly,

(Signed) H. W. THORNTON,
President.

Board of Topographical Surveys and Maps

The Government of Canada has recently, by Order in Council, created a Board, composed of representatives of the various governmental organizations interested in or affected by topographical survey, for the purpose of making recommendations to the government with the object or co-ordinating the surveying and map-making activities of its various organizations, and to settle all questions at issue between the executive departments relating to surveys and maps. To this Board have been appointed:—

For the Department of the Interior:
Dr. E. Deville, HON.M.E.I.C., surveyor-general.
Thos. Shanks, M.E.I.C., assistant surveyor-general.
For the Department of Militia and Defence:
Major J. B. Cochrane, M.E.I.C., assistant director of military surveys.
Col. S. H. Osler, C.M.G., D.S.O., R.C.E.
For the Department of Mines:
Dr. W. H. Collins, director of the Geological Survey.
W. H. Boyd, M.E.I.C., chief topographical engineer.

The Board has been authorized to consider and advise upon all questions that may arise in relation to topographical surveys, the compilation of new maps, the modes of projection, the selection, unification and improvement of scales, the uniformity of symbols and conventional signs, the representation of relief, the use of colours, and other geographic subjects.

Upon consideration of representations made by certain of the Founder Engineering Societies of the United States to the Federal Government at Washington, a similar board for the same purpose was created among representative officials of the different survey and mapping organizations of the Federal Government Service at Washington. Excellent results have been achieved for that country.

Members of *The Institute* will be glad to know that the Dominion Government has taken suitable action for Canada. Although the work of the various Canadian organizations has not overlapped in any considerable degree, they have not, heretofore, worked to common standards, either in field surveying or in map preparation; consequently their results have not contributed as effectively or economically as they might to the systematic primary mapping of the country.

Following the example of the United States, Great Britain, France, Switzerland, Italy, India and most other important civilized countries, Canada will, sooner or later, be topographically surveyed and mapped in small units upon some relatively large scale or scales, which system of primary maps would serve all ordinary industrial and scientific needs and would be a basis for the construction of all maps needed on smaller scales. Such an enterprise need not be an addition to the burden of governmental expense, but can and will be carried on as at present with the existing organizations at a rate in accordance with the needs and financial support of the country.

Copy of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 8th March, 1922.

The Committee of the Privy Council have had before them a joint report, dated 6th March, 1922, from the Minister of Militia and Defence, the Acting Minister of the Interior and the Acting Minister of Mines, submitting that topographical maps are now generally recognized as a preliminary requisite for most irrigation, reclamation, railway, road building, power and general engineering projects, as well as for military purposes and for the use of the public generally, and that the requests for such maps are becoming more frequent and more insistent. Topographical surveys are now being carried out by the Surveyor General, the Geological Survey and the Department of Militia and Defence, but each is working independently and there is incomplete co-operation and co-ordination between them.

The Ministers observe that it has been found advisable in the United States, where a lack of co-ordination existed, to form a central Board of Surveys and Maps composed of representatives of the various organizations interested or affected by such work, for the purpose of making recommendations to the Government with the object of co-ordinating the surveying and map-making activities of various organizations and to settle all questions at issue between the executive departments relating to surveys and maps. It seems that the time has come when a similar Board should be formed in Canada.

The Ministers, therefore, recommend as follows:—

(1) That a Board of Topographical Surveys and Maps be organized to consist of the following officials; of the Departments of the Interior, Militia and Defence, and Mines, namely,—

For the Department of the Interior:
Dr. Deville, Surveyor General,
Thomas Shanks, Assistant Surveyor General.
For the Department of Militia and Defence:
Major J. B. Cochrane, Assistant Director of Military Surveys,
Col. S. H. Osler, C.M.G., D.S.O., R.C.E.
For the Department of Mines:
Dr. W. H. Collins, Director of the Geological Survey,
W. H. Boyd, Chief Topographical Engineer.

(2) That the said Board shall have authority to consider and advise upon all questions that may arise in relation to topographical surveys, the compilation of new maps, the modes of projection, the selection, unification and improvement of scales, the uniformity of symbols and conventional signs, the representation of relief, the use of colours, and other geographic subjects.

(3) That the Order in Council of the 24th April, 1915, P.C. 854, vesting similar authority in the Geographic Board be cancelled.

The Committee concur in the foregoing recommendation and submit the same for approval.

(Sgd.) **Rodolphe Boudreau,**
Clerk of the Privy Council.

Books Required

A. L. Ghysens, A.M.E.I.C., city engineer, Verdun, has addressed a communication asking for contributions of books for the library of the University of Louvain in Belgium, destroyed by the Germans. No doubt many of our members have books not required which will be acceptable for the university library, and consequently it is hoped that there will be a ready response for this worthy object. The letter reads:—

Dear Sir:—

During the last war, the Germans have destroyed the University of Louvain in Belgium. Of the rich library of that Institution, containing a large collection of valuable books and precious documents, nothing has been left.

A committee has been formed in Montreal with the object of collecting books and documents in order to help the authorities of the above mentioned university in reconstructing its library. An important shipment has been made.

I would ask you if you do not have books and documents useful in a university library and of which you could dispose. Mr. Laureys, principal of the High Study School, Viger Square, is in charge of the shipment to Belgium.

I thank you in advance in the name of the committee for any contribution you would be able to let us have.

Yours truly,
A. L. Ghysens, A.M.E.I.C.

Any members desiring to contribute books might have them sent to Headquarters where the secretary will see that they are forwarded to the proper parties and due credit given the donor.

Extension Course in Export Trade

The extension course in export trade, as recently announced to be given by McGill University and the University of Toronto, offers an excellent opportunity to all those interested to receive instruction in the underlying principles of export trade and to become familiar with the practical details of management. The course at the University of Toronto extends from January 15th to 27th, 1923, while that at McGill it extends from January 29th to February 10th, 1923. In each case the registration fee is five dollars and a series of lectures and demonstrations will be carried on from 9 a.m. to 12 m. and 2 p.m. to 4 p.m., each day, with the exception of Saturday afternoon. Applications for the course should be accompanied by the registration fee and should be addressed to W. J. Dunlop, Director, University Extension, University of Toronto, Toronto, Ontario, on or before January 2nd, or to the Registrar's Office, McGill University, Montreal, Quebec on or before January 16th, according to which course the applicant wishes to enrol for

THIS MONTH'S CONTRIBUTORS

Power Factor

W. G. H. Cam, E.E., A.M.E.I.C., whose paper on the physical meaning and commercial manipulation of power factor, appearing in this month's *Journal*, was read before the Montreal Branch on October 19th, 1922, is a native of England, town of Dudley. His early education was received at Felsted school, Essex, and the City and Guilds of London Central Technical Institute, where following a course in electrical engineering, he graduated in 1903 and was appointed demonstrator the next year. The same year Mr. Cam was appointed shift engineer and manager's assistant of the British Continental Electricity Company at San Remo, Italy, receiving his promotion to assistant engineer in 1905 and to resident engineer in 1907. In 1909 he came to Canada arriving in Montreal in September, and in the next month was appointed operator at Lachine Rapids power house, Montreal Light Heat and Power Company. The following year he was transferred to the construction and engineering departments of the same company. Mr. Cam commenced private practice as an electrical engineer in 1911, and during the later part of the year was engaged on the reconstruction of the power distribution system in the town of Valleyfield, Que. In 1915 he was appointed to the engineering staff of Shawinigan Water and Power Company on layout and construction, and two years later he joined the Southern Canada Power Company, and was engaged in building and superintending high-tension transmission lines. In 1919 he accepted his present position with Canada Cement Company as electric and power engineer.

Electrical Furnaces for Heat Treatment of Steel

The description of some principal features of high temperature electric furnaces, dealt with in the paper by A. W. Lamont, A.M.E.I.C., read before the Winnipeg Branch on November 2nd last, features in particular the recently installed furnace at the Transcona shops of the Canadian National Railways.

Born at Mount Brydges, Ontario, in 1889, Mr. Lamont took up his engineering studies at the University of Toronto, graduating with the class of 1910, with the degree of B.A.Sc. Prior to graduation he was engineering apprentice with the Westinghouse Electrical and Manufacturing Company at Pittsburgh, and immediately following graduation he was appointed power house operator with the Lake Superior Power Company. Towards the end of 1910, Mr. Lamont was appointed industrial sales engineer with the Canadian Westinghouse Company Limited, which company he still represents in Winnipeg. It is the installation of the Transcona furnace, by this company, that Mr. Lamont uses for special references in his paper.

The Inspection of Ferrous Materials

The importance of a regular system of inspection for ferrous materials is emphasized by E. A. Allcut, associate professor of thermodynamics at the University of Toronto, in his paper read before the Toronto Branch on November 16th, 1922.

Professor Allcut received his early education in England, having attended the King Edward VI grammar school at Birmingham and the University of Birmingham during the years 1904 to 1910, and graduated with honours in mechanical engineering in 1908, receiving in the same year the Bowen Research Scholarship. The following year he received his degree of M.Sc., in engineering and was awarded the Heslop Gold Medal and the second award of the Bowen Research Scholarship. During the years 1908 to 1910 he undertook post-graduate research in producer gas. Professor Allcut's subsequent work includes design and testing of internal combustion pumps for the Humphrey Pump Company, Westminster, as assistant engineer; manager of large Mond gas plant with bye-product recovery; manager of engineering and testing machinery department, Messrs. W. and T. Avery, Limited, Birmingham; chief inspector of materials, Austin Motor Company Limited, Northfield, England.

For fifteen years Professor Allcut was lecturer in machine design and mechanical engineering subjects at the Municipal Technical Institute, at Smethwick, and it is only since November 1921 that he has been on the staff of the University of Toronto.

OBITUARY

Captain T. E. A. Hall, A.M.E.I.C.

News of the death of Thos. E. A. Hall, A.M.E.I.C., of Capreol, Ontario, while engaged as division engineer on the Canadian National Railways, on December 1st, has been received with deep regret by his many friends within the profession.

Born in England in 1878, he received his education in that country, and later went to South Africa to practise and complete his course in Railway Engineering. He went through the South African war and came to Canada shortly afterwards and joined the C.P.R. engineering staff as instrument man. He was soon promoted to resident engineer on the Bolton-Sudbury line during construction, and followed this up by service in the Maintenance Department. In 1909 he transferred to the Engineering Department of the Canadian National Railways, working as resident engineer on the construction of the Toronto-Ottawa line, with his headquarters at Brighton. In 1913 he was appointed division engineer of Division "F" of the Ottawa-Capreol line opening up and completing the construction of this division. In 1915 he went overseas with the Canadian Army Service Corps, with the rank of Captain, and served throughout the war. He suffered from heart displacement due to concussion and was given a pension. He returned to Canada in 1919, and resumed his duties with the Canadian National Railways, as division engineer at Ottawa, where he remained for about two years. In 1921 he transferred to the Montreal Division in the same capacity and was there until May 1922, when he moved to Nipissing Division with headquarters at Capreol.

He had not been feeling well for some months, due to war injury, and had made arrangements for a three month's leave of absence to go to California for a rest. While getting ready to take the train on December 1st, he experienced a weak turn and died about an hour later. He is survived by his wife and two children.

PERSONALS

A. B. Copping, S.E.I.C., of Montreal is now located with the De Grasse Paper Company of Pytires, New York.

R. Woffenden, S.E.I.C., of Calgary, Alta., is at present attending the Tri-State College of Engineering at Angola, Ind.

Craig Hamilton, S.E.I.C., of Toronto, Ontario, is now located with the Exolon Company, Limited, of Thorold, in the capacity of plant chemist.

T. M. Hamer, Jr.E.I.C., has accepted a position with the sales department of the Northern Electric Company in Montreal, and will specialize in the sales work in connection with telephone equipment.

R. Fraser Armstrong, A.M.E.I.C., has resigned as town manager of Woodstock, N.B. He is to join the Citizens Research Council in Toronto early in the new year.

C. B. C. Donnelly, A.M.E.I.C., has been for the last nine months on an important survey north of Athabasca Landing, and expects to be located there until July of this year.

A. H. Chisholm, S.E.I.C., of Blue Mountain, Nova Scotia, has accepted a position on the engineering staff, St. Lawrence Paper Mills, Limited, at Three Rivers, Quebec.

H. T. Hazen, M.E.I.C., who was acting chief engineer for the Canadian Northern Railway, eastern lines, has been appointed to the position of chief engineer with offices at Toronto.

Kenneth S. Pickard, A.M.E.I.C., has been engaged on surveys and investigations for Messrs. Hollingsworth and Whitney, paper manufacturers of Boston and Waterville, Maine, during the past summer.

J. R. Fenwick, S.E.I.C., who received the degree of B.A.Sc., in electrical engineering from the University of Toronto last spring is now with the Northern Electric Company, Limited, Montreal, as radio engineer.

Horace L. Seymour, C.E. (University of Toronto), A.M.E.I.C., and member of the Town Planning Institute of Canada, has been appointed special lecturer on town planning for the Faculty of Applied Science, University of Toronto, for the Easter term of 1923.

W. L. Clairmont, S.E.I.C., formerly of Niagara Falls, Ont., has accepted a position with the Fire Marshall's Department at Toronto, Ont. Mr. Clairmont graduated last year from the University of Toronto with the degree of B.A.Sc.

C. E. Carson, S.E.I.C., of Dorval, Quebec, who graduated from McGill University this spring with the degree of B.Sc., in chemical engineering, is now on the chemical staff of the Dominion Textile Company, print works, at Magog, Quebec.

Augustin Frigon, A.M.E.I.C., has received the degree of D.Sc. from the Université de Paris, (Sorbonne), where he has been studying for the past two years. Mr. Frigon received his civil engineers' degree from the Ecole Polytechnique, Montreal, where he was for a time a professor.

Kenneth B. Seely, Jr.E.I.C., who graduated from the University of New Brunswick with the degree of B.Sc., in civil engineering and who until recently has been with the Canadian General Electric Company, Limited, has resigned to accept a position on the engineering staff of Stone and Webster, Inc., Boston, Mass.

W. D. Coulter, S.E.I.C., who received his degree of B.A.Sc., from the University of Toronto in 1921, is now located on the designing staff of the bridge and fabrication department of the Lackawanna Bridge Company at Bethlehem, having been moved from the Buffalo office of the same company.

J. O. Hogg, Jr., A.M.E.I.C., construction engineer, is now located at 2404 East 69th Street Terrace, Kansas City, Mo. Mr. Hogg has been engaged for a number of years on the design and construction of reinforced concrete bridges and viaducts in Kansas City, and is the publisher of "Hogg's Wage Tables and Estimating Data for Building Contractors".

Charles F. P. Faulkner, A.M.E.I.C., is now located with the public works department at Revelstoke, B.C. On being discharged from the army after four years on active service, Mr. Faulkner joined the staff of the Canadian National Railways in November 1918 in charge of the laying-out and construction of the terminals at Victoria, B.C.

Messrs. Herbert Phillips, M.E.I.C., of St. John, New Brunswick, and John N. Flood, Jr.E.I.C., who graduated from the University of New Brunswick in 1916 with the degree of B.Sc., in civil engineering, have been appointed by the Common Council as members of the St. John Power Commission to carry out the provisions of the contract entered into by the city with the New Brunswick Electric Power Commission. There are five other members on the commission.

Irving H. Parker, A.M.E.I.C., is now connected with the State Road Commission of West Virginia at Martinsburg as assistant engineer on road construction. Mr. Parker has had considerable experience in road work having been connected with Milton Hersey Company, Limited, in charge of paving inspection at Montreal and Quebec, and with William I. Bishop and P. Lyall & Sons as supervising engineer on road construction.

Allan T. Bone, A.M.E.I.C., is now located with the Shawinigan Engineering Company on design of equipment and plant layout on new development. Mr. Bone received his degree of B.Sc. from McGill University in 1916 and has been connected with the George A. Fuller Company in the capacity of engineer on the construction of the Canada Cement Company building at Montreal, and a reinforced concrete building in Moncton, N.B.

F. M. Steel, M.E.I.C., is now connected with the Department of the Interior, Mining Lands Branch, in the capacity of mining inspector under the North-West Territory and Yukon Branch with offices at Calgary, Alberta. Before going overseas Mr. Steel was in partnership with J. E. Woods, A.M.E.I.C., under the name of Woods and Steel, engineers and surveyors, at Pincher Creek, Alta.

L. J. M. Howard, A.M.E.I.C., is now located with the Grant Brothers Construction Company, Limited, Ottawa, in the capacity of secretary-treasurer. He was formerly

general manager of the Benjamin Wheel Company of Yarker, Ontario. Mr. Howard has had considerable experience in valuation work being on the staff of the Commission of Inquiry into railways and transportation.

Lieut.-Colonel E. V. Collier, A.M.E.I.C., writes an interesting letter from Persia, where he is associated with the Anglo Persian Oil Company, Limited, and suggests the possibility of a trip to Canada in the spring, at which time his friends will be glad to see him. For the past two years he has lived almost continually in the wilds of Persia, living amongst the natives, speaking their language, and eating their food. He expressed his appreciation of the news contained in *The Journal* keeping him in touch, and has promised an account of his work there at some time in the future.

CHARLES BRAKENRIDGE, M.E.I.C.

Vice-President B. C. Professional Engineers' Association.

Charles Brakenridge, M.E.I.C., has been elected vice-president of the British Columbia Professional Engineers' Association. He was born in 1885 at Whitehaven, England, and received his education at the Royal Technical College, Glasgow. He was an articled pupil with the late J. S. Moffat, C.E. After many years experience with the English and Scottish railways, Mr. Brakenridge joined the Grand Trunk Pacific Railway in 1907. Since his arrival in British Columbia he has been assistant city engineer of Vancouver, and since 1918 has been in private practice as a consulting engineer. He is chairman of the Vancouver Branch of *The Institute*.

Word has been received of the death of Casimir Stanislau Gzowski, son of the late Colonel Sir Casimir S. Gzowski, K.C.M.G., first vice-president and third president of the Canadian Society of Civil Engineers, and father of Casimir S. Gzowski, Jr., M.E.I.C., of Toronto. The late Mr. Gzowski was in his seventy-fifth year and was a resident of Toronto where he was identified for many years with brokerage, shipping, mining and financial interests.

Elected President of B. C. Professional Engineers' Association.

A. E. Foreman, M.E.I.C., newly-elected president of the British Columbia Professional Engineers' Association, was born at Cheapside, Ontario, in 1878. He graduated from McGill University in 1903 with the degree of Bachelor of Science. He not only obtained the degree of Bachelor of Science but was gold medalist and was the winner of some thirty prizes. After gaining his business education in Toronto, Mr. Foreman returned to Vancouver in 1907, where he was manager of a construction company. After much work in the province he became, in 1912, assistant city engineer of Victoria. In 1917 he was chief engineer of public works department and is at present district engineer for the Portland Cement Association.

A. E. FOREMAN, M.E.I.C.

Mr. Foreman is an old-time resident in Vancouver, having lived there for thirty-three years. He is a member of the Pioneers' Association, Kiwanis Club, and an active member of the Y.M.C.A., in which he takes great interest in boys' work, especially in athletics, which recalls the days when he was a member of the senior lacrosse team in 1898-99.

Mr. Foreman has also been re-elected a member of the executive of the Convocation of the University of British Columbia for another three year term.

Recent visitors at Headquarters from out of town

J. H. Devey, A.M.E.I.C., Vancouver, B.C.; George F. Dalton, A.M.E.I.C., Ottawa, Ont.; Miles P. Cotton, A.M.E.I.C., Vancouver, B.C.; J. Cummings, A.M.E.I.C., Victoria, B.C.; H. W. Jones, A.M.E.I.C., Ottawa, Ont.; A. F. Stewart, M.E.I.C., Moncton, N.B.; D. W. McLachlan, M.E.I.C., Ottawa, Ont.; R. Yuill, A.M.E.I.C., Cornwall, Ont.; C. R. Young, M.E.I.C., Toronto, Ont.; A. D. LePan, A.M.E.I.C., Toronto, Ont.; E. L. Pettingill, A.M.E.I.C., Chatham, Ont.; W. F. M. Bryce, A.M.E.I.C., Ottawa, Ont.; C. V. Putman, A.M.E.I.C., Ottawa, Ont.; Alan K. Hay, A.M.E.I.C., Ottawa, Ont.; G. B. Dodge, M.E.I.C., Ottawa, Ont.; Peder Westbye, M.E.I.C., Peterborough, Ont.; J. W. Lewis, Jr.E.I.C., St. John, N.B.; Stanley Glover, Jr.E.I.C., Southfield, England; W. H. Breithaupt, M.E.I.C., Kitchener, Ont.

BRANCH NEWS

London Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmsted, A.M.E.I.C., Branch News Editor.

In the evening of November 15th, the London Branch held its regular monthly meeting in the board room of the Public Utilities Commission; H. A. Brazier, M.E.I.C., was in the chair. The members present were, Buchanan, Rostron, Morgan, Angus, Gray, Vance, Julian, Olmsted, Moore, DePassey, Stevens, Bridges, Keith, Brazier, Farncomb, Laniel, Miller, Bell, Chalmers. The following non-members were also present, Sinclair, Riddell, Shaw, Wallace, Murphy, Ivey.

The chairman called on A. J. Stevens, M.E.I.C., to introduce the speaker for the evening, J. Clarke Keith, A.M.E.I.C., secretary-treasurer of the Border Cities Branch, and chief engineer of the Essex Border Utilities Commission. After a few well chosen words by Mr. Stevens, Mr. Keith gave a most interesting and well thoughtout talk on town planning and the proposed legislation relative to it.

In his opening remarks Mr. Keith declared that town planning might govern a multiplicity of definitions, but in its final and complete analysis it was merely a preparation for the future to every phase of civic life or an attempt to remedy the errors and abuses which already prevail, due to lack of foresight or mistakes in judgment. On the face of it, it had to do with things physical — highways, parks, and rapid transit lines. It had, however, a far deeper significance. A proper plan had a powerful influence for good upon the mental and moral development of the people. "It is the firm base", the speaker said, "for the building of a healthy, happy community and one of the greatest assets which any city can possess."

After giving a brief history of the movement toward town planning, Mr. Keith pointed out that planning might be accomplished in two ways. There might either be a plan prepared prior to an incoming population or the replanning of existing populated areas for the remedying of existing conditions and to provide for future needs. Every town and city in Canada was a crying example of the needs of the latter. Washington was an outstanding example of the former type. The objects of town planning were, the speaker declared, the securing of the best economic use of the land, controlling the height, density and use of buildings, securing proper sanitary conditions and convenience in the use of land for every purpose. The initial step in the plan for an established city was a complete survey of existing conditions, physical, moral and business, Mr. Keith declared. Streets, railways, transit lines were not the only factors involved. The nature of the city, the way in which the inhabitants gain their living, whether industrial, residential, educational, governmental or a combination of any two. With all information available, the first purpose should be the preservation, restoration if need be, and the further development of the individuality of the city. Every plan which is to co-ordinate all phases of development, must embrace three primary necessities: first, transportation, including highways, railways, transit systems and waterways; second, open spaces, such as playgrounds, parks and connecting parks; and third, zoning.

There is the problem of financing, the speaker declared. The succeeding generations who are to reap the benefit of the judgment and foresight of the present generation should pay a large share of the cost. He further pointed out that there is a decided movement from the rural to the urban district, and likewise a movement is to be expected from the city to the suburbs in the next few years. Wise cities should begin to prepare immediately for the great suburban development. Turning to the problem of motor vehicles, whereas ten years ago the motor vehicle was a curiosity, it is now a competitor of the railroads in the handling of freight, and has created traffic problems which are very difficult of solution. In conclusion, Mr. Keith explained some of the legislation and proposed legislation touching on the important question of town planning.

On motion of Major Murphy, member of the City Town Planning Commission and F. W. Farncomb, the speaker was tendered a most hearty vote of thanks, and although Mr. Keith had to leave immediately after the talk, in order to make train connections, the subject was thoroughly discussed later by those present. This discussion covered almost every phase of the subject and included discussions of the street railway problem, the using of busses for transportation, the matter of subdivisions of property, building restrictions and many other most interesting and live topics relative to town planning.

Ottawa Branch

F. C. C. Lynch, Associate E.I.C., Secretary-Treasurer.

The Ottawa Branch greeted Fraser S. Keith, M.E.I.C., general secretary of *The Institute*, at a luncheon held at the Chateau Laurier on November 29th.

Mr. Keith spoke on "The place of the Local Branch in *The Engineering Institute*", and dwelt at length on the internal activities of *The Institute*. He pointed out that there are now twenty-three branches of *The Institute* throughout Canada with a combined membership of more than 5,000. He also referred to the engineering legislation which is now effective in all provinces except Saskatchewan. These statutes would have the effect of raising the status of the engineer, he believed. The report of the Committee on Policy, prepared under the direction of J. B. Challies, M.E.I.C., with the assistance of A. B. Lambe, A.M.E.I.C., and the other members of the committee, incorporated good proposals and their adoption, Mr. Keith considered, would be beneficial. A report on classification and remuneration, which had been prepared by a committee, would also be brought up in the near future.

There was increasing personal pride among engineers in membership in *The Institute* and there was a spirit of co-operation that was characteristic of the whole profession. Attendance at meetings created friendship that reacted to the credit of the profession. He stated that the outstanding reason that members are to-day taking a greater interest in their profession is due to the fact

that we have branch societies meeting, not solely on a basis of technical discussion, but meeting on a basis of sociability and fellowship, bringing the members together, making them better acquainted, creating friendships, enlarging viewpoints, and, in general creating an interest that, without such meetings, would be altogether impossible. In the evolution of our organization the branches have taken a proud and glorious place. With increase of responsibility they have risen to greater heights of usefulness so that they stand to-day the most active agencies in our organization, the social and technical meeting point of the engineers in Canada, the point at which most of the suggestions dealing with the affairs of *The Institute* emanate, the ambassadors of the profession to the public at large, the medium through which the community judges the character and standing of the profession as a whole, and on whose activities depends largely the realization of our hopes and aspirations.

A vote of thanks was proposed by R. F. Uniacke, M.E.I.C., while an expression of cordial feeling was extended to Mr. Keith, by K. M. Cameron, M.E.I.C., chairman of the Branch. Those at the head table included: Fraser S. Keith, M.E.I.C., W. P. Merrick, of Toronto, J. B. Burchell, of Sydney, N.S., and the following members of the Ottawa Branch: Dr. Martin Murphy, M.E.I.C., Col. W. P. Anderson, M.E.I.C., G. A. Mountain, M.E.I.C., A. F. Macallum, M.E.I.C., A. A. Dion, M.E.I.C., G. Gordon Gale, M.E.I.C., John Murphy, M.E.I.C., R. F. Uniacke, M.E.I.C., and K. M. Cameron, M.E.I.C.

Discussion on Canada's Fuel Problem

The fuel situation in Canada was discussed in its many complex phases before the Branch at the Victoria Memorial Museum on the evening of December 7th. The meeting was featured by a number of interesting addresses. B. F. Haanel, M.E.I.C., of the Department of Mines suggested that a possible solution of Ontario dependency on the United States for its supply of anthracite coal might be found in the use of peat and by-product coke. The feature of a paper on electric energy and its use in the home, prepared by G. Gordon Gale, M.E.I.C., manager of the Hull Electric Company and read by John Murphy, M.E.I.C., was the statement that the use of hydro-electricity by the individual for heating was not desirable because the cost was too high. George Mountain, M.E.I.C., chief engineer of the Railway Commission read an informative paper on the transportation of fuel in bulk. Hon. D. D. Mackenzie, solicitor-general. moved the vote of thanks to the speakers and lauded the heating value and quality of Nova Scotia bituminous coal. Dr. Charles Camsell, deputy minister of mines, presided at the meeting. During the evening several excellent lantern slides relating to the fuel resources of Canada and the Alfred peat bogs were shown on the screen.

Dr. Camsell reviewed the coal situation. Fuel problems, he stated, were the result of the irregular distribution of the coal resources of the world. Canada needed coal more than most countries because of her climate. This country had enormous resources of coal but because of the irregular distribution, the problem was to supply the greatest centres of population. The most populous provinces, Ontario and Quebec, were without any coal fields and had to depend for their coal supply on the more conveniently situated fields immediately to the south in the United States. It was possible to look upon the coal problem as a confiict between two opposing forces, Canadian coals and United States coals. The principal battle ground within the last four years had been Manitoba, and Canada was making good progress in capturing the domestic market. Dr. Camsell referred to the appointment of a committee by Hon. Charles Stewart, to look into the fundamental causes of the periodic crises resulting from coal shortage.

Mr. Haanel dealt with ways and means of improving the coal situation in Canada and covered the subject in a most comprehensive manner. When the sum total of "heat energy" represented in the four classes of fuel resources comprising solid fuels, coals of all kinds, peat and wood, natural gas, crude oil, and water powers, was considered it would be seen that Canada possessed sufficient energy for heat and power to meet her requirements at the present rate of use for considerably over fifty thousand years, — indeed, it had been stated that the coal resources alone were of sufficient quantity to last this country, at the present rate of use, for over thirty thousand years.

Mr. Haanel expressed the opinion that so far as fuel resources were concerned, Canada did not appear to be on the brink of a fuel famine. Nature unfortunately had placed the enormous coal resources of this country in the extreme east and west. The position of Ontario as regards an assured supply of fuels suitable for industrial and domestic purposes, was exceedingly unfortunate. While "energy" was of absolute necessity to the industries, railways and commerce of a country, the first essential was a requisite quantity of "heat energy" to keep the homes of Canada's eight millions of people warm during eight months of the year. Regarding the use of oil for heating, Mr. Haanel spoke of the importation of American oil threatening to seriously cripple certain of the British Columbia collieries. Patriotism was no panacea for this evil. If oil could be imported into Canada at a price which permitted it to be used as a fuel at a lower cost per heat unit than local coal, then it was economically right to import and use it.

The placing of western coals in Ontario as far as Toronto and Ottawa at a price permitting competition on a cost basis with American coals now imported, was not economically possible. This was due to prohibitive rates for a 2,000 mile haul and the impossibility of balancing freights. Even if existing freight rates could be cut in half, it was quite possible western coals could not compete on a cost basis with American coals.

Mr. Haanel pointed out that of Canada's total consumption of coal amounting to approximately 30,000,000 tons, 60 per cent was imported from the United States. Importations of anthracite amounted to about 5,000,000 tons. Was there a possibility of eliminating American anthracite altogether through the substitution of other fuels or forms of heat energy? Mr. Haanel said that among the impracticable suggestions were the substitution of western coals for the anthracite and bituminous coals, the substitution of fuel oil for domestic heating, and the use of hydro-electric energy for domestic heating. The speaker expressed the opinion that the coking of imported bituminous coal and the intensive development of peat bogs with short rail hauls would not only reduce the quantity of anthracite coal annually required in Ontario, but might eventually entirely eliminate it.

Gordon Gale, M.E.I.C., was to have read a paper on electric energy and its use in heating, but was unable to attend owing to his time being taken up with the solution of the power tie-up which has affected his company in common with other local power companies. An interesting resume of his paper was given by John Murphy, M.E.I.C. The paper dealt, among other things, with the peak load power supply companies would have to carry in winter in order to furnish energy for heating purposes, and the high cost of electric heating. The paper concluded: "The direct use of hydro-electricity for heating is not desirable to the individual because cost is too high. It is not possible to the community because there is not enough to supply everyone, and it is not in the interest of the country because electric power has another and more useful use".

George Mountain, M.E.I.C., spoke on the transportation of fuel in bulk. Coal, he stated, was in railway parlance, good tonnage. There was no special difficulty involved in the loading, unloading and transportation of coal. Mr. Mountain dealt with the principal movements in the transportation of coal on the railways coming into and through Canada.

Annual Smoker

A novel and intensely amusing entertainment was staged at the annual smoker of the Branch, held at the Chateau Laurier on the evening of December 14th. Business worries were laid aside and the evening was given over to the enjoyment of music and humourous dialogue provided by excellent artists.

The feature of the evening was the songs, dialogues and one-man plays put on by Jack McLaren of Toronto, who enjoys a wide popularity as a former member of the P.P.C.L.I., concert party, and later of the "Dumbells". Mr. McLaren is also well known in Canada as a magazine illustrator, having several clever covers to his credit this year. He is one of the most original entertainers heard in Ottawa in some time.

There were many other fine musical numbers. Charles Watt sang several songs and received rounds of generous applause and was forced to sing several times before he was allowed to take his seat. Both he and Mr. McLaren were accompanied by D. F. Jeffrey. Martin Wolff, A.M.E.I.C., of the Ottawa Branch, entertained the members with songs in Chinese dialect in which the names of members of the Ottawa Branch were mentioned. Mr. McLaren excelled in humorous dialect and put on several plays which were received with tremendous applause. His stories were greeted with enthusiasm, and a Scotch monologue, "A Day in Glasgow", proved very popular with the sons of Scotland in the audience. During the evening a radio concert, arranged by several of the members of the Branch, was staged. It proved very successful and announcements and piano selections were heard very distinctly. Following the radio concert one of Harold Lloyd's latest films was shown under the direction of B. E. Norrish, A.M.E.I.C.

The evening's entertainment was one of the most successful staged by the Ottawa Branch. Much credit was given the various artists, especially to Mr. McLaren.

C. R. Coutlee, M.E.I.C., was chairman of the meeting. The committee in charge of the entertainment consisted of J. L. Rannie, M.E.I.C., (convener), R. C. Berry, A.M.E.I.C., P. Sherrin, A.M.E.I.C., H. Godwin and R. K. Odell. Following the programme a buffet supper was served in the main dining room of the Chateau. About two hundred attended.

Kingston Branch

L. T. Rutledge, M.E.I.C., Secretary-Treasurer.

A regular meeting of the Kingston Branch was held on November 28th, at which meeting an excellent address was given by Dr. A. L. Clark, Hon.M.E.I.C., Dean of the Faculty of Science, Queen's University. Dr. Clark spoke on the subject which is a very popular one in all spheres of life. It is a subject which, as Mark Twain says, considerable is said, but nothing is done, but the practice is too convenient to be abandoned. When one meets an acquaintance and does not want to maintain a gloomy silence, one makes an obvious remark about the weather instead of cudgelling one's brains for some profound utterance about public policy or the state of Europe. The weather is therefore a subject of enthralling interest. So Dean Clark chose as the subject of his address "Weather Forecasting".

Dr. Clark has directed the work of taking weather observations at the Kingston station of the Meteorological Department of Canada for some years past. In this connection, daily readings of barometric pressure, temperature, wind velocities, wind direction and precipitation are telegraphed in code to Toronto which is the central station for Canada. The address being so intensely interesting and containing such valuable information of interest to any one, and epitome of it is given for the readers of *The Journal.*

Weather was defined as the sum total of atmospheric conditions. The oldest method of forecasting is the one based on superstitious beliefs which vary widely with different localities. The moon has always occupied an interesting position and almost from the dawn of history changes of weather have been attributed to its phase, position, or its appearance. The speaker, very reluctantly stated that no dependence could be placed in these beliefs. As many wrong guesses are made, as correct ones, but only the latter are remembered.

Forecasting by observations such as is practised by Indians, trappers, sailors and others whose work brings them into constant touch with nature, can be relied on to a great extent. Forecasting by observations of the sun or sun spots is gaining popularity. Periodicity of storms has been claimed to be due to the rotation of sun spots. The whirling of these sun spots, causes a magnetic field so intense that its effect can be observed on the earth's surface. Immense numbers of negatively charged particles or electrons arrive at the earth's atmosphere from the sun and it has been stated by an eminent physicist, Sir Oliver Lodge, that a negatively charged atmosphere signifies bad weather, whereas a positively charged atmosphere forecasts fair weather.

Fine dust in the upper air causes a diminution of temperature. After each large volcanic eruption there is a lower temperature on the earth. In 1883 this was very pronounced after the terrible volcanic eruption in the East. The dust travelled three times around the earth. Volcanic eruptions could cause an ice-age if these eruptions were sufficiently intense and happened often enough. It is interesting to note the precipitation on the earth's surface. Twenty-six million tons of water, in the various forms which it may assume, fall per second on an average on the earth's surface. Changes in atmospheric pressure is the great factor that determines weather conditions. A falling barometer indicates a storm. The barometric pressure at sea level varies between 29 and 31 inches of mercury, though as low as 27 has been recorded in the low pressure area of a typhoon.

For the purpose of forecasting the Meteorological Department issues daily a map of our continent on which isobaric lines or lines of equal pressure are shown. The map shows the location of the low and high pressure areas and also the intensity of the storm. As a usual thing, the storms travel in the same general direction across the continent. A great many originate out in the North Western part of the continent and travel across the Great Lakes and out the St. Lawrence valley. The storm that originates in the Caribbean sea generally passes up the eastern states and out the St. Lawrence valley. Records show that 83 percent. of all official predictions made from these isobar maps are correct. This service is of great value to the shipping industry on both the lakes and the oceans. The direction of the wind results from the positions of the low pressure areas. The wind tends to blow towards the centre of low pressure but the rotation of the earth causes a deflection towards the right.

Dean Clark discussed in detail many other phases of the subject. The lecture aroused a very interesting discussion.

The next meeting was held on December 14th, when a paper was given by Captain Donnelly on the releasing of the passenger steamer Rapids Prince from the rocks of the Lachine rapids, in the St. Lawrence river.

It will be recalled that on July 30th, this vessel of the Canada Steamship Lines, on its trip from Prescott to Montreal with over 400 passengers, met an accident in the passage down the rapids. The rudder chain broke and the vessel drifted out of the main channel and lodged on a flat rock and retained its position. The passengers and crew were safely removed on the following day by rivermen. Tenders were called for the salvaging of the vessel. The Donnelly Wrecking and Salvage Company were the lowest bidders and were given the contract on a basis of "no cure, no pay" at a price of $49,475. On August 3rd, the contractors were on the job and work of installing plant began. Flat bottomed scows and gasoline launches were put into service. Fortunately a flat rock, quite accessible, was located 1,200 feet from the wreck on the opposite side of the channel. Here a boiler and winding engine were set up and firmly fastened to the rock.

Mr. Donnelly described in detail the method used in fastening a 1½-inch wire cable 1,200 feet long to the wreck. A small Lyle gun

brought from Halifax was used to shoot a steel projectile weighing 19 pounds, to the end of which a ⅜-inch manilla rope was fastened. The first shot went 1,800 feet beyond the wreck. After a very few shots a direct hit was made. Great care had to be used in coiling the rope so that it would not foul. The rope was used to pull a ¼-inch wire rope, the latter pulled a ⅜-inch rope, then it was used to pull a ¾-inch wire cable and lastly the ¾-inch to secure a 1½-inch plow steel wire cable with an ultimate strength of approximately 280,000 pounds. This heavy cable was secured to the bow of the steamer.

In the first place, the deck was reinforced by joining it to the keel with rods and 1½-inch turnbuckles. The cable was wound four times in the figure "S" around two bollards or short pillars firmly secured to the deck. The coils were wired together at the start. The wire cable was then passed through a shackle and joined to two five inch manilla ropes and lastly to block and tackle, the latter secured to the deck. After it was secured and taut the small wires on the "S" coils were removed.

The intention was to pull the bow of the wreck by the cable so as to release the vessel bow first and pull the vessel into the main channel and cross-wise of the current, trusting to the forty mile current and the rudder to turn the vessel bow downstream. This necessitated pulley the vessel 450 feet. Two men were detailed to cut with sharp axes the manilla rope at the proper signal. Another with an oxy-acetylene flame was ready to burn the cable if it should foul. Everything was done by signals. The engines in the vessel were in good condition and full steam was up. The signal was given to start the winding engine 1,200 feet away. Everything went as was planned. The boat was released and came gradually and smoothly from the rock. It was pulled across the stream. On the signal, the axe-men cut the manilla rope. In an infinitesimal time, the large cable jumped the bollards, the vessel turned down stream on its regular course. In nine minutes from the first signal, she was gliding peacefully down the Lachine rapids. Capt. Donnelly had the vessel docked in Montreal within two hours from the first signal to draw up the cable.

The Branch are very grateful to Capt. Donnelly for the full explanations of the details of this great engineering feat.

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

Local engineers are pleased to welcome Lester Willis Gill, M.E.I.C., to Hamilton. Prof. Gill, who has recently been appointed Principal of the new technical school, has had an interesting career, which may well be an inspiration to his students. Born on a farm in Prince Edward Island, he left at the early age of fifteen, making his way to Boston, where he found employment in a livery stable. During the next five years he worked successively as a street car conductor, a carpenter, a painter and a handy man, during which time he was carefully saving his money so as to get an education. At the age of twenty-one he applied for admission to McGill University. He was refused on the ground that his preliminary education was not sufficient. Nothing daunted, he prevailed on the authorities to give him a trial on condition that he pass every examination during the first three months. In this he was successful and the same pluck which gave him a start, enabled him to graduate in 1896 in mechanical engineering with honours and the gold medal and the degree of B.Sc. He continued at McGill another year, taking up electrical engineering in 1896-'97, winning the 1851 Exhibition Scholarship, calling for 2 years further study. He devoted the year 1897-'98 to research work on magnetic hysteresis. This work was published in the Philosophical magazine, London, and our plucky young student won the degree of M.Sc.

The following year was spent at Harvard University in further research work on magnetism and also the study of higher mathematics and physics. Several of his papers at this time were published in the Philosophical magazine. The following year was devoted to the practical application of his science in the works of the Westinghouse Electric and Manufacturing Company, at East Pittsburgh, Pa.

In 1900 he was appointed professor of general engineering in the mining department of Queen's University, and during the next five years was largely responsible for the initial organization of the departments of civil, electrical and mechanical engineering. Subsequent to this he became Professor of electrical and mechanical engineering, and finally Professor of electrical engineering. During this period from 1900 to 1915 at Queen's, the Professor was able to devote a part of his time to consulting engineering work, making reports on power projects, besides designing power and heating plants, including that for Queen's University.

Upon the outbreak of war, our professor volunteered his services with the engineering corps of the first contingent, but was unable to join up at that time. In 1916 he organized the 46th Queen's University Battery C.F.A., leaving for overseas in the spring of the same year. He saw service in France until June 1917, when he was sent to hospital in England suffering from gas. He was subsequently appointed to the war office and supervised the equipment for munition factories during the next nine months. Just prior to the armistice Prof. Gill was on his way back to France to take charge of a field battery, when he was appointed to the post of Director of Education for the Khaki College, under Colonel Tory. In the December of 1918, when Professor Gill undertook this work, the college only had a staff of one hundred instructors. Within two months' time it was necessary to increase this number to four hundred instructors, and the number of students increased proportionately.

The executive and organizing ability of Professor Gill called forth the highest praise from educationists in England. In January 1919, General Currie, officer commanding the Canadian corps, gave him permission to establish a concentration camp at Ripon, England, for university students. At this camp there were eight hundred scholars, with a staff of forty instructors. All told, the Khaki College had an enrolment of ten thousand with a staff of four hundred teachers. Professor Gill was demobilized with the rank of Lieut.-Colonel in 1919.

Upon returning from overseas, Prof. Gill was given the office of director of technical education for the Dominion Government. He occupied this post for nearly two years, after which he took over the position of director of the departments of electrical and mechanical engineering at the University of British Columbia, in 1921. In October, Prof. Gill became principal of the Hamilton Technical School and with such a man at its head, and in a growing industrial city, such as we have here, there is a bright future ahead for the students who pass under his care.

Winnipeg Branch

George L. Guy, M.E.I.C., Secretary-Treasurer.

The session is now well into its stride in Winnipeg, with a number of interesting papers and addresses already presented to the membership. On October 19th, Rev. Father Morton gave a talk on relativity and the record attendance, over 100, were treated to a rare example of

a lucid treatment of a very abstruse scientific development. The speaker, starting with a few elementary notions, led his listeners on in easy stages until even the most uninitiate after the lecture had a very fair grasp of the idea underlying the general and specific theories developed by Einstein. With never a pause for a word, with never a hiatus in his reasoning the lecturer illustrated not only a complete mastery of his subject, but an object lesson in the use of the King's English as applied to scientific thought, which in itself made the occasion worth while. Professor Allen in moving a vote of thanks stated that he believed Father Morton was one of the only six men living who, it is asserted, really understand the theory of relativity.

At the next meeting A. W. Lamont, A.M.E.I.C., of the Canadian Westinghouse Company, gave a complete account of an electric furnace for the heat treatment of the moving parts of locomotives recently installed in the local Canadian National shops. The members had previously been given the opportunity of visiting the shops and seeing the apparatus actually in operation. Mr. Lamont's paper will be found in full in another part of this issue.

On November 16th, F. H. Martin, M.E.I.C., addressed the meeting on the economics of rate-making as applied to a public utility furnishing electric energy. As was anticipated the subject gave rise to a lively discussion prolonged to a late hour. Mr. Martin with good tactics, in his address merely gave a sketchy outline of the subject, and reserved his heavy artillery until subjected to a direct frontal attack. The subsequent exchanges were lively, but good humour prevailed throughout. It would be a pity, if such discussions among professional men should degenerate to mere bickering between representatives of rival interests. It is a tribute to the usefulness of *The Institute*, that there was no evidence of any such condition and that opportunity was presented of frank presentation of every point of view.

At the meeting on December 7th, Harold Edwards, A.M.E.I.C., reported on behalf of the Committee on Foundations. This committee since its last report, has been doing considerable study of the local foundation problem which presents many unusual conditions. It is the policy of the Branch to encourage the work of its committees, believing that therein lies the chief source of the Branch's vitality. The benefit of this policy was very forcibly illustrated as a result of Mr. Edward's report. It transpired that the university has been made a repository of all information relative to foundations, where the information is not only readily accessible to the members but also serves as a valuable supplement in the college curriculum. Further the committee has in contemplation the construction of a soil testing machine similar to that recommended by the American Society of Civil Engineers, which will also be operated in conjunction with the University. Again the civic authorities are about to undertake a revision of the city building by-law, and there is no doubt the findings of the committee will prove of much importance in this regard. Co-operation between the city and the Branch in the undertaking, will prove the disinterestedness of the engineers, the value of their services and will go far towards achieving that recognition which is so essential in the betterment of the profession. The discussion which followed Mr. Edwards report evidenced the keen interest taken in the work of the committee, and in passing a vote of thanks especial comment was made on the amount of time, particularly in Mr. Edwards case, given to the work involving a heavy sacrifice.

On November 8th, Capt. C. N. Mitchell, V.C., M.C., A.M.E.I.C., was married to Gertrude Hazel Bishop of Winnipeg, and the bridal pair left for a short stay in Vancouver, proceeding thence to the state of Washington where Captain Mitchell will act as superintendent for the Foundation Company on the construction of bridge piers.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the Branch was held in the Barker House on Thursday evening, December 7th, in the form of a banquet and an address by Dr. Bigelow of Sackville.

The chairman, G. C. Torrens, A.M.E.I.C., introduced the speaker of the evening, who chose as his subject "The Place of Research in the Development of Canadian Industries". Dr. Bigelow is Dean of the Faculty of Science of Mount Allison University, where he occupies the chair of chemistry. He is a charter member of the Canadian Institute of Chemistry, of which he is past vice-president, and is a member of the Council of Industrial Research. In addition, therefore, to his academic qualifications for treating his subject, he is in intimate touch with actual research work; qualifications which were very evident showed out in his intensely interesting statement of his subject, and in his clear analysis of the influence of research on the industrial development of all countries.

At the outset Dr. Bigelow congratulated *The Institute* on the work it was accomplishing in advancing the profession of engineering and in so doing, serving the interests of the country as a whole. He hoped that the Canadian Institute of Chemistry would soon be doing like good work for chemists.

Entering upon his subject he showed that it was the investigator who was responsible for all the wonderful advances in modern times. In the more recent developments he doubted whether it was generally known on whose shoulders many of the so called "inventors" had climbed to fame. It was in the research laboratory that tests and trials and experiments were carried out that established principles upon which the manufacturer and producer built. The accomplishment of other nations was touched upon with the results accruing. Germany, before the war, realized the importance of research and, as a result, when her supply of nitrates was cut off at the beginning of the war she was in a position to manufacture nitrates from the air and at the end of the war her production was at the rate of 200,000 tons per annum. Without research she must have collapsed early in the war.

Canada's own work was outlined more particularly in the production of acetone, a vital product in the manufacture of explosives. At Shawinigan Falls during the war, Canadian research was responsible for a process that revolutionized the industry and greatly aided the Allies in winning the war.

Dr. Bigelow's message was not a more recital of facts accomplished. He outlined briefly many of the problems yet unsolved and particularly those relating to eastern Canada. The proper curing and packing of fish was a most important subject. The trade in this product with Cuba alone was valued at a million and a half annually, yet in spite of Canada's favourable position as regards proximity of markets, Alaskan and Norwegian fish dominated, chiefly because of better keeping qualities. Research had overcome part of the trouble as it

had been discovered that the salt used in curing the fish promoted a growth that discolored it. Preventitives to the softening that our cured fish is still subject to, are yet to be discovered. Our forests are subject to pests that cause enormous losses yearly. In the discovery of means to exterminate these is a wide field for research. In the reduction of our ores, — particularly in the preliminary smelting of the nickel ores, — a vast quantity of sulphur dioxide is given off with no attempt at reclamation. Canadians import sulphur and sulphuric acid, particularly for the paper making industry, yet in the smelting of nickel the sulphur dioxide given off is the base used in the manufacturing of sulphuric acid. In our manufacture of wood pulp by the chemical process, as contrasted with the mechanical or grinding process, fifty per cent of the material is wasted, and is discharged into our rivers in solution. Think of the enormous saving to be effected if this material could be reclaimed for commercial use. Canada has a vast supply of helium, the gas that is now replacing hydrogen in lighter-than-air air craft. In our natural gases there is now going to waste helium to the value of millions of dollars annually on a war valuation. This is because no peace time use is found for it. Here is an opportunity for research.

Other problems awaiting solution were touched upon and the members of the Moncton Branch were left with the feeling that life is by no means thread-bare; there was yet work to be done on behalf of mankind if we will but go to it with that sublime patience and industry that, steadily applied by the unknown investigator in the privacy of his laboratory, has been responsible for all the wonderful improvements in his condition that mankind now enjoys.

Dr. Bigelow has the poise and earnestness of the true thinker and the clearness of expression of the valued teacher and it was no formal vote of thanks which the meeting tendered him on the completion of his fascinating address.

Cape Breton Branch

Kenneth G. Cameron, A.M.E.I.C., Secretary-Treasurer.

The annual meeting of the Branch was held on Tuesday, December 12th, at the Branch rooms, K. H. Marsh, M.E.I.C., vice-chairman, presiding.

The secretary read the annual report, and following its adoption, the chairman announced that the election for officers for the coming year had resulted as follows: Chairman, K. H. Marsh, M.E.I.C.; executive committee (1923-1924), Horace Longley, M.E.I.C., and C. C. Curtis, M.E.I.C.

After completing the transactions of business, J. G. H. Purves, M.E.I.C., read a paper entitled "Abnormal Friction Losses in a Twelve-inch Water Main".

The intention of the paper was to compare actual loss of head in a specific case with the theoretical loss arrived at by means of standard formulae, due allowance being made for time and conditions of service. The instance cited was that of a twelve-inch main leading in a straight line from a reservoir at elevation 202, to a point of delivery at, as far as referred to in this paper, elevation 81. Subsequent higher levels required delivery at elevation 135. The original installation was designed to supply not more than one and one-half million gallons per day at elevation 81 and have sufficient reserve head left to supply the higher levels at a pressure of ten pounds per square inch as a minimum, — say 25-foot head. The latter figure of 25 feet added to elevation 135 means that the main was supposed to deliver one and one-half million gallons per day at an effective head of 202 less 160 or 42 feet. This figure checks fairly well with calculated quantities from various standard formulae for flow, for new pipe.

The demand upon the pipe, however, was too heavy. When lower levels were supplied, no head was left to take care of those higher up. A booster pump was installed, necessitating a considerable expenditure, but did not give entire satisfaction. Early investigation was thought to indicate a leakage at some unknown points in the pipe. At a point 12,000 feet distant from the reservoir, i.e. the above mentioned point at elevation 81, the pressure had dropped to 38 pounds per square inch, when the main was flowing at the rate of only 600,000 gallons per day, equivalent to a loss of head of 34.5 feet, against a theoretical loss of only 11 feet, for new pipe. Careful metering at intake and delivery disproved any assumption of leakage. Pressure readings taken at intervals along the pipe showed the drop to be uniform throughout and pitotmeter readings indicated an abnormal skin resistance, in one place showing even a reversion of flow.

Special inside calipers for testing diameter and feeling for roughness showed that the diameter of the pipe did not average one-quarter of an inch less than when pipe was new, but did locate small blisters or tubercles, (about ¼ inch high and at 4 inches to 5 inches centres), which could be crushed by the calipers. It was thought that the reversion of flow might be a swirl or eddy in the neighbourhood of one of these tubercles.

Mr. Purves then went on to state various causes for increased friction loss, comparing losses calculated from several standard formulae. He preferred to offer no suggestion as to what might be better practice in designing but he believed that many other phases of design should receive equal consideration with the mere question of flow as set forth by various formulae and tables.

The paper evoked a great deal of interest and discussion and a hearty vote of thanks was tendered to Mr. Purves at the conclusion.

Following the adjournment, a meeting of the Executive Committee was held at which the following appointments for the coming year were made: — Vice-chairman, Horace Longley, M.E.I.C.; secretary-treasurer, D. W. J. Brown, Jr.E.I.C.; Papers and Meetings Committee, S. C. Mifflen, A.M.E.I.C., A. L. Hay, A.M.E.I.C., M. W. Booth, A.M.E.I.C., C. McD. Smyth, A.M.E.I.C.

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

"A Fundamental Plant Study of St. John", was the subject of a very interesting paper read at the regular meeting of the St. John Branch on Friday December 15th, by W. R. Pearce, M.E.I.C., chief engineer of the New Brunswick Telephone Company Ltd. A. G. Tapley, A.M.E.I.C., presided and a large number of members were present.

In opening, Mr. Pearce described a telephone system as "the nervous system of modern business". It is an essential part of every-day life and has become a first necessity in all business. Each subscriber's line must have a separate pair of wires extending from his premises to the exchange building and it is apparent that the telephone company must plan far in advance of its present requirements, in order to be ready for future growth, moves or other changes.

In order to undertake scientifically a development study as applied to the telephone field, it is necessary to make an analysis of all the factors which may affect the growth of its business: — (1) Is it a manufacturing town, or an educational centre? (2) Are its inhabitants engaged in industries which pay fair wages, or is foreign labour largely employed? (3) Has it good hotels, do the people live in apartments, flats or individual houses? (4) What percentage of the people own their own homes or is its population transient, and many other features?

The engineer who undertakes this work must go back as far as possible in the history of the place to study the growth in population. He must consider the possibilities of industrial and commercial expansion, the opportunity for cheap power as well as the local geographical features which limit expansion and affect the physical properties of the company. When he has obtained all this data he must make a house to house analysis of each city block; he must forecast the growth for the next five to fifteen years and plan his main and lateral conduit systems accordingly. From this it can be seen that we no longer go along in a haphazard manner, extending a cable here and one there as the lines are used up. A well defined and predetermined plan is laid out on a scientific basis.

According to the growth of St. John from 1911 to 1921 the population of the area covered by the New Brunswick Telephone Company

district should be 63,900 in 1927 and 77,300 in 1937. These figures deal with an area larger than the city of St. John. The population curve is checked and corrected every five years. A curve is also drawn to show the growth of the telephone lines during a similar period.

At this stage Mr. Pearce showed by charts and slides how the future growth was estimated in a typical city block. A similar study being made of all the blocks, an estimate of the future requirements is made and the lines laid out accordingly. Having determined the number of lines which may be expected in each block, these are plotted on a plan of the city and the total number of estimated lines is divided into four equal parts, the intersection of the division is the theoretical wire centre. At this point should be located the exchange from which each subscriber may be reached with the least amount of outside plant. It has been found that the St. John exchange is within five hundred feet of the theoretical wire centre.

To give proper and efficient service it is necessary that spare lines should be available in all sections of the city. This means a considerable investment lying idle as it is proposed to fill our cable to only 80 per cent of their capacity, the remaining 20 per cent being necessary to care for moves, changes and unforeseen conditions. Efforts have been made by the company to secure permission to use "back-lot construction" in the centre of St. John. Too many obstacles were confronted to permit the carrying out of this scheme, and it seems necessary that the telephone lines must follow the streets in order to reach the subscriber.

The advance in the manufacture of telephone cable has been remarkable in the last few years. To-day it is found to be common practice to use 900 and 1,200 pair cable. There are laid in St. John to-day 37,000 trench feet of conduit with accommodation for 175,000 feet of cable. Of this duct, 86,500 feet are in use, while 87,500 feet have been laid ahead of the street paving for future installations of underground cable. The largest cable now laid in St. John is 600 pair.

Many interesting slides and charts were shown during the paper and the discussion which followed brought out additional features. A vote of thanks to Mr. Pearce was moved by F. G. Goodspeed, M.E.I.C., and seconded by N. F. Nutter, A.M.E.I.C.

Among the out of town members present were B. M. Hill, M.E.I.C., of Fredericton, K. S. Pickard, A.M.E.I.C., of Sackville, and J. D. McBeath, M.E.I.C., of Moncton, who were in the city attending a meeting of the council of the Association of Professional Engineers of the Province of New Brunswick.

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

The fall outing of the Branch was held on Friday, November 24th. The programme comprised an inspection trip over the enlargement of the Niagara Falls Power Company's plant at Niagara Falls, New York; a visit to Chippawa to view the intake works of the Queenston-Chippawa power development, followed by a dinner at the Clifton Inn and an address on the Near East by Mr. D. A. Andrus.

Inspection Trip to Power Developments.

About seventy members assembled at the offices of the Niagara Falls Power Company and were conducted over the new work by N. R. Gibson, M.E.I.C., chief hydraulic engineer; O. D. Dales, construction engineer, both members of the power company's staff, and by W. W. Read, of Read-Coddington Engineering Company, contractors for the work.

The work consists of an intake located about a mile above the crest of the falls and immediately adjoining the intake of the present canal. From the intake the water will travel to the forebay through a pressure tunnel of horse-shoe shape, 4,500 feet in length, 32 feet in height and with a maximum horizontal dimension of 32 feet. In order to pass beneath the present power canal, city sewers, and on account of the quality of the rock, the tunnel descends from the intake until the invert is 123 feet below the intake water level and then ascends to the forebay. At the lowest point the invert is about 140 feet below the ground surface. From the lowest point in the tunnel a drainage tunnel of approximately 8-foot diameter has been cut into the tail-race tunnel of the Niagara Plant. This allows for drainage during construction, and as a stop-gate structure is provided at both the intake and forebay ends the tunnel can be emptied if necessary for inspection or repair work.

The water from the tunnel enters into an enlargement of the present forebay and is carried to the turbines through three penstocks, each 21 feet in diameter, cut through the rock at an angle of 45 degrees. The tunnel penstock are lined with concrete and at the lower ends there are plate steel linings for a length of about 100 feet. The total amount of rock excavation involved in the new work will be about 400,000 cubic yards and the total amount of concrete 90,000 cubic yards.

The effective head is 215 feet, and the three new turbines will be of 70,000 h.p. each, and are of the single runner vertical type. Two of the draft tubes are of the Moody spreading type and one is a White hydrocone.

Having inspected this work, the party crossed back to the Canadian side and proceeded up the Queen Victoria Park Boulevard to Chippawa where the intake work for the new Queenston-Chippawa power development of the Hydro-Electric Power Commission of Ontario was inspected. This work, which is situated at the junction of the Welland river with the Niagara consists of a breast wall 800 feet in length and 42 feet in height, in which are fifteen openings, 18 feet by 28 feet, and also six submerged intale tubes, each having a maximum section of 32 feet by 36 feet. All openings can be controlled by gates and stop-logs, and the whole structure was specially designed to eliminate ice trouble. The Welland river being a navigable stream it was necessary to provide a ship channel opening in the intake wall; large concrete lock walls with facilities for gates being built, providing a channel 80 feet wide with a depth of water of 28 feet over the sill. The work is practically complete and water will be admitted sometime in December, 1922. Sufficient water for the four 55,000-horse power units at present in operation at Queenston is being obtained through a temporary channel which is also used for navigation.

The party then adjourned to the Clifton Inn where, after an excellent dinner, an address on the Near East was delivered by Mr. D. A. Andrus, manager of the Sir William Arrol Construction Company on their work on Section 3 of the Welland Ship Canal. Mr. Andrus spent twenty years on engineering work in Egypt and Asia-Minor and gave a very interesting address on the latter country.

Besides the historical outline, Mr. Andrus touched on points of archaeological value, various interesting experiences of his own, sketched the character of the

peasants and the life they led, and gave some very amusing incidents of the Turkish official system of grafting. Mr. Andrus' daughter was in Smyrna when the Turks entered during the recent campaign and witnessed some terrible scenes. She is now safe in Canada.

The whole meeting greatly appreciated Mr. Andrus' thoughtful and interesting address and the Branch is looking forward to hearing another address from the same speaker on Egypt at some future date.

St. Andrews Dinner.

Many members of the Niagara Peninsula Branch enjoyed the hospitality of Mr. David Dick, Jr., of Welland, president of the National Sand and Materials Company, Limited, at a St. Andrews Dinner on November 30th, 1922. There were pipers, haggis and heather and everybody was Scotch for the evening. A very fine address on the advantage of being Scotch was delivered by the Rev. Dr. George Adam of Glasgow and Montreal.

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

Branch Elections

Following the handing in of the report from the Nominating Committee, which provided for the election of only three executive committeemen to replace the three retiring members, a telegram was received from Maj.-General R. G. Edwards Leckie, A.M.E.I.C., tendering his resignation from the Executive, his term of office properly expiring at the end of 1923. This made four vacancies to be filled; and in order to meet the situation, and keep the rotation of two-year periods of office correct, the Executive Committee, under authority of sections 4 and 5 of the Branch by-laws, added two more names to the ballot-paper, stating that, of the four candidates elected, the one polling the lowest vote, should automatically retire at the end of 1923.

The elections, and annual general meeting will be over before this appears in the January issue of *The Journal*, the notice for the meeting being now in the mail, calling the meeting for Tuesday, December 19th. Our great distance from Montreal prevents our sending a full, written report, as the final date for Branch copy is the twentieth of each month. However, we trust that a telegraphed message, bearing the result of our branch election will reach headquarters in time for publication in this issue.

Results given in Telegram referred to above

Chairman, A. C. Eddy, M.E.I.C.; Vice-Chairman, J. Muirhead, M.E.I.C.; Secretary-Treasurer, P. H. Buchan, A.M.E.I.C.; Executive, W. G. Swan, M.E.I.C.; D. O. Lewis, M.E.I.C.; W. H. Powell, M.E.I.C.; T. W. Fairhurst, A.M.E.I.C.

November General Meeting

One of the changes which marked the general meeting of the Vancouver Branch held on November 7th last, was the removal of our usual place of meeting to the new spacious and comfortable auditorium of the Vancouver Board of Trade at 300 Pender Street West.

This auditorium has the distinct advantage of being on the ground floor, thereby eliminating the use of an elevator, or the tiresome climb up numerous flights of stairs. It is well ventilated and the acoustics are excellent, being in these respects particularly, far superior to the old auditorium. Another feature, which we would impress on the members of the Branch, is the large seating capacity, as compared with the old hall. The Executive Committee is confident that the advantages enumerated above will be largely responsible for the greatly increased attendance at our future meetings.

The second important change from our usual custom, was the introduction of a speaker outside of the engineering profession. Dr. R. H. Mullin, director of laboratories, at the Vancouver General Hospital, addressed the meeting on "Sanitary Water Supply", dealing with the medical aspect of the subject in relation to the choice of water supply and methods of purification. He exhibited a large number of very interesting lantern slides ranging from illustrations of various bacteria, to large modern filter plants and kindred engineering works. The discussion was contributed to by Wm. Smaill, M.E.I.C., J. W. B. Blackman, M.E.I.C., and a number of others, among whom was E. M. LeFlufy, water-works engineer for the city of Vancouver. The Chairman expressed the thanks of the meeting to Dr. Mullin, in a few well-chosen remarks.

Chief among the items of business transacted at the meeting, was the appointment of a Nominating Committee to prepare a ballot paper for the coming Branch elections. According to the by-laws, as amended last year, the committee should have been appointed at the last annual general meeting; but, through an oversight, this duty was not performed. On motion of W. G. Swan, M.E.I.C., seconded by W. H. Powell, M.E.I.C., the chair was given power to make the appointment, which duty was satisfactorily discharged by selecting Wm. Anderson, M.E.I.C., as chairman, with four committeemen, viz.: F. O. Mills, A.M.E.I.C., R. Rome, A.M.E.I.C. W. B. Greig, A.M.E.I.C., and P. P. Brown, M.E.I.C. This Nominating Committee was instructed to function with as little delay as possible, the date for the submission of their report being the fifteenth of November.

Saskatchewan Branch

D. A. R. McCannel, A.M.E.I.C., Secretary-Treasurer.
D. W. Houston, A.M.E.I.C., Branch News Editor.

On November 22nd, a special meeting of the Branch was held at the Kitchener hotel, preceded by a dinner, which was addressed by Professor W. G. Worcester, the head of the ceramics department of Saskatchewan University. His subject was "The Clay Products of Saskatchewan". The attendance at the meeting was large and great interest was shown in the subject.

He told first in some detail of the usefulness of clays both in the raw state and when burned. Raw clays are used in paints, oil cloth, and paper, for medicinal purposes, for clarifying oils and lard, etc. A more recent use is, in reclaiming waste print paper, by taking out the ink. There is a wide of articles manufactured from clays, when burnt, i.e., dishes, tiling sewer pipe, insulators brick and, many other articles.

Canada is well supplied with clays with the possible exception of refractory, and Saskatchewan has many varieties — more than any other province, — common, shales, pottery, refractory and those used for paint, oil cloth, etc.

Fossilized shales from which can be manufactured the better type of face brick are not numerous in the southern portion of the province, but there are great quantities in the north. Refractory clays are found at Clay Bank. Full tests of this clay is being made at the university, and tiles from it are now used in the Canadian Pacific Railway locomotives. In other parts semi-refractory clays are abundant, enough to make us independent of importation. Pottery clays are found in many stratas and of many grades, which for different types can be blended. Up to the present only one deposit of China clay has been discovered, which is up in the northern part of the province. Some of the best clays have been found contiguous to coal beds in the southern part of the province.

Prof. Worcester pointed out the opportunities in the ceramic field, as ten and one-half million dollars worth of clay products were imported each year. He stated that capital for development and manufacture should be raised in Canada. Our materials are basically right, if the right material is used for the right purpose. Production must be as cheap as the importers' and we must have modern kilns to compete. T. M. Molloy, secretary of the Provincial Bureau of Labour and Industry, who was present stated that much interest is taken in the ceramic department at the university, inquiries being received from capitalists in Canada, England, Scotland and Belgium. Lieut. Col. A. C. Garner, M.E.I.C., who, last year, was with Professor Worcester in an exploration trip into the northern part of the province, amplified the speaker's statements about the clay resources there.

Town Planning Discussed

Gathering at the Kitchener hotel, Regina, on December 14th, the Saskatchewan Branch held a very live meeting dealing with the subject of Town planning. J. R. C. Macredie, M.E.I.C., chairman of the Branch, presiding.

The officers of the newly formed Town Planning Association of Regina, Col. Garner, M.E.I.C., Leslie Wallace and H. G. Phillips, A.M.E.I.C., attended as guests of the Branch, also J. J. Smith, deputy minister of public works of Saskatchewan. W. A. Begg, A.M.E.I.C., director of Town Planning for Saskatchewan, read a paper on "Town Planning in its Relation to the Engineering Profession". Following this paper lantern slides were exhibited, well illustrating the subject.

Mr Begg began by stating that some of the ancient cities show better town planning than the modern development. The ancient city was often laid out by some king or prince who had at his command the best engineers and architects of his time. The cost was wrung from his subjects, and as he had supreme control, he was able to follow a well thought out plant. With the development of representative municipal government, more freedom has been allowed individuals and cities have developed in a piecemeal fashion each new sub-division being considered by itself rather than as a part of the city.

Mr. Begg went on to show that the fault did not lie with the land surveyor or even the promoter, the difficulty comes from having no well defined plan for the development of the city or means of carrying such a plan when developed. Town planning legislation is intendent to give a means for such development of cities and towns. The development of the town planning profession and town planning legislation was ably explained, also the relation between the work of the architect, engineer, surveyor and town planner.

Following Mr. Begg's address, much time was taken in discussion. Mr. Wallace told of the work of the Town Planning Association and Mr. Smith spoke of his interest in the matter and pleasure in attending the meeting. Various phases of town planning were brought out by R. N. Blackburn, M.E.I.C., J. N. deStein, M.E.I.C., Col. Garner, M.E.I.C., R. H. Murray, A.M.E.I.C., H. G. Phillips, A.M.E.I.C., and P. C. Perry, A.M.E.I.C. The mistakes which have been made in this province in connection with the smaller centers were referred to, and the discussion clearly demonstrated that all concerned are now among of the importance of town planning and are prepared to co-operate with others to insure the best possible development for our new towns.

Programme of Future Meetings

The Recreation and Entertainment Committee, under the chairmanship of H. N. Macpherson, A.M.E.I.C., in order to stimulate interest in and attendance at the meetings has divided the local membership into seven (7) teams. Each team has been given a captain who is responsible for the attendance of his team at each meeting. Two points are allowed for a member's attendance at dinner and meeting, and one point for attendance at meeting only. A prize will be awarded to the team having the most points at the close of the programme of 1922-23 meetings. The following programme of meetings for the session 1922-23 has been arranged:—

Programme

December 14—Town Planning in Relation to the Engineering Profession — W. A. Begg, A.M.E.I.C., director of town planning, Saskatchewan Government.

January 11—Wireless Telephony — S. R. Parker, A.M.E.I.C., and C. W. Doody, Prov. Department of Telephones.

January 25—Scientific Methods of Commercial and Industrial Lighting — J. A. Daly, Mgr. Northern Electric Company, Regina.

February 13—The Forest Reserves of Saskatchewan — C. MacFayden, District Forest Inspector, Prince Albert.

February 22—Engineering Cost Accounting — E. A. Markham, A.M.E.I.C., Poole Construction Company, Regina.

March 8—(Annual Meeting) Conservation of Highways by joint use of Poles and Ducts, the Operation and Maintenance of Underground and Overhead Systems and Necessary Regulations governing their use — G. D. Archibald, A.M.E.I.C., City Engineer, Saskatoon, and J. R. Cowley, Electrical Superintendent, Saskatoon.

March 22—Is the Development of a City Limited by Lack of Facilities for Disposing of Sewage and Good Water Supply and at What Sta e in the Development of a City are these Defects Most Apparent? — G. D. Mackie, M.E.I.C., city commissioner, Moose Jaw.

April 14—Engineering Education — (Speaker being arranged for).

April 28—The William Pearce Irrigation and Water Supply Scheme as Applied to Saskatchewan — Wm. Pearce, M.E.I.C., Department of Natural Resources, C.P.R., Calgary, Alta.

Halifax Branch

O. S. Cox, A.M.E.I.C., Secretary-Treasurer.

At a meeting of the Halifax Branch, held in the Board of Trade rooms on November 29th, Mr. J. A. Wilson, A.M.E.I.C., Secretary of the Dominion Air Board, delivered an interesting address on Aviation in Canada. The remarks of the speaker were profusely illustrated with lantern slides made from aeroplane photographs showing the value of aircraft as an adjunct to the forestry service, both in spotting fires and in the rapid transportation of

fire-fighting apparatus and men to the scene of the blaze, and also as an aid to engineers in surveying and mapping the more remote and inaccessible areas of the Dominion. In his opening remarks Mr. Wilson stated that aviation being only in its infancy at the outbreak of the war, was forced into false channels and its commercial and civil value was for a time lost sight of. At the close of the war the general public idea was that aviation, in competition with existing modes, would revolutionize the world's transportation. Mr. Wilson pointed out that the best avenue for the commercial development of aviation does not lie in competing with existing modes of transportation but rather in serving remote areas which are inaccessible except by long and arduous trips by canoe, or dog team. He illustrated this statement by showing a map of the Northern section of Manitoba where by use of an aeroplane from the Air Board station, the commissioner for the district was able to complete in ten days a trip which usually meant three months of arduous travel by trail and canoe.

The possibilities of the aeroplane as an aid to geographical and geological surveys, in the mapping of the inaccessible portions, especially in mountainous districts, have barely been touched upon as yet, said the speaker. He explained, with the aid of lantern slides, a method now being perfected whereby from aeroplane photographs, taken to scale, engineers can plot their maps with a degree of accuracy and detail impossible to obtain by the ordinary methods with field parties. It is expected that it will be possible in the near future to cover an area of fifty square miles in a single photograph.

The aeroplane is fast replacing the old method of watch towers in connection with fire prevention. Owing to its great range of visibility a wisp of smoke is easily detected at a great distance and it is possible to be on the scene of the blaze in a few minutes with fire-fighting apparatus. Great areas of forest have been saved in the western Provinces this year, through the efficiency of this method of fire-fighting. At the close of the lecture three motion picture films were shown illustrating training camps and various phases of aviation work.

Toronto Branch

O. M. Falls, A.M.E.I.C., Secretary-Treasurer.

The weekly meetings for the past month have been well attended. Two meetings were reserved for the discussion of reports submitted by committees of *The Institute* while at the other two meetings excellent addresses were delivered upon practical subjects of absorbing interest to engineers.

Report of the Committee on Policy

The meeting of November 23rd was taken up with the discussion of the report of the Committee on Policy as formulated at their meeting in Montreal April 11th and 12th. The arrangements for the meeting were in the hands of R. O. Wynne-Roberts, M.E.I.C., who was himself a member of that committee. Mr. Wynne-Roberts before entering into a detailed analysis of the report paid tribute to J. B. Challies, M.E.I.C., and A. B. Lambe, A.M.E.I.C., of Ottawa, whose untiring efforts permitted the committee to accomplish so much in so short a time. In dealing with the objectives of *The Institute*, Mr. Wynne-Roberts favoured broadening out, that *The Institute* might assume a position as the one outstanding national organization of Canadian engineers. To this end he favoured more effective co-operation with sister engineering organizations in Canada and the United States. The creation of an eastern and western division, in his opinion, might prove advisable owing to the impossibility of western members attending meetings of Council in Montreal.

Brig.-Gen. Mitchell, M.E.I.C., who very ably assisted, in explaining the salient features of the report, confined his remarks to the recommendations relating to membership nomenclature, the number and representation of Council as compared with other similar organizations, engineering education, ethics, and the discussion of public questions. As the engineering students of to-day will be the engineer of to-morrow Gen. Mitchell stressed the importance of more scholarships which should include, besides a sound training in the sciences and the fundamentals of diversified engineering, a training in political science, economics, municipal law, general letters, and public speaking. Elaborate codes of ethics were not so desirable, in his opinion, as a more general application of the Golden Rule. Gen. Mitchell also strongly urged all engineers to interest themselves in public questions and affairs outside their own professional duties.

The relationship of the students to the E.I.C. was very ably presented by A. M. Reid, S.E.I.C., who favoured closer co-operation between the university students and *The Institute*. He submitted a proposed general policy and organization, which, if followed, might secure the desired result. The capable manner in which Mr. Reid presented his views on this matter was very favourably commented upon by several subsequent speakers.

In opening the general discussion on the report, G. W. Winckler, M.E.I.C., quoted a series of Scriptural proverbs on which might be based a code of ethics for engineers. Others taking part in the discussion were G. T. Clark, A.M.E.I.C., G. A. McCarthy, M.E.I.C., J. M. Oxley, M.E.I.C., F. G. Engholme, A.M.E.I.C., H. E. T. Haultain, M.E.I.C., and H. A. Goldman, A.M.E.I.C.

The Local Improvement Act

The Toronto Branch on November 30th, listened to one of the most practical and instructive addresses, especially to municipal engineers, that has been presented to the local Branch, when R. C. Harris, commissioner of works for the city of Toronto, discussed in detail the provisions of the Local Improvement Act. Mr. Harris' many years in municipal affairs has provided him a vast and diversified knowledge of the intricasies of municipal procedure and in no branch of municipal endeavour is procedure so vital as under this Act.

In introducing the subject Mr. Harris outlined briefly the various methods of financing municipal works such as by direct taxation, by debenture issue, and by local improvement. He explained very thoroughly the variety of works which might be carried out under the Act, by cities, towns, villages and townships, and the

manner in which the application of the Act could be limited by by-law of the municipality concerned. The different methods of proceeding with the work under the Act, such as by petition, by initiative, by section 9, or by order of the Medical Board of Health were also explained by Mr. Harris. In conclusion the commissioner urged upon all municipal engineers the necessity of a thorough knowledge of the provisions of the Act with its amendments, as well as those of any special Acts or local by-laws which might govern the particular municipality concerned.

The discussion was opened by E. M. Proctor, A.M.E.I.C., who advocated amending the Act so as to allow, without a special Act or local by-law, of the assessing of a portion of the cost of watermains in excess of six inches in diameter, upon the municipality at large, rather than entirely upon the property abutting. Among others taking part in the discussion were: A. E. K. Bunnel, A.M.E.I.C., Prof. Gillespie, M.E.I.C., G. T. Clark, A.M.E.I.C., Wm. Gore, M.E.I.C., and W. C. Lumbers, A.M.E.I.C.

Purification of Public Water Supplies

At the meeting of December 7th, Norman J. Howard, chemist and bacteriologist at the Toronto filtration plant, delivered an illustrated address on "The Purification of Public Water Supplies". This address introduced many new and interesting problems in connection with water purification, and the many improvements and explanations suggested by the speaker would easily warrant another evening being reserved for its discussion.

Mr. Howard gave the subject an historic setting by reference to the famous Roman aqueduct constructed in about the year 50 A.D. By aid of many valuable slides, several of which were prepared from pictures taken from an aeroplane, the speaker described the sources from which many of the largest cities of the world obtain their water supplies, and the various methods of delivery and purification adopted.

Entering upon the technical portion of his address Mr. Howard explained the effect of storage and sedimentation upon coloured or turbid waters. The two main methods of filtration, namely slow sand and mechanical or rapid sand, were dwelt upon at some length. Many excellent slides were shown explaining the details of these two processes. The various methods of sterilization, such as chlorination, ozone treatment and violet ray treatment were quite thoroughly reviewed, and upon the request of the chairman, Mr. Howard related the result of some interesting researches into the cause of the chlorine taste in the Toronto water at certain times.

A brief discussion ensued in which the following members took part: G. W. Winckler, M.E.I.C., F. A. Dallyn, M.E.I.C., Wm. Gore, M.E.I.C., A. C. Oxley, A.M.E.I.C., and R. O. Wynne-Roberts, M.E.I.C.

Report of Committee on Classification and Remuneration

The evening of December 14th was reserved for a discussion of the above mentioned report and after its general provisions had been carefully explained by Mr. A. H. Harkness, M.E.I.C., Chairman of the Committee, the meeting was declared open for general discussion in which almost everyone present took part.

G. W. Winckler, M.E.I.C., compared the salary schedule with that obtaining in the British Public Works Department in India which he said was in many respects quite similar. Prof. O. W. Ellis reviewed the efforts adopted by the civil servants employed in the technical department for the Government of Great Britain to bring about an increased salary schedule.

While the report in general appealed quite favourably to all present still there was considerable disappointment voiced that no means or methods had been outlined to put the scheme into effect. In the judgment of the majority of those who voiced any opinion some form of unionism would ultimately have to be adopted to bring about the general acceptance of this or any other salary schedule. Mr. Wynne-Roberts declared his conviction that the enforcement of this schedule could best be undertaken by some special organization from within the E.I.C.

At the close of the discussion the following motion, introduced by Prof. Haultain and seconded by A. H. Harkness, M.E.I.C., was carried: that R. O. Wynne-Roberts, M.E.I.C., be appointed a committee of one with power to add to his numbers to formulate ideas as to methods to ensure the adoption of this salary schedule and to report back to the Branch.

The following meetings have been arranged for the first portion of the session starting on January 11th:

January 11th—Informal Dinner and Musical Evening at the Engineers Club. **January 18th.**—"Railway Valuation" by Arthur Crumpton, M.E.I.C., valuation engineer, Grand Trunk Railway Company, Montreal. **January 25th**—"The Giving of Expert Evidence" by His Honour Mr. Justice Riddell. **February 1st**—Moving picture film on "The Analysis of Motion by High Speed Photography," and a paper entitled "Some Recent Psychology", both by Prof. H. E. T. Haultain, M.E.I.C., of the University of Toronto. **February 8th**—"Rainfall and Its Measurement" by Sir R. Frederick Stupart, Director of the Meteorological Service, Toronto.

Publications

Handbook of Construction Cost; by Halbert Powers Gillete; published by McGraw Hill Book Company, Inc. This handbook is not intended as a revised edition of the author's "Cost Data" published some twelve years ago, but rather as a companion book; not containing any duplication of data; and in its 1720 pages will be found much valuable information in detail under each of the following chapters: — Engineering economics; prices and wages; haulings; excavation economics; concrete construction; dams, reservoirs and standpipes; water works; water treatment plants; irrigation; land drainage; sewers; sewage treatment; garbage disposal; street sprinkling; cleaning and snow removal; roads and pavements; highway bridges and culverts; railway bridges; steam railways; small tunnels; large tunnels; bank and shore protection; docks and wharves; building construction; engineering, surveying and overhead costs; miscellaneous costs.

Radio Reception; by Harry J. Marx, technical editor, "Radio Digest", and Adrian Van Muffling, consulting engineer, published by G. P. Putnam's Sons. This book contains a detailed explanation of the principles of radio telephony and a full exposition of the successfull methods of radio reception; with special reference to practical tuning and to radio and audio-frequency amplifications. The book has 272 pages with a large number of illustrations, while the appendix includes, radio formulae; calculation of tuning apparatus, and "hook-up" diagrams.

Trade Publication

Taylor Stoker Company, Limited, representing the American Engineering Company of Philadelphia, has issued a series of most interesting booklets, describing trips through various types of mills. These are in pocket-size, five by three and one-half inches, and are prepared in a very attractive manner. Those received to date are: "I see a Steel Mill"; "I see a Paper Mill"; and "I see a Textile Mill". These may be secured on application to the company at 416 Phillips Pace, Montreal.

EMPLOYMENT BUREAU
AND
MEMBERS' EXCHANGE

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Chemical Engineer

Chemical engineer capable of handling general analytical work and to study industrial problems from the chemical standpoint, with an electrical manufacturing concern. Apply stating qualifications to, Box No. 222.

Chemical Engineer

Chemical engineer with sufficient experience to take charge of an industrial manufacturing concern in Saskatchewan. Qualifications should be included with application. Apply Box No. 223.

Electrical Engineer

Electrical engineer with extensive experience in the design of high voltage steel tower transmission lines required at once. Qualifications should be included with application. Apply Box No. 224.

Architectural Draughtsman

An architectural draughtsman required immediately. Must have had considerable experience and must be capable of assuming responsibility of detail design of residences and office buildings. Box No. 225.

Civil Service Positions

Assistant Mechanical Engineer

An Assistant Mechanical Engineer, Department of Public Works, at Montreal, Que., at a salary of $2,100 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum until a maximum of $2,580 has been reached. This salary will be supplemented by whatever bonus may be provided by law.

Duties.—To assist in designing and preparing plans and estimates of mechanical equipment and heating and ventilation systems; to supervise the construction and installation and maintenance thereof; and to perform other related work as required.

Qualifications Required.—Education equivalent to high school graduation; either graduation in mechanical engineering from a school of applied science of recognized standing with three years of experience in mechanical engineering work, one year of which shall have been in a position of professional responsibility, or five years of mechanical engineering experience, one year of which shall have been in a position of professional responsibility; considerable machine, forging, and casting shop experience; tact and ability to manage men.

(For this vacancy, preference will be given to residents of the Province of Quebec.)

Assistant Chemist

An Assistant Chemist, Experimental Farms Branch, Department of Agriculture, Ottawa, Ont., at an initial salary of $2,100 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,580 has been reached. This salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction to perform difficult chemical analyses and physical examination of substances; in some cases to instruct or supervise assistants doing routine analytical work; and to perform other related work as required.

Qualifications Required.—Graduation from a university of recognized standing with specialization in chemistry and preferably post-graduate specialization in chemical research work; three years of post-graduate practical laboratory experience; thorough knowledge of inorganic and organic chemistry; supervisory ability. While a definite age limit has not been stated age may be a determining factor when making a selection.

Junior Chemist

A Junior Chemist for the Experimental Farms Branch, Department of Agriculture, Ottawa, Ont., at an initial salary of $1,680 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,040 has been reached. This salary will be supplemented by whatever bonus may be provided by law.

Duties.—Under direction to make chemical analyses and physical examination of substances, following prescribed methods of analysis; and to perform other related work as required.

Qualifications Required.—Education equivalent to graduation from a university of recognized standing with specialization in chemistry; at least one year of post-graduate practical laboratory experience. While a definite age limit has not been fixed age may be a determining factor when making a selection.

Application forms properly filled in must be filed in the office of the Civil Service Commission **not later than January 11th, 1923.** Application forms may be obtained from the offices of the Employment Service of Canada, from the Postmasters at Prince Rupert, Vancouver, Victoria, Edmonton, Calgary, Regina, Winnipeg, Quebec, Charlottetown, Halifax, Fredericton, and St. John, or from the Secretary of the Civil Service Commission.

By Order of the Commission.

Ottawa, December 18, 1922. W. FORAN, Secretary.

Members' Exchange

Back Copies of the Journal wanted

Repeated requests have been received for copies of the following numbers of *The Engineering Journal.* If any members have spare copies of these, the Secretary would be very pleased to receive same:—May, June, July, August, 1918; March 1919; October 1919; December 1919; April 1920; October 1920; December 1920; August 1921.

ELECTIONS AND TRANSFERS

At the meeting of Council held on December 19th, 1922, the following elections and transfers were effected:—

Members

GRONAU, William Frederick, C.E. (Renns. Poly. Inst.), contracting engr., Dominion Bridge Company, Limited, Montreal.

Associate Members

BARNUM, John Baylor, of 472, LaSalle Road, Verdun, Que.

BAYNE, George Manning, eng., heating division, Canadian Westinghouse Company, Limited, Hamilton, Ont.

FRASER, William Lawrence, B.Sc. (McGill Univ.), in chg. constrn., Sable River, Lockport Highway, for Engineers and Contractors, Annapolis, N.S.

SINCLAIR, George Edward Blake, B.Sc. (Univ. of Man.), geodetic engr., Geodetic Survey of Canada, Dept. of the Interior, Ottawa, Ont.

SYMES, Cyril Barron, city engr., City of Fort William, Ont.

WRIGHT, Harry, designer and checker, draughting dept., McGregor and McIntyre, Limited, Toronto, Ont.

Transferred from the class of Associate Member to that of Member

ANDERSON, Frederick William, B.Sc. (McGill Univ.), civil engineer, New Westminster, B.C.

Transferred from the class of Junior to that of Associate Member

ALLEN, Robert William, asst. city engr., City of Regina, Sask.

Transferred from the class of Student to that of Junior

EVANS, Maurice John, engaged on private enterprise, reclaiming land by drainage, Belvedere, Alta.

SHOTWELL, John Stuart Glashan, investigating into natural resources and preparation of graphical charts, Natural Resources Intelligence Branch, Dept. of the Interior, Ottawa, Ont.

OTHER SOCIETIES NEWS

Association of Professional Engineers of British Columbia

Third Annual General Meeting

The third annual general meeting of the Association of Professional Engineers of the Province of British Columbia took place in the auditorium of the Vancouver Technical School, by kind consent of the School Board Governors, on Saturday, 2nd December, at 10 o'clock in the forenoon.

Some two hundred members were present, D. O. Lewis, M.Inst.C.E., M.E.I.C., the retiring president, occupied the chair. After opening the meeting, G. A. Walkem, M.E.I.C., requested permission of the chairman to withdraw from his candidature for the presidency, on account of the pressure of his public duties. His withdrawal was reluctantly accepted.

Following the adoption of the minutes of the second annual general meeting, Mr. Lewis addressed the members on the work accomplished and the experience gained during the year 1922. He drew attention to a series of suggested amendments to the engineering profession Act, which had been collected by E. A. Wheatley, A.M.E.I.C., registrar and secretary-treasurer of the association, from every available Act of a similar character, throughout the world. Upon this question the meeting subsequently expressed the unanimous opinion that no favourable opportunity should be lost by the association, in the years to come, to obtain such amendments of the British Columbia Act.

Mr. Lewis also showed that at the present time seventeen of the states to the south of us have legislation for engineers, and that of these, eleven have made reciprocal arrangements with Canada and other parts of the world. This information was most favourably received by the members present, it being apparent to all, that most of the troubles now existing in the administration of engineering Acts, would be entirely eliminated, should this movement cover the whole English-speaking world.

The chair next referred to the question of taking legal action in the case of breaches of the present Act. For many reasons, chief amongst which being the advisability of waiting until the extent of protective legislation has spread, it was decided, that for the present, it would be sound policy to strengthen the position of the association by means of propaganda, rather than rush into the courts.

In dealing with the finances of the association, Mr. Lewis emphasized his pleasure in reporting that things were in a very flourishing condition, and that in view of the surplus which had been accumulated, the council had seen fit to recommend a reduction in the fee for the year 1923. He, however, advised consideration of the importance of keeping the annual fee at a figure sufficient to provide funds to defray all expenses for the current year, it having been the common practice of successful institutions throughout the world, to devote the first years of their lives, to the consolidation of their positions by the building up of capital funds, sufficient to give them good permanent incomes. The decision finally reached was to retain the annual fee at $15.00, but to allow a rebate of $5.00, if paid on or before January 20th, 1923.

Upon the termination of the morning session, the members retired to a luncheon at the Hotel Vancouver, where covers were spread for one hundred, and where they were addressed by Dr. J. H. McDermot of the British Columbia Medical Association, his subject being "Advice and remarks from a member of an old Association to members of a young Association at the commencement of their Association's life".

Words cannot convey the greatness of the interest aroused by Dr. McDermot's remarks. He dealt with the troubles and difficulties of the professional engineers' association, showing by parallel examples from the experiences of his own association, the methods adopted to overcome these difficulties. In terminating his exceedingly valuable and helpful address, he remarked that he hoped the time would speedily arrive, when greater co-operation would take place between all the professions.

Following a hearty vote of thanks to Dr. McDermot, Dean R. W. Brock, of the University of British Columbia, addressed the members on the importance of engineers giving more attention to the human-nature factor in their enterprises. He pointed out that engineers, by training, are prone to concentrate on the technical side of their undertakings, and overlook the fact that the workman or labourer is largely actuated by the force of human nature in his daily toil. He quoted from Mr. Hoover, secretary of commerce of the United States, to the effect that engineers find themselves in the unique position of being between capital, on the one hand, and labour on the other. He emphasized the great necessity for engineers to realize the importance of this position, and to devote more attention to the study of human nature, as a dominant factor in many of their problems.

The second session was held in the afternoon, following the taking of a group photograph on the court house steps. Interesting discussions took place, ranging over many subjects. Some mining members urged the need of a unification of ideas amongst the different branches of the engineering profession, following which, steps were taken to form committees, whose function should be to investigate and report on the problems of their respective branches, with a view to initiating a common policy in dealing with them wherever such would appear feasible.

During the afternoon session, the results of the election of officers was announced, the president for 1923 being A. E. Foreman, B.Sc., M.E.I.C., and the vice-president, C. Brakenridge, M.E.I.C., chairman of the Vancouver Branch of the E.I.C. The four new members of the council are F. Sawford, H. L. Robertson, F. W. Guernsey of Vancouver, and P. Philip, M.E.I.C., of Victoria.

Mr. Foreman, on taking the chair, addressed the members present as follows: "Fellow engineers, I sincerely appreciate the honour, more than any words of mine can express, the very great honour you have conferred upon me, the greatest honour that the members of the Associa-

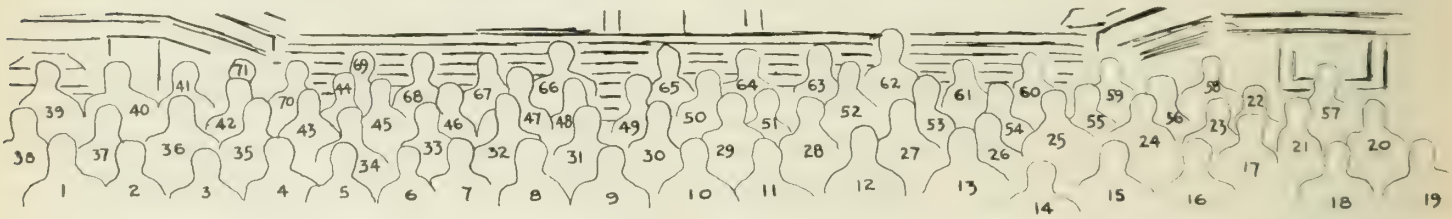
tion of Professional Engineers of British Columbia can confer on any of their number. I fully realize at the same time the responsibility of the work that goes with the position." Mr. Foreman then referred very optomistically to the tremendous boom which is taking place, especially in building operations, in the United States, and contended that such a boom in construction must spread across the 49th parallel. Mr. Foreman went on to speak of the Professional Engineers' Club which, during the course of the year, has commenced its work in Vancouver. The formation of the club was in response to a number of requests for chapters, which had been found by the council to be outside of their jurisdiction. He contended that the club fulfilled all the functions of any such chapter and moreover in a better, cheaper, and more efficient way. He showed some of the work that had been done, and referred to the very complimentary remarks passed by Mr. Fairbairn, chief engineer of the C.P.R., on the occasion of his being a guest at one of the club lunch meetings.

In the evening, the Professional Engineers' Club entertained the out-of-town members at a smoking concert, the greater part of the numbers on the programme, being provided by the members themselves. A most enjoyable evening was spent by everyone. The out-of-town members were unanimous in returning thanks, and requesting that a similar entertainment be staged, if possible, the following year, as they were sure that a greater number of members would attend.

Association of Professional Engineers of New Brunswick

The annual meeting of the Association of Professional Engineers of the Province of New Brunswick will be held in St. John on Friday, January 26th, 1923. Besides the election of officers various matters of interest will be discussed.

Association of Professional Engineers, Province of British Columbia, Vancouver, B.C.
Holds its Third Annual Meeting, December 2, 1922.



1. R. L. Hall
2. C. E. Webb
3. A. C. Garde
4. W. G. Norrie-Lowenthal
5. E. A. Wheatley
6. F. J. Crossland
7. J. Muirhead
8. John Peck
9. D. O. Lewis (Retiring Pres.)
10. A. E. Foreman (Pres. 1923)
11. E. G. Matheson (Pres. 1920)
12. G. A. Walkem
13. G. Wilkinson
14. J. Green
15. A. Guest
16. C. E. Kendall
17. F. W. McCrady
18. A. S. Wootton
19. J. W. B. Blackman
21. J. A. Stephen
22. E. D. Todd
23. G. M. Stowe
24. E. N. Horsey
25. E. E. G. H. Verner
26. D. W. Johnstone
27. J. Davidson
28. J. A. Walker
29. P. Philip
30. J. Scott
31. J. Bruce
32. P. P. Brown
33. F. P. Wilson
34. J. R. Grant
35. R. Campbell-Johnston
36. T. H. Crosby
37. W. M. McAndrew
38. H. L. Taylor
40. J. H. Kennedy
41. H. Idsardi
42. G. A. Kent
43. W. R. Bonnycastle
44. W. J. Mackenzie
45. H. H. Baxter
46. C. E. Cooper
47. R. Brock
48. C. Brakenridge
49. H. M. Lloyd
50. J. McNeill
51. J. B. Winter
52. W. H. Powell
53. I. D. Todd
54. E. C. W. Lamarque
55. C. L. Bates
56. G. Madigan
57. L. F. Merrylees
58. W. B. Greig
59. J. Bright
60. J. M. Duncan
61. J. Porter
62. W. Anderson
63. W. Footner
64. H. F. Bourne
65. E. E. Brydone-Jack
67. J. McHugh
68. F. M. Sharp
69. H. P. Archibald
70. J. N. Anderson
71. A. E. Gaul.

Canadian Geodetic Society

At their first regular meeting of the season, on the afternoon of November 23rd, the members of the Canadian Geodetic Society listened to an excellent talk on "Aero Radio Surveying" by Major D. H. Nelles, M.E.I.C. He told of the application of radio to the determination of longitude. He explained how the action of vibrations on a receiving instrument was exactly similar in principle to their action on the human ear. This led to a few remarks on the importance of tuning the instrument sharply to the incoming wave. The speaker went very thoroughly into details of construction. In this part of his lecture he showed and explained a number of diagrams. He also pointed out differences of structure in several instruments which stood on a table before him and spoke of the results obtained from each. The lecturer finally explained with the help of a diagram how radio could be used, in conjunction with aerial photography and direction — finding instruments, at either end of a measured base line, for the work of the topographical surveyor. Here he emphasized the special importance of proper ground connection in any kind of field work.

Major W. A. Steele, M.C., A.M.E.I.C., Royal Canadian Corps Signals, complimented the lecturer on the thorough manner in which he had dealt with the subject.

J. L. Rannie, M.E.I.C., the president of the society, spoke briefly on the saving of money which could be effected by applying the latest scientific inventions to technical work.

Royal Astronomical Society

Ottawa Branch

Dr. R. J. McDiarmid of the Dominion Observatory was elected president of the Ottawa branch of the Royal Astronomical Society at its annual meeting in the Victoria Museum on December 12th. Charles R. Coutlee, M.E.I.C., Department of Public Works, is the new vice-president. Dr. R. E. DeLury of the Dominion Observatory was chairman of the meeting. Senator J. G. Turiff was proposed as a new member. The reports of the secretary, A. H. Miller, M.A. and the treasurer, W. S. McClenahan, B.A., showed a year of progress and excellent work. Both these officers were re-elected. Councillors elected were W. J. Stewart, M.E.I.C., Dr. T. L. Tanton, and W. C. Way, A.M.E.I.C. It was announced that a new series of lectures would commence early in the new year.

Alberta Land Surveyors' Association

The Alberta Land Surveyors' Association have just issued their annual report in which is incorporated the honour roll of the association. This volume reflects great credit on those in whose hands its preparation was intrusted.

The honour roll of the members of the association who served in the great war is accompanied by a photograph and biographical sketch of each of these members who lost his life as a result of service overseas.

CORRESPONDENCE

The Federated American Engineering Societies

719, 15th Street, N.W.,
Washington, D.C.
November 15th, 1922.

My dear Mr. Keith:

I have very carefully studied the report of the Committee on Policy, so am conversant with the entire import of that report. I was very much pleased to see the policies set forth by the Committee on page two. I refer to items A to L inclusive. I also was gratified to observe the character of the objective set up for *The Institute*. They are not unlike those of the Federated American Engineering Societies and other engineering organizations of the United States, so that there is a fellow feeling among the Canadian engineers and those of the United States in regard to this matter.

Going directly to your question as to my candid opinion of the policy of *The Institute* as outlined, inasmuch as its affects the American societies: I have studied this phase of the report very carefully indeed. I see no objection to the policy outlined.

I notice that it is stated the duty of the Canadian engineer is first to manifest his allegiance to *The Engineering Institute of Canada*. This is proper and cannot be attacked. I believe in every instance an engineer should become associated with the engineering society of his locality and graduate from that into the national organization and from that into international relationships. In other words, our duty begins at home, and we cannot gracefully discharge other responsibilities until we have met those nearby. So I believe that your Institute is both wise and right in setting up a general policy that affiliation with foreign engineering societies should not be at the expense of the national body.

In the Federation we emphasize that all engineers should support the local society before going into a national organization. We realize that it is only through strong local societies that there can be an effective national movement. Likewise there cannot be a strong international movement until there is a strong and effective national group in each of the nations.

I was pleased to note the statement that there should be co-operation and united action along professional lines between the engineers of Canada and of the United States. This is undoubtedly true and the Federated American Engineering Societies has recognized this to be the case and has therefore been anxiously awaiting the time when there might be some affiliation between the Federated American Engineering Societies and *The Engineering Institute of Canada*. Some months ago we appointed a special committee, as you know, to prepare a plan whereby such relationships might be realized. I am glad to know that you are to have a like committee. Through the working of the two committees some tangible results should obtain in the near future.

To sum up my views regarding your policy in relation to the engineering societies of the United States I wish to state, they seem to be sound in every particular. I see no reason for modifying them.

I would like to call your attention to the first paragraph on page three wherein it is stated "Leaders of the profession in the United States have been attempting to evolve such an organization, etc." The statement I wish to make regarding the reference is this: While the Federated American Engineering Societies has not proven to be a panacea, yet it has accomplished a great deal. However, I do not know that anyone ever anticipated that it would be a panacea. Those most concerned in forming the Federation realized that many difficulties would have to be overcome and that a long period of education would be necessary before the engineers would have a full comprehension of the possibilities of the organization. The accomplishments to date have in fact been more pronounced than many hoped would be the case. In other words, the Federation has been fully proven by concrete accomplishments. As the engineers become fully acquainted with the real purpose of the Federation, have some knowledge of what it has actually done, and some insight into the potential possibilities, they become enthusiastic. This fact was demonstrated on my western trip. I believe that as soon as the engineers of the United States are more fully acquainted with the actual accomplishments, the Federation will enter a still greater period of constructive activity. I felt constrained to say this in view of the paragraph referred to.

In the last issue of our Bulletin we have an article summing up some of the activities of the Federation in recent months. I thought that this would interest you, so I am sending you a copy herewith. If after glancing over this you should desire additional copies to distribute among any of your people, I would be happy indeed to supply you with them.

I hope the foregoing remarks will prove to be of some help to you. Be assured of my keen desire that there be the closest possible co-operation between *The Engineering Institute of Canada* and the Federated American Engineering Societies. Anything that this office can do to further this end will be entered into with enthusiasm.

With kindest personal regards, I am

Sincerely yours,

(*signed*) L. W. WALLACE,
Executive Secretary.

Fundamental Results of Engineering Congress at Rio de Janeiro, September 1922.

29 West, thirty-ninth Street, N.Y.
December 9, 1922.

My dear Mr. Keith:

Enclosed is correspondence just received. This is transmitted immediately to the Engineering Societies of the United States and Canada (of which I had the honour to be one of the representatives at the International Engineering Congress in Rio de Janeiro in September 1922), notwithstanding that my formal report has not yet been prepared.

The object of sending this communication to you is to show you that fundamental results of the Congress are now in evidence.

In order that you may all observe the principle on which I worked and so that you may base upon it any action you may care to take, I give you the following:

In every country visited I urged:

1. That every professional man from the United States affiliate with the local engineering society of the country where he is residing, even if only temporarily.

2. That they form within or under the auspices of the local society groups of members of the National Engineering Societies of the United States for purposes of service to the local society.

3. That the local society link up with its government.

4. That the organization of engineers — members of U.S. societies — link up —

   a. With their country's government through the embassy and commercial attaché and with the Inter-American High Commission.

   b. With the National Engineering Societies of the United States.

The reaction that I get from the entire trip is that throughout the world there is the liveliest pride in one's profession and in his society. In fact, it is an inspiration to try to live up to the standard that members establish. As a society, we cannot go on unless it be with a devotion to the public good as our definite aim and purpose.

Yours truly,

(*signed*) CALVIN W. RICE,
Secretary.

Rio de Janeiro, 31 de Outubro de 1922.

Calvin W. Rice, Esquire, New York.

I have the honour and great satisfaction of acknowledging receipt of the letter which you were good enough to address me last month, together with a collection of the publications of the "American Engineering Standards" which have been adapted up to date in the U.S of America; for all of which please accept my grateful thanks.

The great authority of the Committee entrusted with such work, covering as it does, the domains of five Public Departments: Commerce, War, Naval, Interior and Agriculture, besides the work of other Engineering organizations, and Scientific Institutions of the great North American nation, greatly enhances the value of the collection you so kindly presented to the Engineers Club of Rio de Janeiro.

This valuable gift has already reflected its beneficial inspirations in the midst of the International Engineering Congress, and has led to the voting of conclusions to emphasize the necessity of the adoption in this country of the salutary fundamental precepts which lay at the basis of such standardizing methods. And the Engineers Club has already evoked the co-operation of other purely commercial institutions, inasmuch as standardization is a matter of deep interest to all commercial enterprise.

We enclose copy of letter addressed by this Club to the Chamber of Commerce of Rio (Associacao Com-

mercial) which will show you the interest we are taking in this matter.

Always at your service, very faithfully yours,

(*signed*) ARTHUR GETULIO DAS NEVES.
President
CLUB DE ENGENHARIA

Rio de Janeiro, 27 de Outubro de 1922.

To The Most Illustrious and Excellent Seniors, the Director of the Commercial Association of Rio de Janeiro.

I have the honour to bring to the attention of this distinguished association that at the International Congress of Engineering particular study was given to the important subject of standardization, that is, systematization in our country of all kinds of products, packings, weights and measures. This, if in common use, being expected to bring advantages of all kinds and to save waste and other prejudicial inconvenience. Apart from its technical feature this question has a commercial aspect of even greater importance and the Engineering Club as organizer of the International Congress has come to the conclusion that your illustrious association might consider this matter with great competence and profitable results. Feeling so, it has asked our illustrious associat, Dr. J. Simao da Costa, why, by fortunate coincidence is also a member of your distinguished corporation, to have the great kindness to present to the Commercial Association the useful ideas which have been discussed in great detail at the recent International Congress of Engineering, organized by our Club. And it appeared to us that in your assembly, more much competent and adequate, this matter could be discussed with greater profit, especially in its commercial aspects. The illustrious Dr. J. Simao da Costa, apart from his previous knowledge of the subject with which he has been well familiar for a long time, has a large accumulation of material on this subject which has been furnished us by the American Committee of Engineering Standards, which represents five departments of the government, namely, Commerce, War, Marine, Interior and Agriculture, and also scientific and engineering professional societies in the U.S. The Engineering Club is strongly of the opinion that so useful and helpful ideas deserve the support and protection of your illustrious society.

I avail myself of this opportunity to present your excellencies the assurances of my highest consideration.

(*signed*) ARTHUR GETULIO DAS NEVES,
President
CLUB DE ENGENHARIA

Sao Paulo,
Dear Mr. Keith, 3rd October, 1922.

I am glad to say that I was able to attend, as a representative of *The Engineering Institute* some of the sessions of the International Engineering Congress, held in Rio at the invitation of the "Club de Engenharia" of that city.

Due to school being in session, I was able to get away only one week, but enjoyed that time very much.

At the Engineers Congress, the delegates consisted only of Brazilians and North Americans, although at the Railway Congress for South America held at the same place and at the same time, a number of engineers from the Argentine, Chili, Bolivia, Uruguay, etc., were present.

The Congress was formed into 8 sections: — 1. Transportation. 2. Metallurgy. 3. Fuels. 4. Hydraulic Power. 5. Sanitation. 6. Ports. 7. Machinery. 8. Standardizing of statistics in Ports and R.R.s.

The first section had very little to do as most of the interest in railroads had centered in the R.R. Congress.

The larger number of papers fell into the section on Hydraulic Power, and the meetings of this section were especially interesting. The papers presented are to be published in Portuguese by the Congress, and I believe that the "Ingenieria Internacional" will also publish them in Spanish.

One very interesting part of the Congress was the frequent meetings of the representatives of the various North American Engineering Societies. There were usually about twenty present, and the men from the American Societies showed every courtesy to your representative, their point of view being that the technical interests of the two countries were so closely identified that they should be considered as a unit.

A great part of the success of the Congress was due to Colonel C. H. Crawford, of the Baldwin Loco. Co., Rio, Mr. Calvin Rice who represented most of the technical societies in the United States, and Mr. V. L. Havens of the Engenieria Internacional.

I understand that after I left, there were to be some excursions and a couple of banquets, but the only official function in the first ten days was a banquet given by the "Club de Engenharia" to the R.R. Congress to which they invited some of the engineers.

Rio itself is magnificent, as always, and by about January the Exhibition will be worth seeing.

There are two very interesting jobs going on at present; the first is the levelling of a large hill on the centre of the water front and the use of the material to fill in at that part of the harbour. Most of the removal is by hydraulic means. Farther up the harbour is another project of the same kind, also hydraulic, on a larger scale, but being out of sight is hardly ever heard of.

Rio, built as it is around the bases of the high hills, has some tremendous problems of engineering and transportation, perhaps second only to New York.

During my visit I had the very great pleasure of meeting the Canadian Trade Commissioner in Rio, Major MacColl. He is doing a very important work in Brazil for Canadian trade, but is handicapped by the fact that he has not diplomatic status. It seems to me that this question is one that might be taken up with our Government by the society, to obtain for our trade commissioners the same connection with the ambassy which is enjoyed by the English commercial attachés. At present our men are at a disadvantage in comparison with both the English and American representatives.

Thanking you for the honour of representing *The Institute* at the Congress, I remain,

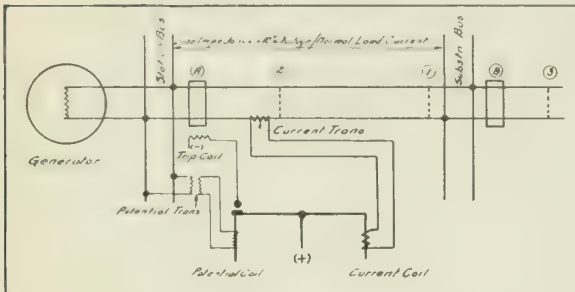
Very truly yours,

E. O. TEMPLE PIERS,
Mackenzie College, Sao Paulo.

P.S. I will be glad to be of service to members of the society in any way.

Relay Protection for Radial Transmission and Distribution Systems.

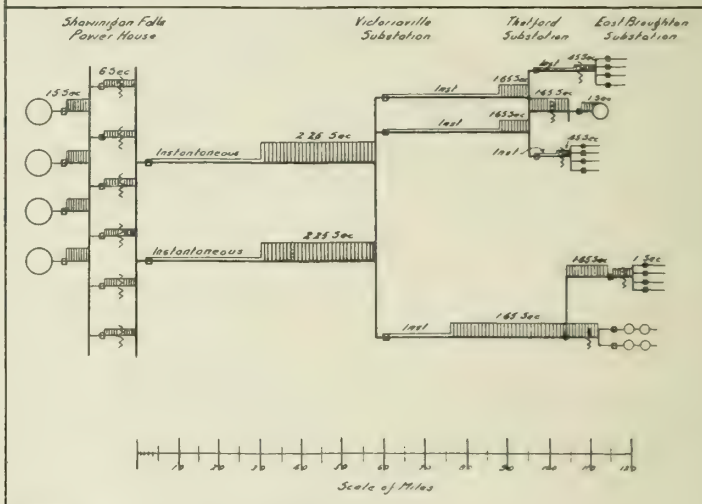
In order that the diagrams, shown as figures Nos. 7, 8 and 9, of this paper on page 574 of December 1922, Journal, may be more easily read, the author P. Ackerman, A.M.E.I.C., has submitted the improved plate shown below.



Condition	Relative Magnetic Pull on Solenoids		Action of Relay
	Potential Coil	Current Coil	
Light Load			Potential Coil overpowers Current Coil and keeps trip circuit blocked
Full Load			" "
Short at end of Line at point ①			Potential and Current Coils just keeping balance Relay adjusted for this balance
Short near Power House at point ②			Current Coil overpowers Potential Coil and trips Switch
Short beyond Line at point ③			Potential Coil overpowers Current Coil and keeps Trip Circuit blocked

Fig 7. Schematic Diagram of Current Potential Overbalance Principle for a Single Phase Circuit with Table Showing Functioning under Different Conditions

Fig 8. Typical Time Curve of Current Potential Overbalance Protection as Applied to a System of Several Stations in Series



Notes.
Horizontal Dimensions correspond to distances
Vertical Dimensions signify time required for Line Switch to clear Short Circuit at respective points

Fig. 9 Time Curve of Current Potential Overbalance Protection of 30 Cycle System.

Publications

A Text-Book of Physics; edited by A. Wilmer Duff with contributions by A. Wilmer Duff, Albert P. Carman, E. Percival Lewis, R. K. McClung, C. E. Mendenhall; published by P. Blakinton's Son and Company. The fifth edition of this text-book has recently been published and in it are incorporated such minor improvements over the former editions as have been considered desirable in the light of recent experience. The text-book contains six hundred and eighty-six pages and is well illustrated throughout, while the subject is treated under the following principle headings: —Mechanics and properties of matter, wave motion, heat, electricity and maggetism, conduction of electricity through gases and radioactivity, sound, and light.

Gravitation Versus Relativity; by Charles Lane Poor, professor of celestial mechanics in Columbia University, with a foreword by Thomas Chrowder Chamberlin, emeritus professor of geology in the University of Chicago; published by G. P. Putnam's Sons. In this book the author has made a non-technical explanaton of the fundamental principles of gravitational astronomy and a critical examination of the astronomical evidence cited as proof of the generalized theory of relativity, with a view to presenting "to the jury of the thinking world the concrete astronomical evidence cited by Einstein and the relativitists as proof of the generalized theory of relativity, and to subject that evidence to a critical examination."

Library Catalogue

Society Transactions and Publications

American Association of Architects.
JOURNAL: vol. 1, no. 1, (Jan. 1913) to vol. 5, no. 10, (Oct. 1917)

American Association of Engineers.
JOURNAL: vol. 4, no. 4 (Aug. 1921) to date.

American Concrete Institute. (National Association of Concrete Users).
JOURNAL: vol. 1, no. 3 (Jan. 1914) to vol. 3, no. 8 (Aug. 1915).
PROCEEDINGS: vol. 1 (1905) to vol. 8 (1912) and vol. 12 (1916) to vol. 16 (1920).

American Institute of Electrical Engineers.
TRANSACTIONS: vol. 6 (1890) to vol. 40 (1921).
YEAR BOOK: 1917 to 1922.
PROCEEDINGS: vol. 28, no. 1, (Jan. 1909) to vol. 38, no. 12 (1919).
JOURNAL: vol. 39, no. 1 (Jan. 1920), to date.

American Institute of Mining Engineers.
TRANSACTIONS: vol. 15 (1886) to vol. 49 (1914).
INDEX TO TRANSACTIONS: vol. 1 to vol. 15; vol. 21 to vol. 25.
BULLETIN: Jan. 1910 to Oct. 1914.

American Institute of Mining and Metallurgical Engineers.
JOURNAL "MINING AND METALLURGY": no. 170 (Feb. 1920) to date.

American Public Health Association.
JOURNAL: vol. 11, no. 3 (Mar. 1921) to date.

American Public Works Association.
REPORT OF SECOND CONVENTION: 1906.

American Railway Engineering Association.
BULLETIN: no. 107 (Jan. 1909) to date.
PROCEEDINGS: vol. 1, (1900) to vol. 22 (1921).
MANUALS: 1905, 1907, 1911 and 1915.
INDEX TO PROCEEDINGS: 1900 to 1915.

American Society of Civil Engineers.
PROCEEDINGS: vol. 35, no. 1 (Jan. 1909) to date.
TRANSACTIONS: vol. 1 (1867) to vol. 85 (1922).
INDEX TO TRANSACTIONS: vol. 1 to vol. 74 (1867-1911) and vol. 1 to 83 (1867-1920).
YEAR BOOK: 1918 to 1922.

American Society of Mechanical Engineers.
TRANSACTIONS: vol. 1 (1880) to vol. 41 (1919).
YEAR BOOK: 1912 to 1917, 1921 and 1922.
JOURNAL "MECHANICAL ENGINEERING": vol. 32 no. 1 (Jan. 1910) to date

American Water Works Association.
PROCEEDINGS OF ANNUAL CONVENTIONS 1903 to 1913.
PROCEEDINGS AND JOURNAL: vol. 1 (1914) to vol. 5 (1918).

Association des Anciens Elèves, Ecole Polytechnique.
REVUE TRIMESTRIELLE CANADIENNE: vol. 1 (1915) to date.

Association of Civil Engineers of Cornell University.
"THE CORNELL CIVIL ENGINEER": vol. 24, no. 4 (Jan. 1916) to vol. 29, no. 9 (June 1921).

Association of Engineering Societies.
JOURNAL: vol. 21, no. 5 (Nov. 1898) to vol. 22, no. 4 (Apr. 1899). vol. 44, no. 3 (Mar. 1910) to vol. 55, no. 5 (Dec. 1915).

Australian Institute of Mining Engineers.
TRANSACTIONS: vol. 10 (1905) to vol. 13 (1909)

Boston Society of Civil Engineers.
JOURNAL: vol. 1, no. 7 (Sept. 1914) to date.
YEAR BOOK: 1914, 1915, 1916, 1919, 1920.

Brooklyn Engineers' Club.
PROCEEDINGS: (1903) to (1916).

Canadian Institute of Mining and Metallurgy.
JOURNAL: vol. 1 (1898) to vol. 14 (1911).
TRANSACTIONS AND JOURNAL: vol. 15 (1912) to vol. 24 (1921).
INDEX TO TRANSACTIONS: vol. 1 to vol. 10.
INDEX AND SUMMARIES OF PAPERS: vol. 1 to vol. 10.
BULLETIN: no. 83 (Mar. 1919) to date.

Cleveland Engineering Society. (U.S.A.).
JOURNAL: vol. 5, no. 4 (Jan. 1913) to vol. 11, no. 1 (July 1918).

Cleveland Institution of Engineers. (England.).
PROCEEDINGS: 1889 to 1898.

Cleveland Institution of Engineers. (England).
PROCEEDINGS: sessions 1911-12 to 1921-1922.
LIST OF MEMBERS: 1912, 1914, 1920.

Cleveland Technical Institute. (England).
BULLETIN: vol. 1, no. 3 (Dec. 1921) to date.

Concrete Institute, (England).
TRANSACTIONS: vol. 9 (1921).

Electric Club, (Pittsburg).
JOURNAL: vol. 1 (1904) to vol. 10 (1913).

Engineering Association of New South Wales.
PROCEEDINGS: vol. 1 (1885) to vol. 32 (1917).

Engineers Club of Drayton.
PROCEEDINGS: vol. 1, no. 1 (Oct. 1914) to vol. 3, no. 7 (May 1917).

Engineers Club of Philadelphia and Affiliated Societies.
PROCEEDINGS: vol. 6, (1886) to vol. 32 (1915).
JOURNAL, "ENGINEERS AND ENGINEERING" formerly "The Journal" vol. 37, no. 1 (1920) to date.

Engineers Club of St. Louis.
JOURNAL: vol. 3, no. 2 (Mar. 1918) to vol. 6, no. 3 (Sept. 1921).
YEAR BOOK: 1917.

Engineering Institute of Canada.
TRANSACTIONS: vol. 1 (1887) to vol. 32, part 2 (1918).
INDEX TO TRANSACTIONS: vol. 1 to 24.
THE ENGINEERING JOURNAL: vol. 1, no. 1 (May 1918) to date.

Engineering Society of the University of Michigan.
"THE MICHIGAN TECHNIC": vol. 32, no. 1 (Mar. 1919) to date.

Engineering Society of Western Pennsylvania.
PROCEEDINGS: vol. 26, no. 10 (Jan. 1911) to date.

Franklin Institute.
JOURNAL: vol. 124 (1887) to date.
YEAR BOOK: 1914 to 1919.

Institution of Civil Engineers, (England).
PROCEEDINGS: vol. 41 (1874) to vol. 212 (1921).
TRANSACTIONS: vol. 1 and vol. 2 (1836) (1838).
INDEX TO PROCEEDINGS: vol. 1 (1837) to vol. 58 (1879).
SUBJECT INDEX: vol. 59 (1879) to vol. 118 (1894). vol. 119 (1894) to vol. 170 (1907).
NAME INDEX: vol. 59 (1879) to vol. 118 (1894). vol. 119 (1894) to vol. 170 (1907).
INDEX TO TRANSACTIONS OF ENGINEERING CONFERENCE OF 1907.
YEAR BOOK: 1891 to 1922.

Institution of Civil Engineers of Ireland.
TRANSACTIONS: vol. 23 (1894) to vol. 46 (1922).

Institution of Electrical Engineers, (England).
JOURNAL: vol. 17 (1888) to date.
INDEX: vol. 21 to vol. 30.
YEAR BOOK: 1911 to 1921.

Institution of Engineers and Shipbuilders in Scotland.
TRANSACTIONS: vol. 30 (1886) to vol. 64 (1921).

Institution of Mechanical Engineers, (England).
PROCEEDINGS: 1887 to 1922.
GENERAL INDEX: 1895 to 1910.
LIST OF MEMBERS: 1911 to 1916.

Institution of Mining and Metallurgy, (England).
TRANSACTIONS: vol. 1 (1892) to vol. 29 (1920).

Institution of Naval Architects, (England).
TRANSACTIONS: vol. 50 (1908) to vol. 63 (1921).

Institution of Royal Engineers.
JOURNAL: vol. 28, no 6 (Dec. 1918) to date.

Institution of Water Engineers, (England).
TRANSACTIONS: vol. 23 (1918) to vol. 25 (1920).
INDEX TO TRANSACTIONS: vol. 1 to vol. 24.

International Engineering Congress, San Francisco, California, 1915.
TRANSACTIONS: complete set with index.

Junior Institution of Engineers.
JOURNAL AND TRANSACTIONS: vol. 31, part 12 (Sept. 1921) to date.
PROCEEDINGS: vol. 1 (1884) to vol. 24 (1914).

Liverpool Engineering Society, (England).
TRANSACTIONS: vol. 9 (1888) to vol. 42 (1921).

Manchester Association of Engineers, (England).
TRANSACTIONS: (1890) to (1901) and (1908-09.)

Massachusetts Institute of Technology.
PROCEEDINGS: 1879 to 1885.
QUARTERLY: vol. 2 (1888) to vol. 9 (1896).

Master Car Builders' Association.
PROCEEDINGS: vol. 29 (1895) to vol. 31 (1897) and vol. 39 (1905), vol. 41, (1907), vol. 42 (1908).
INDEX TO PROCEEDINGS: vol. 1 to vol. 34.

Mining Institute of Scotland.
TRANSACTIONS: vol. 9 (1887) to vol. 20 (1899); vol. 35, part 5 (June 1913) to date.

National Association of Railway Commissioners, (U.S.A.).
PROCEEDINGS: annual conventions, 17th (1905), 19th (1907), 20th (1908), 27th (1915), 30th (1918), and 31st (1919).

National Fire Protection Association.
PROCEEDINGS: 1920 to 1922.
"THE QUARTERLY". vol. 14, no. 3 (1921) to date.
INDEX TO PUBLICATIONS: 1920.
YEAR BOOKS: 1920, 1921.

New Zealand Society of Civil Engineers.
PROCEEDINGS: vol. 6 and vol. 7 (1919-21).

North of England Institute of Mining and Mechanical Engineers.
TRANSACTIONS: vol. 68 part 5 (Apr. 1918) to vol. 71, no. 3 (Mar. 1921).
INDEX to mining, mechanical, metallurgical literature: 1901 and 1902.
YEAR BOOKS: 1919 and 1920.

North East Coast Institution of Engineers and Shipbuilders.
TRANSACTIONS: vol. 1 (1884) to date.

Northern Engineering Institute of New South Wales.
PAPERS: vol. 7 (1915-16).

Nova Scotian Institute of Science.
PROCEEDINGS AND TRANSACTIONS: vol. 5 (1879) to vol. 8 (1894). vol. 10 (1901) to vol. 15 (1919)

Nova Scotia Society of Engineers.
TRANSACTIONS: vol. 7 (1913) to vol. 9 (1914).

Ontario Land Surveyors Association.
ANNUAL REPORTS: 1898 to 1900; 1904; 1906; 1908 to 1917; 1921; 1922.

Permanent International Association of Navigation Congresses, (U.S.A.).
QUESTIONS, COMMUNICATIONS, PROCEEDINGS, BIBLIOGRAPHIC NOTES: 12th Congress, Philadelphia, 1912.
YEAR BOOK: 1911, 1913, 1914.

Permanent International Asociation of Road Congresses, (England).
REPORTS, COMMUNICATIONS, PROCEEDINGS: 3rd Congress, London, England, 1913, 1st and 2nd sections.

Royal Artillery, (England).
JOURNAL: vol. 39, no. 9 (Dec. 1912) to date.

Royal Artillery Institution.
PROCEEDINGS: vol. 15 (1888) to vol. 23 (1896).

Royal Canadian Institute, (The Canadian Institute).
TRANSACTIONS: vol. 1 (1889) to vol. 12 part 1, (1919).
PROCEEDINGS: Third series, vol. 4 (1887) to vol. 7 (1888).

Royal Colonial Institute.
JOURNAL: new series, vol. 12, no. 2 (Feb. 1921) to date.

Royal Dublin Society.
SCIENTIFIC PROCEEDINGS: (new series) vol. 14, no. 7 (Jan. 1914) to date.

Royal Philosophical Society of Glasgow.
PROCEEDINGS: vol. 17 (1885) to vol. 50 (1920).

Royal Scottish Society of Arts.
TRANSACTIONS: vols. 12 and 13 (1890-94).

Royal Society of Arts, (England).
JOURNAL: vol. 68 (July 1920) to date.

Royal Society of Canada,
PROCEEDINGS AND TRANSACTIONS:
FIRST SERIES, vol. 1, (1882) to vol. 11, (1893).
SECOND SERIES, vol. 1, (1895) to vol. 12, (1906).
THIRD SERIES: vol. 1 (1907) to vol. 15, (1921).

Royal Society of Edinburgh.
PROCEEDINGS: vol. 14 (1886) to vol. 28 (1901) and vol. 34 (1913) to date.

Smithsonian Institute.
ANNUAL REPORT: 1905 to 1915.

Sociedad Cientifica, Antonio Alzate, (Mexico).
MEMOIRES: vol. 35, no. 1, (Mar. 1920) to date.

Sociedad Cubana de Ingenieros, (Cuba).
BULLETIN: vol. 12, no. 12 (Dec. 1920) to date.

Sociedad de Ingenieros del Peru.
MEMOIRES: vol. 22, no. 11 (Nov. 1920) to vol. 23 no 11 (Dec. 1921).

Société des Ingénieurs Civils de France.
MEMOIRES: 1889 to date.
ANNUAL REPORT: 1920 to 1922.
YEAR BOOK: 1920.

Société des Ingénieurs Civils de France.
PROCEEDINGS: July 1920 to date.

Société Industrielle de l'est, (France).
BULLETIN: no. 118 (Mar. 1914) to no. 155 (Feb. 1920).

Société Industrielle du nord de la France.
BULLETIN: no. 188 (Jan. 1913) to date.

Société Scientifique Industrielle de Marseille, (France).
BULLETIN: vol. 14 (1886) to vol. 26 (1898) and 1912.

Society for the Promotion of Engineering Education, Worlds Engineering Congress at Chicago, Ill., 1893.
PROCEEDINGS: section E. vol. 1.
BULLETIN: vol. 9, no. 3 (Nov. 1918) to date.
YEAR BOOK: 1922.

Society of Arts, (England).
JOURNAL: vol. 36 (1887) to vol. 44 (1896).

Society of Engineers (Society of Engineers Incorporated), (England).
TRANSACTIONS: 1886 to 1916 and 1921.

Society of Naval Architects and Marine Engineers.
TRANSACTIONS: vol. 18 (1910) to vol. 29 (1921).

South Wales Institute of Engineers.
PROCEEDINGS: vol. 27, no. 7 (Jan. 1922) to date.

United States Artillery.
JOURNAL: vol. 47, no. 2 (Mar. 1917) to vol. 52, no. 1 (Jan. 1920)

United States Naval Institute.
PROCEEDINGS: vol. 14 (1888) to vol. 21 (1895).

University of California.
CHRONICLE: vol. 15, no. 1 (Jan. 1913) to date.

University of Illinois.
BULLETIN: no. 28 (Oct. 1908) to date.
CIRCULARS: nos. 4, 6 and 8.

University of North Dakota.
JOURNAL: vol. 9, no. 2 (Jan. 1919) to date.

University of Toronto Engineering Society.
"APPLIED SCIENCE": Jan. 1910 to Mar. 1914.

Victorian Institute of Engineers, (Australia).
PROCEEDINGS: vol. 9, (1908).

Victorian Institute of Surveyors, (Australia).
TRANSACTIONS AND PROCEEDINGS: vol. 3 (1885) to vol. 5 (1909)

Western Australia Institution of Engineers.
PROCEEDINGS: vol. 7a (1917) to vol. 10 (1919).

Western Society of Engineers.
JOURNAL: vol. 1, no. 2 (1896) to date.

This Listing is to be continued.

Preliminary Notice

of Applications for Admission and for Transfer

19th December, 1922

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in January, 1923.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements ,or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ATTFIELD—ARTHUR EVANS, of 171 Belmont Ave., Ottawa, Ont. Born at Worcester, England, Dec. 27th, 1883; Educ., 4 yrs. Model High School, Cork, Ireland; 1901-11 Ordance Survey, Eng. — 1904-05, topographer, Anglo-Portugese Boundary Commn., E. Africa; 1905-08, senior topographer, Anglo-French Boundary Commn., N. Nigeria; for the past six years in chg. of topographical survey parties in the field; at present, senior topographer, Dept. of Militia and Defence, Ottawa, Ont.

References: J. B. Cochrane, J. L. Rannie, T. Shanks, H. P. Moulton, H. F. Maple.

BATES—RALPH ORVILLE, of West River, Albert Co., N.B. Born at Kingston, N.B., July 22nd, 1900. Educ., B.Sc., McGill Univ., '22; 1922 (summer) with C. McN. Stevens on constrn. of concrete culvert on branch line of C.P.R., between Norton, N.B. and Fredericton; Sept. 4th to 30th, chainman for K. S. Pickard, A.M.E.I.C., in survey of lumber lands, Albert Co., N.B. to date, dftsman. on survey of lumber lands of Hollingsworth & Whitney, Ltd., of Canada, for K. S. Pickard, Sackville, N.B.

References: C. McN. Stevens, H. M. MacKay, C. M. McKergow, K. S. Pickard, H. M. Lamb, B. A. Yandall.

BOYCE—THOMAS EDWARD, of 1214 Ossington Ave., Toronto, Ont. Born at London, England, Feb. 9th, 1892. Educ., Higher Grade School, England; 1908-11, in drawing office, detailing, etc., McGregor & McIntyre; 1911, Canada Foundry; 1912-20, complete charge of drawing office, Hepburn & Disher, Limited, designing buildings, general building work and detailing a number of bridges; 1920 to date, asst. manager and estimator, Hepburn & Disher, Limited, Toronto, Ont.

References: J. M. Oxley, A. H. Harkness, F. Byam, E. M. Proctor, F. R. Ewart.

BROWNE—JAMES EDWARD, of 100, 2nd Avenue, Ottawa, Ont. Born at Great Yarmouth, England, Nov. 28th, 1872; Educ., School of Military Engr'g., Chatham, England; 3 mos. special course in geology and astronomy, Royal School of Science, South Kensington, England; 1894-97, asst. instructor in military surveying at School of Military Engr'g., Chatham; 1898-99, asst. surveyor, Anglo-Portugese Boundary Commn., South East Africa; 1900-03, instructr. in civil and military surveying at Royal Military College, Kingston, Ont.; 1904-22, engag'd. on the military survey of Canada as topographical engr. in all branches of office preparatory work and field work — 1911-13, in chg., sub-districts; 1914, in chg. of topography; at present, topographical engr. (officer i/c of topography), Surveys Division, Militia Headquarters, Ottawa, Ont.

References: J. B. Cochrane, J. L. Rannie, W. M. Tobey, K. M. Cameron, C. L. Hervey.

CHISHOLM—GILBERT GORDON, of 289, Queen's Ave., London, Ont. Born at London, Ont., Apr. 24th, 1890; Educ., R.M.C., Kingston, 1907-10; 1907 (Apr. Aug.), rodman, T. & N.O.Rly.; 1910 (Sept.-Oct.), rodman, C.P.R., Estevan, — Forward constrn.; 1910 (Oct.-Dec.), transitman, C.P.R., out of Calgary; 1910-11, field engr., mtce. of way, coast divn., C.P.R.; 1911-12, asst.-engr., City of Vancouver; 1912-13, asst. dist. engr., Dept. of Public Works, New Westminster district, chiefly harbour work; in private practice until Sept. 1914; enlisted and overseas until 1919; 1919 (Sept.-Dec.), building supt., John Puterbough Constrn. Co., London, Ont.; 1919-21, engr. in chg. constrn., for Ernest McGeorge Co., consltg., engrs., Cleveland, Ohio; 1922 (Apr.-Sept.), Dept. of Public Works, Ontario.

References: F. W. Farncomb, H. B. R. Craig, W. J. Forbes-Mitchell, A. A. Anderson, T. H. Tracey.

EARDLEY—WILMOT, Vere Levinge, of 87 Mackay Str., Ottawa, Ont. Born at Dublin, Ireland, Oct. 29th, 1886; Educ., mining and metallurgy, Royal School of Mines, London, England, 1906-09; 1909, asst., in assaying laboratories, Liverpool, Eng.; 1910, mucker and later assayer, in Hewitt silver-zinc mine, Silverton, B.C.; 1910-12, mill supt., Elmore Vacuum process, Silverton, B.C.; 1912-14, surveyor and geologist, Le Roi 2, Rossland, B.C.; 1914, asst., geological survey, Ainsworth area, Koolenay Lake, B.C.; 1915-19, Lieut., overseas, Engineers and Tunnelling Coy. in France; 1919-21, genrl. manager, Quebec Graphite Coy., Buckingham, Que.; 1921 to date, mineral technologist, Mines Branch, Dept. of Mines, Ottawa, Ont.

References: L. H. Cole, O. S. Finnie, B. F. Haanel, E. S. Malloch, R. L. Peek, P. Sherrin, R. F. Uniacke.

GARRETT—ROY WILLIAM, of London, Ont. Born at London, Ont., March 30th, 1888. Educ., London Collegiate Inst., 3½ yrs.; 1908-11, student in office of F. W. Farncomb, C.E., O.L.S., London, Ont., dftsman., and later asst. engr., also under Mr. Farncomb, as res. engr. on water works and sewerage systems at Ridgetown, Exeter, Dresden, Tavistock etc., and principal asst. in chg. topographical work, surveying and levels for drainage work; 1911-16, Capt., Canadian Engineers, C.E.F.; 1916-19, in chg. of survey of West London (8 months); at present engr'g. asst., City Engineer's Office, London, Ont.

References: F. W. Farncomb, H. A. Brazier, H. S. Phillips, J. M. Moore, C. Talbot, E. V. Buchanan.

HEHN—JOHN AUBREY, of Sault Ste. Marie, Ont. Born at Sandwich, Ont., Oct. 21st, 1900. Educ., B.Sc., Univ. of Manitoba, '22; 1918 (May-Sept.), rodman, C.P.R., Maintenance of Way, Kenora, Ont.; 1919 (May-June), Dominion Land Survey in Manitoba; 1919, (July-Aug.), C.P.R. construction.

References: J. N. Finlayson, P. I. Baker, E. P. Fetherstonhaugh, N. M. Hall, W. James, J. Reid, G. H. Herriott.

PRICE—HAROLD NEWTON, of Moncton, N.B. Born at Moncton, N.B., Sept. 3rd, 1889. Educ., 2 yrs., Univ. of New Brunswick, 1907-08, and 1 yr. Century Elect. School, testing dept., 1909; 1906-07, mtce. and way dept., Intercolonial Rly.; 1909-10, supt., Rock Island Construction Co. (Iowa, and 6 mos. at Niagara; 1911-12, electr'l constrn., C.N.R.; 1912-13, supt. and engr., in chg. laying main gas lines from oil and gas wells to Moncton, 1913, supt., elect'l and tramways dept. M.E.P. & C., installing part of tram line at Moncton, asst. to supt., Cumberland C. R. & P. C., for few months, 1915-19, overseas, elect'l installns., St. Louis, Mo., Memphis, Tenn., Little Rock, Ark., etc., install'g substation H.T. for C.C.R. and P.C. Logan & Joggins, at present, mgr., Central Combustion Co., and contractor, Moncton, N.B.

References: M. J. Murphy, J. D. McBeath, J. Edmonton, H. Jarvis, R. H. Emmerson.

ROBERTS—ESTYN, of 717 George Str., Peterborough, Ont. Born at Pontblyddyn, N. Wales, England, Sept. 27th, 1884. Educ., [illegible], Shropshire, England, 15 years. Hydro-Electric Power Commission of Ontario, 1907-11, general tech. asst., 1912 to date, distr. hydrographer at [illegible], Hydro-Electric Power Commission of Ontario, c/o James Mackintosh, A.M.E.I.C., Peterborough, Ont.

References: H. G. Acres, T. H. Hogg, C. C. McLennan, J. Macdonald, E. A. Robertson.

SPENCE—HUGH SWEYN, of Ottawa, Ont. Born at Honiton, Devonshire, England, Nov 30th, 1885. Educ., Mining Engr., Freiberg Univ., Saxony, '08, 1910 to date, mining engr., conducting and in chg. of investigations into occurrence, mining, preparation for market, concentrating and refining, and industrial utilization of economic minerals, preparation of reports, etc., Mines Branch, Department of Mines, Ottawa, Ont.

References: J. H. Cole, C. P. Edwards, G. Mountain, P. Sherrin, B. F. Haanel, O. S. Linnie, J. White.

THOMAS—ARTHUR, of 39 Brighton Ave., Ottawa, Ont. Born at Monmouth, England, May 31st, 1877; Educ., 6 yrs. Monmouth Grammar School, 1906-07, engr., Anglo Congolese Boundary Commn., 1908-09, topographic survey work on Uganda survey, 1909-13, chg. of party of topographers in field; since 1913, topographer in survey branch, Militia and Defence Department, Ottawa, Ont.

References: J. B. Cochrane, J. L. Rannie, W. M. Tobey, T. Shanks, H. P. Moulton.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

COUSINS—EDWARD LANCELOT, of Toronto, Ont. Born at Toronto, Ont., June 11th, 1883. Educ., B.A.Sc., Univ. of Toronto, '07, and C.E., '22; 1902, chainman, rodman, G.T.R., Toronto; 1902-06, (excluding attendance at university), asst. engr., mtce., constrn. and re-constrn., G.T. and Central Vermont Rly.; 1907-10, engr., Middle and Sthrn. divns., G.T.Rly.; 1910-12, asst. city engr., in chg. Dept. of Rlys., Bridges, Docks, Toronto; 1912-16, chief engr. and 1916-22, chief engr., and mgr., Toronto Harbor Commn.; 1915, engr. in chg., assoc. with F. A. Gaby and R. C. Harris for report on Radial Railway Entrances and Rapid Transit for City of Toronto; 1913-14, consltg. engr., Federal Plan Commission of Ottawa and Hull; 1921-22, consulting engr., Toronto Transportation Commn.; at present, chief engr. and manager, Toronto Harbor Commission, Toronto, Ont.

References: J. M. R. Fairbairn, C. H. Rust, C. H. Mitchell, J. R. W. Ambrose, H. G. Acres, H. E. T. Haultain, E. G. Hewson, G. G. Powell.

ELLS—SIDNEY CLARKE, of Ottawa, Ont. Born at Amherst, N.S., Sept. 29th, 1878. Educ., B.A., 1900 and B.Sc., '08, McGill Univ.; 1900-01, chainman, rodman, picketman, G.N.Rly.; 1901-04, various underground mining, including 'shift' work and machine running; 1904-05, transitman, preliminary and location surveys, G.T.P.; 1905, transitman, Can. Geological Survey; 1906, grade revision surveys, Port Hope-Midland, G.T.R.; 1907, res. engr., G.T.R., maintenance; 1908-09, topographical-geological surveys, Geological Survey Dept.; 1910, examination of mineral claims in B.C.; 1911-12, in chg. of surveys looking to selection of harbour for T. & N. O. Rly. at James Bay and surveys and plans for proposed site at Moose factory; 1913-22, mining engr., Mines Branch, Dept. of Mines in chg. of extensive topographical surveys, demonstration paving, core drillings and laboratory research (as Fellow of Industrial Research, Mellon Institute, Pittsburg); to date, mining engr., Mines Branch, Dept. of Mines, Ottawa, Ont.

References: L. H. Cole, J. G. G. Kerry, S. B. Clement, W. W. Benny, G. H. Blanchet, K. M. Cameron.

HALL—NORMAN MACLEOD, of Winnipeg, Man. Born at Cornwall, Ont., Feb. 8th, 1886. Educ., B.Sc., (Mech.-Eng.), McGill Univ., '07; 1904-09, grad. app'tce to machinist, G.T.R. and G.T.P.Rlys., mech. dept.; 1909-11, hydro-electric plant design and constrn., Western Canada Power Co., Ltd., Vancouver, B.C.; 1911-15, Steam, Diesel- and Hydro-Elec., and water works design and installation, etc., DuCane, Dutcher & Coy., consulting engrs., Vancouver, B.C.; 1915-19, Royal Engrs., B.E.F., (2nd Lieut. to Major); 1919 to date, Asst. Prof., Mech. Engr'g., University of Manitoba, also pvte. practice, Winnipeg, Man.

References: E. V. Caton, E. P. Fetherstonhaugh, J. N. Finlayson, H. K. Dutcher, W. R. Bonnycastle, F. S. Keith.

JERMYN—PERCY VANDELEUR, of 97 Avenue Road, Toronto, Ont. Born at Toronto, Ont., April 4th, 1883. Educ., B.A.Sc., Univ. of Toronto, '05; 1905, construction dept., Sudbury Kleinberg Branch, C.P.R., Toronto, tredle bridge design; 1906, asst. engr. on constrn., Prof. Graham Bell Baddick, Cape Breton; 1907-08, structr'l. design, estimates, etc., Trussed Concrete Steel Co., of Canada, Ltd.,Toronto; 1909-10, engr. and contr., on waterworks and sewerage work, Factories Ltd., New Toronto; 1911-14, engr., production, genrl. supervisn. mill conditions, designed proposed reinforced concrete factory, (bldg. postponed on outbreak of war), R. N. Boxer Wallpaper Co., Ltd., New Toronto; 1914-15 and 1917-18, engr. on design, constrn., and inspectn., Curtis Aeroplanes and Motors of Canada, Ltd. (McCurdy), Toronto; 1916, mgr., Castle Mfg. Co., Ltd., Toronto; 1919, structr'l. engr., Harkness, Loudon, & Hertzberg, Toronto, also 1921-22; 1920-21 and at present, dept., engineering drawing Faculty of Applied Science, University of Toronto, Toronto, Ont.

References: H. H. Harkness, T. R. Loudon, C. S. L. Hertzberg, C. R. Young J. R. Cockburn.

LUMSDEN—HUGH ALLAN, of Oakville, Ont. Born at Toronto, Ont., Sept. 20th, 1886; Educ., B.Sc., McGill Univ., '12; 1904 to 1910 (incl.) summers, chainman, rodman and instr'man., on location, constrn., and mtce., C.P.R.; 1909 (Mar.-Apr.), right of way survey for Temiscouata Rly., P.Q.; 1909-10, surveying timber limits as timber cruiser for Riordon Paper Co.; 1911, (May-Oct.), instr'man., on power development work, Smith, Kerry and Chase, Peterborough, Ont.; 1912 (Apr.-Dec.), res' engr., C.P.R., Red Deer West, Alta.; 1913 (Mar.-Dec.), res. engr., South of Maple Creek, Sask.; 1914-15, asst. engr., Dept. of Highways, Prov. of Ontario; 1915, went overseas, Lieut., 19th Battn., Can. Overseas Rly. Constrn. Corps.; 1915-16, in command "C" Company, 4th Can. Rly. Troops; 1917-18, Major; on demobilization Mar. 1919, asst. distr. vocational officer with D.S.C.R. to Feb. 1920; to April, 1921, equip'mt, engr., Abitibi Paper Coy.; to date, distr. engr., municipal engr., municipal roads, Dept. of Highways, Province of Ontario.

References: W. A. James, B. Ripley, C. L. Hervey, W. A. McLean, R. C. Muir.

McGINNIS—THOMAS ALEXANDER, of 2 Alwington Ave., Kingston, Ont. Born at Belleville, Ont., Apr. 20th, 1887; Educ., B.Sc., Queen's Univ., '09; 1904-07, dly. surveys and constrn., 1907-09, res. engr., Lehigh Portland Cement Co., plant near Belleville, Ont.; 1909-11, operating supt., Canada Cement Co. plant, No. 5, near Belleville, 1911-13, constrn. engr., Canada Cement Co., on various plants, 1914-18, mng'g. director, Mississaqua Marbles Ltd., Philipsburg, Que.; 1918 to date, senior member of firm, McGinnis & O'Connor, on highway constrn. in Province of Ontario for Provincial Government, Kingston, Ont.

References: W. P. Wilgar, A. J. Macphail, L. M. Arkley, W. L. Malcolm, J. M. Campbell.

RUTLEDGE—MICHAEL JOSEPH, of Montreal, Que. Born at Brighton, Mass., Feb. 16th, 1887. Educ., B.Sc., Univ. of New Brunswick, '08; one yr., Boston-steel bridges, reinforced concrete, electricity, 1905 and 06 summers, Boston Elevated Rly.; 1907 summer, Mass. Highway Commission; 1908-09, leveller and transitman, Hudson Bay Rly., 1910-11, instr'man., C.P.R.; 1912-14, Dominion Bridge Co., 1914-15, subway design, Public Service Comm., N.Y.; 1915-17, designer, Mt. Royal Tunnel; 1918-19, second asst., Henry Holgate; 1919 to date, first asst., Henry Holgate, Consulting Engineer, Montreal, Que.

References: H. Holgate, H. H. Vaughan, F. S. Keith, F. Newell, S. J. H. Waller, J. L. Allison, W. E. Joyce.

WAY—WILLIAM C., of 57 Strathcona Avenue, Ottawa, Ont. Born at Belleville, Ont., Oct. 10th, 1881; Educ., M.Sc., Queen's Univ., '06; 1905-06, Town Engr., Lindsay, Ont.; 1907 (summer), testing steam turbines, General Electric Co., Lynn, Mass.; 1907-08, drifting and testing dept., Allis Chalmers Co., Montreal, 1909-11, lecturer, mech. engr'g., Queen's Univ., 1908-09, engr. to sales dept., investigation of problems re installn. of air compressor plants, preparation of specifications for air compressors, sock drills, etc., Canadian Ingersoll-Rand Co., Montreal, Que. 1912 to date, supervisr. of surveys laboratory, work includes solution of research problems relating to engr'g. and physical instruments, and their use, Topographical Surveys Branch, Dept. of the Interior, Ottawa, Ont.

References: L. W. Gill, W. P. Wilgar, Alex. Macphail, N. J. Ogilvie, G. B. Dodge, J. L. Rannie, H. V. Haight.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

CREASOR—JOHN ALFRED, of Lakefield, Ont. Born at Owen Sound, Ont., May 23rd, 1893. Educ., B.Sc., (C.E.), McGill Univ., '14, Staff Course, Cambridge Univ., 1917; 1910 (summer), in field office, John S. Metcalfe Co. (Port McNicol) Elevators; 1911 (summer), rodman and chainman with a little level work, Dept. of Mines survey; 1912 (summer), Machine Shop, North American Bent Chair Co., Owen Sound; 1913 (summer), foreman, Kennedy Bros., Montreal, water works and sewerage installn., Dorval, P.Q.; 1914 (from May), ch. foreman, Kennedy Bros., Montreal, water works and sewerage installn., Strathmore and Lower Lachine Rd., from Verdun to Highlands, P.Q.; 1915-18, Lieut. overseas, 1918-19, Staff Capt. 3rd Bgde. Can. Engrs.; 1919 to date, constrn. engr., Canada Cement Co., — 1919-20, inspect'g. engr. in chg. of erection of Potash Recovery Plant for Canada Cement Co., Port Colborne, erected new pumping stn. and intake for Cement Plant water supply; 1920 to date, engr. in chg. and supt. of constrn., erecting cement plant at Lakefield, Ont. Dec. 1921 (work closed at Lakefield), to Apr. 1922, various surveys of property held by C.C. Co. at Hull and Port Colborne and mapping same.

References: W. Kennedy, A. C. Tagge, C. W. U. Chivers, W. H. G. Cam, H. C. Kennedy.

DIXON—BRUCE GILBERT, of 420 Michigan Str., Victoria, B.C. Born at Hopewell Cape, N.B., Sept. 28th, 1889. Educ., Univ. of New Brunswick, '12; 1907-08, (vacations), location and constrn. parties, International Rly., New Brunswick; 1909-11 (vacations), instr'man., Saskatchewan River Survey, measuring rates of flow, storage capacity and genr'l. hydrographic survey work; 1912-13, chief of party on the Pitt and Fraser Rivers survey; 1913 (Mar.-July), transitman, revising location Pac. Gt. Eastern Rly., B.C.; 1913-15, in chg. highway location and constrn., also trails and bridges, Strathcona Park Development, Vancouver Island, B.C.; 1915-16, testing ammunition, Imperial Munitions Board; 1916-19, active service; 1919 (Sept.-Dec.), course, Univ. of B.C.; 1920-21, Taylor Engr'g. Co., 2 mos. in mine for practical experience in breaking and moving rock, and bal. of time in chg. constrn. pipe lines and storage basins for Alice Arm Hydro-Electric installn.; 1921 to date, inspector of dykes and commissioner to Matzqui Drainage for Government of British Columbia.

References: W. Cross, C. W. Williams, P. Philip, J. E. Griffith, J. O'Neill, H. F. Bennett.

FEENEY—JOHN LOUIS, of 44 Sydney Str., St. John, N.B. Born at Fredericton, N.B., May 29th, 1891. Educ., B.Sc., (C.E.), Univ. of New Brunswick, '10; 1907-08-09, (summers), asst. to City Engr., Fredericton, N.B.; 1910-12, City Engr., Fredericton, N.B.; 1912-15, (except for six mos. in west), asst. engr., Public Works of Canada on Courtenay Bay Harbour Works and St. John River; 1915-17, provincial road engr., New Brunswick; 1917-20, constrn., later estimater and finally sales engr., N.Y. Continental Jewell Filtration Co. of Nutley, N.J.; 1920-21, asst. City Engr., Beaumont, Texas; at present member of firm, Frechet & Feeney, Architects and Engineers, St. John, N.B.

References: F. A. Barbour, C. McN. Steeves, A. K. Grimmer, H. G. Hunter, W. S. Lea, H. F. Bennett, F. G. Goodspeed.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

DEMERS—PAUL EMILE, of 56 Sherbrooke Str., W., Montreal, P.Q. Born at Chicago, Ill., Jan. 16th, 1896. Educ., B.Sc., (E.E.), McGill Univ., '22; summer work at Quebec Stream Commission, Bell Telephone Company, G. T. Rly., M.L.H. & P. Coy.; 1919 (Apr.-Sept.), Marconi Coy., asst. engr., Transatlantic Stn.; 1920-21, asst.-engr., Marconi Wireless Telegraph and Telephone Company; at present, radio engr., Northern Electric Co., Montreal, Que.

References: W. C. Adams, L. Herdt, C. V. Christie, W. B. Cartmel, F. S. Keith.

HEWSON—JOHN HENRY, of Hamilton, Ont. Born at Hamilton, Ont., January 30th, 1896. Educ., 3 yrs. Hamilton Tech. School, general engr'g. course; 1912-14, chainman, transit and levelman on township engr'g., with E. G. Barrow, O.L.S.; 1914-17, Sgt. of transport, 1st Can. Divl. Hdqrs., 1917-19, Royal Air Force; 1919-20, chainman and transitman on sub. divn. and city survey work with J. W. Tyrell & Co., O.L.S.; 1922 to date, transitman and dftsman., on genrl. surveying and subdivision work with O. R. Blandy & Co., Ontario Land Surveyors, Hamilton, Ont.

References: J. W. Tyrell, J. J. MacKay, E. G. MacKay, F. O. Pringle, J. E. Jackson.

MAY—LOUIS WILLIAM, of 41, Benson Str., Niagara Falls, Ont. Born at St. Thomas, Ont., July 25th, 1899; Educ., Collegiate Institute Diploma, 5 yrs., Hydro-Electric Power Commission at Niagara Development; two years in chg. of party on preliminary railway location and constrn. railway engr'g., 18 mos. in chg. of party on plant layout, land surveys, canal constrn. and power house constrn., at present, office asst. to Divisional Engineer, Niagara Falls, Ont.

References: W. Jackson, S. W. Johnston, W. S. Orr, A. C. D. Blanchard, M. Malloch.

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A

ACCIDENT PREVENTION

INDUSTRIAL PLANTS. Accident Prevention in Industrial Plants, W. G. H. Cam. Eng. Jl. (Eng. Inst. Can.), vol. 5, no. 11, Nov. 1922, pp. 537-540. Importance of accident prevention as demonstrated by results of campaigns in cement industry.

ACCIDENTS

INDUSTRIAL. Industrial Accidents and Hygiene.. Monthly Labor Rev., vol. 15, no. 4, Oct. 1922, pp. 159-166. Causes and prevention of accidents in iron and steel industry; lighting in relation to safety; safety activities in Pennsylvania; industrial poisons and diseases in British factories.

AERONAUTICS

PUBLIC DEPARTMENTS. The Organization of Public Departments in Aeronautics (De l'organisation des pouvoirs publics en matière aéronautique). Léon Jacob. Aérophile, vol. 30, nos. 17-18, Sept. 1-15, 1922, pp. 264-267, 2 figs. Discusses departments of French government concerned with aeronautics, viz., ministries of public works, war, marine, colonies, post and telegraph, giving summary of activities of each.

RESEARCH. Some Aspects of Aeronautical Research, A. Ogilvie Aeronautical Jl., vol. 26, no. 142, Oct. 1922, pp. 381-389. Notes on history of experimental work; research in war and post-war periods. Tenth annual Wilbur Wright lecture.

AIR COMPRESSORS

BELLISS. Air Compressor Development. Beama, vol. 11, no. 5, Nov. 1922, pp. 759-761, 3 figs. The Belliss compressors, manufactured by Belliss & Morcom, Ltd.

AIRPLANE ENGINES

DIESEL CYCLE. Diesel Cycle and Airplane Engines (Le cycle Diesel et le moteur d'aviation), M. Dumanois. Technique Automobile et Aérienne, vol. 13, no. 118, 1922, pp. 90-95, 3 figs. Discusses contradictory requirements of airplane engines, properties of Diesel cycle, comparison with cycle of constant volume of combustion, adaptation to airplane engines.

FUEL CONSUMPTION. Curves for Estimating the Fuel Consumption of an Aviation Engine on the Basis of Piston Displacement and Revolutions per Minute, C. F. Taylor. Air Service Information Circular, vol. 4, no. 375, Oct. 15, 1922, 8 pp., 7 figs. Present curves drawn for purpose of determining correct full-throttle fuel consumption for normal types of water cooled aviation engines.

GEARED VS. DIRECT DRIVE. Le Rhône Geared Engine vs. Direct Drive, W. S. Diehl. Nat. Advisory Committee for Aeronautics Tech. Notes, no. 146, Oct. 1922, 12 pp. Results of comprehensive tests made at Naval Air Station, Hampton Roads, Va., show that an L-5-L with geared engines takes off in approximately 90 per cent of time required for same airplane with standard direct drive engines, climbs in 20 min. to altitude 20 per cent greater, and maximum speed is about 3.5 per cent greater.

AIRPLANE PROPELLERS

INTERNAL STRESSES. Internal Stresses in Laminated Construction, A. L. Heim, A. C. Knauss and Louis Scutter. Nat. Advisory Committee for Aeronautics. Report no. 145, 1922, 56 pp., 10 figs. Covers work conducted by Forest Products Laboratory of U.S. Forest Service. Review of procedure employed in investigation of sources and influence of internal stresses caused by atmospheric conditions upon tensile strength across grain in laminated construction with special reference to airplane propellers.

AIRPLANES

ANGULAR VELOCITY IN FLIGHT. A Study of Airplane Maneuvers with Special Reference to Angular Velocities, H. J. E. Reid. Nat. Advisory Committee for Aeronautics. Report no. 155, 1922, 9 pp., 11 figs. Investigation undertaken for purpose of increasing knowledge on behavior of airplane during various maneuvers and to obtain values of maximum angular velocities and accelerations in flight.

CORROSION OF STEEL TUBING. Interior Corrosion of Steel Struts and Its Prevention, V. M. Wade. Air Service Information Circular, vol. 4, no. 374, Sept. 1, 1922, 5 pp., 3 figs. Investigates necessity of protecting from corrosion interior of airplane parts manufactured from steel tubing, and also to develop suitable method for cleaning and coating interior of these parts.

GLIDERS. The Curtiss Sail Plane. Aerial Age, vol. 15, no. 19, Oct. 1922, p. 503, 1 fig. Dimensions: Weight empty 150 lb., loaded (1 man) 310 lb.; span 28 ft.; chord 60 in.; overall length 22 ft. 11 in.; wing area 267.5 sq. ft. Hull is made of duralumin. New sailplane of silk remained aloft for two periods of 30 sec. each on Sept. 6.

LANDING EMERGENCY. Emergency Landings from Low Altitudes — Minimum Altitude Required to Turn Back into Field in Case of Engine Failure After Take-Off, Louis P. Moriarty. Air Service Information Circular, vol. 4, no. 366, Sept. 1, 1922, 8 pp., 10 figs. Investigation to determine minimum altitude for landing required by various types of airplanes.

LANDING-FIELD BUILDINGS. Landing Field Buildings' Archibald Blank. Aerial Age, vol. 15, no. 19, Oct. 1922, pp. 494-499, 8 figs. Types, sizes and cost of buildings for civil-airplane landing fields. Deals with hangars, shops and garages, field office and stock room, gasoline and oil houses, and miscellaneous buildings.

TURBO-COMPRESSORS FOR. The Use of the Turbo-Compressor for Attaining the Greatest Speeds in Aviation, A. Rateau. Instn. Mech. Engrs. — Proc., no. 4, June 1922, pp. 795-831, 9 figs. Specific pressures and weights of air under normal atmospheric conditions. Author shows what must be done to obtain greatest possible speed from airplane. Translated from French.

WIND-TUNNEL TESTS. Report of Wind-Tunnel Test of DH-4B Model, C. L. Morse. Air Service Information Circular, vol. 4, no. 355, June 15, 1922, 8 pp., 6 figs. Object of test, with positive stagger, was to obtain correct tail setting for balance of airplane, which had been very tail heavy; object with negative stagger was to obtain proper balance of airplane for additional weight due to machine guns.

AIRSHIPS

MOORING, MAST. The U.S. Navy Airship Mooring Mast. Aviation, vol. 13, no. 20, Nov. 13, 1922, pp. 661-662, 2 figs. Details of greatly perfected appliance for mooring airships in open, at Lakehurst, N.J.; constructed without any wires.

RIGID. The Longitudinal Strength of Rigid Airships, William Hovgaard. Soc. Nav. Architects & Mar. Engrs. advance paper, no. 9, for meeting Nov. 8-9, 1922, 28 pp., 17 figs. Results of study carried out by author when retained by Navy Dept. in consulting capacity in connection with design of rigid airship ZR-1.

ALIGNMENT CHARTS

TYPES. Modern Alignment Charts (A proposito di una forma moderna di abachi), Augusto de Marchi. Industria, vol. 36, no. 12, June 30, 1922, pp. 224-225, 12 figs. Discusses construction and application of various types, gives examples including logarithmic, projective, circular, parabolic charts and describes cubic alignment chart.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

NON-FERROUS, UNDER SUPERHEAT. The Use of Non-Ferrous Alloys Under Superheat, H. C. Dews. Engineering, vol. 114, no. 2965, Nov. 3, 1922, pp. 561-562, 7 figs. Consideration of properties of alloys commonly used in boiler fittings, valves, turbine blades, condenser tubes, connectors and superheater parts, etc., indicating probable direction of future activities.

QUARTZITE. Quartzite and Its Application to Electric Industries (Le Quartzite et ses applications aux industries électriques). Bul. Technique de la Suisse Romande, vol. 48, no. 21, Oct. 14, 1922, pp. 248-251, 10 figs. [illegible] by catgut heating to temperature up to 1700 deg. cent. made by Dixon & Matter, at Aarau, Switzerland, and is used for domestic heating purposes, foundry furnace work, etc.

WHITE METAL. Analysis of White Metal Alloys, F. W. Sherl. Metal Industry, (Lond.), vol. 21, no. 15, Oct. 13, 1922, pp. 337-339. Discussing principles of analysis by electrodeposition. Determination of copper, lead, tin, antimony and arsenic.

ZINC. *See Zinc Alloys.*

ALUMINA

CLAY, PRODUCTION FROM. Production of Alumina from Clay Tests on the Miguet Process, Clyde F. Williams and Clarence E. Simms. U.S. Bur. of Mines Reports of Investigations, no. 2393, Sept. 1922, 2 pp. Describes patented process for preparation of pure alkaline aluminates.

ALUMINUM

NICKEL PLATING OF. Treatment of Aluminum Prior to Nickel Coating (Sur le traitement de l'aluminium avant son nickelage), M. E. Tassilly. Bul. de la Société Chimique de France, vols. 31-32, no. 10, Oct. 1922, pp. 973-976. Discusses various methods for preparing aluminum and the different effects on the nickel coating.

ALUMINUM ALLOYS

ALPAX. Alpax :- A New Aluminum Alloy, M. de Fleury. Foundry Trade Jl., vol. 26, no. 321, Oct. 12, 1922, p. 302. Describes new alloy of 13 per cent silicon and 87 per cent aluminum, known in France and United States as alpax, and in Germany as silumin. Its characteristics and application. Can be used to substitute steel castings where lightness is essential.

CALITE. Future Applications of a French Metal (Applications d'avenir d'un métal Français). Industrie Electrique, vol. 31, no. 727, Oct. 10, 1922, pp. 369-373. Discusses aluminum and its alloys, aluminum bronzes, aluminum powder, calorization, and describes calite, a new aluminum alloy containing iron, nickel and some titanium.

AMMONIA COMPRESSORS

DEFECTS, DETECTION OF. Discharging Ammonia Compressor Troubles, T. M. Gunn. Power, vol. 56, no. 17, Oct. 24, 1922, pp. 649-651, 1 fig. Discussion of use of thermometers to detect compressor defects; proper suction and discharge conditions; chart showing correct discharge temperature for any suction pressure.

AMMONIA CONDENSERS

TYPES. Ruling Factors in the Selection of an Ammonia Condenser, L. C. Miller. Power, vol. 56, no. 19, Nov. 7, 1922, pp. 721-723, 5 figs. Discusses double-pipe closed-flow atmospheric, bleeder-type and multi-tube condensers.

ARCHES

DOUBLE-HINGED, CALCULATION. Calculation of Double Hinged Arch with Parabolic Centre Line (Calcul de l'arc à deux articulations à fibre moyenne parabolique), A. Rogoff. Génie Civil, vol. 81, nos. 17 and 18, Oct. 21 and 28, 1922, pp. 363-366 and 381-387, 2 figs. Endeavours to make more exact and quicker calculations.

SKEW. Method of Determining Thrust in Skew Arches. Can. Engr., vol. 43, no. 17, Oct. 24, 1922, pp. 467-469, 5 figs. Discusses theory and practice of skew arch design and gives formulas for magnitude and eccentricity of thrust.

THRUST MEASUREMENT OF SKEW. Test Arrangement for Measuring Skew Arch Thrust. Eng. News-Rec., vol. 89, no. 17, Oct. 26, 1922, p. 700, 2 figs. Methods used in experimental study of distribution of thrust at abutment of skew arches undertaken by Bur. of Pub. Roads.

ASH HANDLING

UNDERFEED STOKER PRACTICE. Systems of Ash Discharge as Applied to Underfeed Stoker Practice, David C. Spencer. Southern Engr., vol. 38, no. 3, Nov. 1922, pp. 54-57, 9 figs. Discusses station whose load changes frequently and station whose load is constant; lays particular stress on power dump for ash removal.

AUTOMOBILE ENGINES

CARBURETORS. *See Carburetors.*

DIESEL TYPE. Diesel Engines for Motor Vehicles. Automotive Manufacturer, vol. 64, no. 7, Oct. 1922, pp. 7-9, 6 figs. Diesel modified in weight and size, permitting use in motor vehicles, developed in Austria by Joseph Hindlmeier; now being manufactured in three sizes of stationary type, viz., 4½-hp. horizontal, 7-hp. vertical and 14-hp. twin vertical. Two-cycle Diesel having two pistons per cylinder, a German design, being built by Deutsche Automobile Construction Gesellschaft.

FUEL-FEED SYSTEM. New Fuel Feed System Uses Vacuum Created by Oil Pump. Automotive Industries, vol. 47, no. 16, Oct. 19, 1922, pp. 764-765, 8 figs. Acts as safety device in that car will not operate when oil supply is exhausted; vacuum increases with engine speed regardless of throttle opening; installation includes vane-type oil pump.

HEAVY OILS, USES OF. A Simple Device which Permits of Using Kerosene and Heavy Oil in Automobile Engines (Un dispositif simple qui permet, dans les moteurs d'automobiles, l'emploi du pétrole lampant et des huiles lourdes), Ed. Bruet. Outillage, vol. 6, no. 41, Oct. 14, 1922, pp. 1384-1385, 1 fig. Consists of more effective atomizing and distributing system. Results of tests made show that it is entirely satisfactory.

PISTONS, *See Pistons, Aluminum.*

AUTOMOBILE FUELS

FRANCE. Our Resources in Automobile Fuels (Nos ressources en Carburants), P. Mallet. Journal des Usines à Gaz, vol. 46, no. 20, Oct. 20, 1922, pp. 305-308. Discusses use of distillation products, alcohol synthetic fuels, low-temperature carbonization and by-products, in search for suitable fuel.

See also Gasoline.

AUTOMOBILES

CHASSIS FRICTION LOSSES. Chassis Friction Losses, E. H. Lockwood. Soc. Automotive Engrs.—Jl., vol. 11, no. 5, Nov. 1922, pp. 415-426 and (discussion) 426-429, 15 figs. Loss of power due to friction of various parts of chassis were investigated by dynamometer, for purpose of determining amount of internal friction resistance of front or rear wheels and for measurement of power that can be delivered at rear wheels with comitant rate of fuel consumption. Results of tests are shown in charts and tables.

ELECTRIC WIRING. Electric Wiring for Automobiles, William S. Haggott. Soc. Automotive Engrs. Jl., vol. 11, no. 5, Nov. 1922, pp. 430-431 and (discussion) 431-432. Discusses present practice with regard to three main divisions of electric wiring, namely, high-tension ignition, lighting and starting circuits. Suggests adoption of standard color scheme whereby character and service of each separate circuit on any car would be indicated by color of wires used.

GASOLINE-ELECTRIC. A New Petrol-Electric. Motor Transport, vol. 35, no. 921, Oct. 23, 1922, pp. 505-508, 8 figs. Detail description of new petrol-electric chassis, 3 to 4 tons, by Frost-Smith; 4-cylinder White and Poppe engine; Solex carburetor transmissions; control box.

MANUFACTURE OF PARTS. Some Unique Features of Automobile Production, William Dunk. Soc. Automotive Engrs. Jl., vol. 11, no. 5, Nov. 1922, pp. 398-401. Discusses Franklin automobile designs in regard to production of air-cooled cylinder, making of case-hardened crankshafts and machining of duralumin connecting rods, comment upon experiments made with view to producing hot-swaged rear-axle drive shafts.

SPLINE SHAFTS. Processing Spline Shafts by a New Method. James A. Ford. Soc. Automotive Engrs. Jl., vol. 11, no. 5, Nov. 1922, pp. 435-441, 4 figs. Process devised by author, evolved to eliminate difficulties incident to finishing of splines and body portions of spline shafts used in transmission gearing, by grinding after shaft has been hardened.

SPRINGS. *See Springs, Automobile.*

B

BEARING METALS

BABBITT. Selection and Use of Babbitt Metal, L. D. Allen. Machy. (N.Y.), vol. 29, no. 3, Nov. 1922, pp. 211-213, 1 fig. Explains why there are such wide variations in different brands of bearing metals; points out danger of selection by analysis alone, and gives pratical advice on melting and pouring of babbitt metal for bearing liners; outlines causes of shrinkage when cast, and emphasizes importance of pouring and casting metal at low temperature.

BEARINGS, ROLLER

INSPECTING BY MACHINE. Inspecting Bearing Rollers by Machine. Machy. (Lond.), vol. 21, no. 524, Oct. 12, 1922, pp. 40-41, 3 figs. Describes machine developed by Bock Bearing Co., Toledo, O., which automatically inspects and sorts rollers at rate of 3000 per hr., thereby lowering cost of inspection.

RAILWAY. Survey of the Questions of Railroad Bearings (Übersicht über Eisenbahnlagerfragen). Zeit. des Österr. Ingenieur u. Architekten-Vereines, vol. 75, nos. 35-36, Sept. 8, 1922, pp. 171-177, 12 figs. Discusses application of ball and roller bearings in connection with report of Swedish state railways on subject.

Roller Bearings for Heavy Rolling Stock (Wälzlager in schweren Schienenfahrzeugbau), H. Ayasse. Verkehrstechnik, vol. 39, nos. 37 and 40, Sept. 15 and Oct. 6, 1922, pp. 473-475 and 501-504, 21 figs. S.K.F. standards of ball and roller bearings for medium and heavy rolling stock and results of tests. Construction and friction conditions in pendulum and cylindrical roller bearings and their development.

BAUXITE

MINING AND USES. Bauxite: Occurrence, Mining, and Uses, Raymond B. Ladoo. Eng. and Min. Jl.-Press, vol. 114, no. 19, Nov. 4, 1922, pp. 805-809. Arkansas produces most of world's supply. Types of deposits; mining methods. Used principally for manufacture of metallic aluminum; refractories and sundry chemicals are made from bauxite.

BEAMS

REINFORCED-CONCRETE. An Exact Theory of Flexure of Homogeneous and Reinforced Concrete Beams, C. A. P. Turner. Concrete, vol. 21, no. 4, Oct. 1922, pp. 108-111, 3 figs. Discusses shear distortion and reinforced concrete beams and gives equations of deflection.

Torsional Strength of Reinforced Concrete Beams, C. R. Young, W. L. Sagar and C. A. Hughes. Can. Engr., vol. 43, no. 15, Oct. 10, 1922, pp. 425-430, 9 figs. Longitudinal steel is shown to be valueless; spiralling of 0.4 to 1.0 per cent increases torsional resistance 20 to 25 per cent. Resistance of plain rectangular specimens easily calculable; torsional modulus of elasticity of plain concrete 1,500,000 lb. per sq. in.

BELT DRIVE

D. C. MOTORS VS. Group Drive with Belting as Compared to D.C. Motors, Louis W. Arny. Belting, vol. 21, no. 4, Oct. 1922, pp. 13-16, 4 figs. First cost is drawback to motors; motors vs. belt efficiency; belt maintenance.

BLAST FURNACES

MODERN PRACTICE. The Bases of Modern Blast-Furnace Practice, A. K. Reese. Iron and Coal Trades Rev., vol. 105, no. 2845, Sept. 8, 1922, pp. 323-327, 2 figs. Deals with prime factors in blast-furnace practice; preparation of materials, furnace design, auxiliary equipment, and method of operation. (Abridgment.) Paper read before (Brit.) Iron and Steel Inst.

BOILER FEEDWATER

REGULATORS. Feed-Water Regulators for Steam Boilers, W. H. Wakeman. Southern Engr., vol. 37, no. 6, and vol. 38, nos. 2 and 3, Aug., Oct. and Nov. 1922, pp. 50-53, 61-64 and 42-44, 33 figs. Describes various types and their operation, and how valves in connecting pipes are used; control of power boiler-feed pumps.

BOILER PLANTS

DESIGN. Economics of Boiler Plant Design, P. F. Walker. Combustion, vol. 7, no. 4, Oct. 1922, pp. 198-201, 2 figs. Load and fuel characteristics; fuel cost of steam; factors in ultimate economy; investment; etc.

BOILER TUBES

SLAG FORMATION. How to Combat Formation of Slag on Boiler Tubes, Harry H. Bates. Am. Gas Jl., vol. 117, no. 17, Oct. 21, 1922, pp. 370 and 372-375, 1 fig. Conclusions arrived at after extensive tests of coals for slag-forming properties.

Studies Boiler Tube Slag Formation. Iron Trade Rev., vol. 71, no. 17, Oct. 26, 1922, pp. 1127-1128, 2 figs. Outline of extensive study of boiler operation conducted by Westinghouse Elec. & Mfg. Co., under supervision of Harry H. Bates.

BOILERS

CHEMICAL PRINCIPLES. The Chemical Principles of Boiler Efficiency. Wm. St. J. S. Findlay. Indus. Management (Lond.), vol. 8, no. 8, Nov. 2, 1922, pp. 255-256. Notes on investigation of chemical principles of combustion by means of heat-balance sheet, and suggestions for reducing loss through unburned carbonaceous matter in ashes.

CODES, A.S.M.E. Work of A.S.M.E. Boiler Code Committee. Mech. Eng., vol. 44, no. 11, Nov. 1922, p. 743-758, 7 figs. Preliminary report on rules for construction of unfired pressure vessels; rules for autogenous welding, forge welding and brazing. Revision of heating boiler section of A.S.M.E. Boiler Code, 1922: Preliminary report on rules for construction of boilers used exclusively for low-pressure steam heating, hot-water heating, and hot-water supply.

CORROSION. Electrolytic Protection for Boilers and Condensers (Elektrolytische Schutzanlagen für Kessel und Kondensatoren), H. Philippi. Archiv für Wärmewirtschaft, vol. 3, no. 8, Aug. 1922, pp. 151-153, 10 figs. Causes of corrosion and its prevention; prevention of boiler-scale formation. Describes protective installations with zinc plates and electric currents, advantages and operating results.

FEEDING TRAPS. Traps for Boiler Feeding, H. A. Jahnke. Power Plant Eng., vol. 26, no. 21, Nov. 1, 1922, pp. 1059-1062, 9 figs. Experiences in using them for boiler feeding. Difficulties encountered and how they were overcome.

HEAT LOSSES. Determination of Heat Losses in the Waste Gases of Steam Boilers (Sulla determinazione della perdita di calore nei gas d'uscita di un apparecchio di riscaldamento), Stefano Pagliani. Giornale di Chimica Industriale ed Applicata, vol. 4, no. 9, Sept. 1922, pp. 391-392. Discusses heat efficiency of boilers and heat losses and develops formulas for calculating them.

INSPECTION AND REGISTRATION. The Inspection and Registration of Steam Boilers. Power, vol. 56, no. 17, Oct. 24, 1922, pp. 651-652. Points out that general adoption of A.S.M.E. code and acceptance of certificates of members of Nat. Board of Boiler and Pressure Vessel Inspectors would eliminate present confusion and benefit manufacturers and users of boilers.

KESTNER. Utilization of Waste Heat. Iron and Coal Trades Rev., vol. 105, no. 2853, Nov. 3, 1922, p. 651, 2 figs. Describes Kestner boiler, consisting of two drums connected together by long, straight tubes, arranged along drums in repeated V formation, each V consisting of double row of tubes.

LOCOMOTIVE. *See Locomotive Boilers.*

OIL-FIRED. From Coal to Oil in Twenty-six Days, Power, vol. 56, no. 19, Nov. 7, 1922, pp. 712-713, 5 figs. New York Central Ry. changes six boilers from coal to fuel oil at its Yonkers plant.

STACK HEIGHT. Stack Height To Supply Draft Power, H. Misostow. Power, vol. 56, no. 17, Oct. 24, 1922, pp. 638-640. Points out that latest boiler developments have greatly increased resistance to draft in fuel bed and air passages; stack, in addition to conveying gases, must act as generator of power for operating boiler. Discusses connected load and mechanical efficiency.

BOILERS, WATER-TUBE

SPEARING. The Spearing Boiler, Indian & East. Engr. vol. 51, no. 2, Aug. 1922, pp. 79-82, 5 figs. Describes two types of Spearing boiler, first with longitudinal drum for smaller sizes and second with cross drum for boilers of larger capacity. Both are of sectional header class, and main distinctive features are (1) downcomer pipes, (2) reservoir mud drum, (3) enlarged nipples, and (4) straight headers.

BORING MACHINES

SURFACING AND. A Large Surfacing and Boring Machine, Machy. (Lond.), vol. 21, no. 526, Oct. 26, 1922, pp. 103-107, 5 figs. Built by H. W. Kearns & Co., Ltd., Manchester, England, for machining turbine casings and condensers. See also Engineer, vol. 134, no. 3484, Oct. 6, 1922, p. 360, 3 figs. partly on p. 361.

BRASS

INTERAL STRESSES. The Effect, Determination and Elimination of Internal Stresses in Cold Wrought Brass and Nickel Silver, G. L. Thirkell. Commonwealth Engr., vol. 9, nos. 11 and 12, June 1 and July 1, 1922, pp. 405-410 and 446-451 and vol. 10, no. 1, Aug. 1, 1922, pp. 18-22, 30 figs. Results of Investigations carried out at Brown Firth research laboratories, Sheffield, England.

BREAKWATERS

GREAT LAKES. Experience with Breakwater Design on the Great Lakes. Eng. News-Rec., vol. 89, no. 17, Oct. 26, 1922, pp. 684-688, 7 figs. Types include rock rubble-mound, mass-concrete and concrete caissons; costs and cross section; quality and requirements of marine concrete.

BRICK

SAND-LIME. Better Methods for Making Sand-Lime Brick, Charles A. Breskin Rock Products, vol. 26, no. 19, Sept. 23, 1922, pp. 24-29, 16 figs. Describes plant and equipment of Belt-Line Brick Co., including chain diggers, screens, elevators, hydrators, storage bins, etc. for production of 75,000 bricks daily.

BRIDGE ERECTION

CENTERING FOR CONCRETE ARCH. Boldly Designed Center for Heavy Concrete Arch. Eng. News-Rec., vol. 89, no. 16, Oct. 19, 1922, pp. 655-657, 3 figs. A Centering so slender that its failure was freely predicted was taken from under successfully completed arch ribs of Beechwood Avenue bridge in Pittsburgh, Pa.

BRIDGE ERECTION

STEEL ARCH. Old Suspension Bridge Used in Erecting New Arch. C. B. McCullough Eng. News-Rec., vol. 89, no. 18, Nov. 2, 1922, pp. 730-733, 5 figs. Main 350-ft. ribs of new highway bridge at Oregon City, Ore., swung into place by means of cables of bridge being replaced; other erection methods studied.

BRIDGE PIERS

CONSTRUCTION. Pier Construction, Wells St. Bridge, Chicago. Pub. Works, vol. 53, no. 8, Oct. 1922, pp. 174-176, 3 figs. Large water-tight concrete tail pits for long double-deck bascule span built in cofferdams enclosing multiple deep cylindrical foundation piers sheeted down by Chicago well process.

BRIDGES, CONCRETE

OPEN-SPANDREL. Reinforced Concrete Bridge Over the River Pambayanar at Chengannur. S. Indian Engineer, vol. 134, no. 3486, Oct. 20, 1922, pp. 410-412, 6 figs. Bridge is of open spandrel type and consists of three chief spans each of 120 ft.

BRIDGES, HIGHWAY

FIRE RISK IN TIMBER FLOORS. Fire Prevention in Timber Floors of Highway Bridges. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 796-797, 1 fig. Report of co-operative committee finds definite fire risk and suggests safeguards in construction and maintenance.

STEEL. The New Highland Creek Highway Bridge, A. B. Crealock. Contract Rec., vol. 36, no. 44, Nov. 1, 1922, pp. 1045-1048, 8 figs. Describes general plan and elevation, abutments, expansion aprons, etc., of 655-ft. steel bridge crossing deep ravine on Kingston Road, Toronto.

BRIDGES, RAILWAY

LABOUR-SAVING DEVICES. Labour-Saving Devices in Routine Bridge and Building Work. Ry. Rev., vol. 71, no. 18, Oct. 28, 1922, pp. 583-589, 9 figs. Greater economy rather than increased speed said to be problem that confronts operating officers. (Abstract.) Report of Committee to Am. Ry. Bridge and Bldg. Assn.

BRIQUETTING

FLUE DUST AND SCRAP. Briquetting Flue Dust and Scrap, A. L. Stillman. Iron Trade Rev., vol. 71, no. 19, Nov. 9, 1922, pp. 1269-1272, 5 figs. Progress during the past three years had led to installation of plant in Cleveland, Ohio, for making briquets from steel turnings and one in Buffalo, N.Y., for briquetting blast-furnace flue dust.

BUILDING CONSTRUCTION

PRESSED STEEL IN. Pressed Steel in Building Construction, A. H. Bromley, Jr. Eng. World, vol. 21, no. 4, Oct. 1922, pp. 233-236, 11 figs. Its advantages; properties of pressed steel sections showing carrying capacityes; application of roof construction.

C

CABLEWAYS

BI-CABLE SYSTEM. The Aerial Wire Ropeway at Trimdon Grange Colliery, R. S. Tate. Iron and Coal Trades Rev., vol. 105, no. 2850, Oct. 13, 1922, pp. 531-534, 8 figs.; also Colliery Guardian, vol. 124, no. 3224, Oct. 13, 1922, pp. 895-896. Describes bi-cable ropeway erected for disposal of large quantity of pit refuse. Details and advantages of system. (Abstract.) Paper read before North of England Inst. Min. and Mech. Engrs.

CALORIMETERS

INDIRECT. Indirect Calorimetry and Its Applications, H. M. Smith. Tech. Eng. News, vol. 3, no. 5, Nov. 1922, pp. 140-141 and 154, 2 figs. Discusses human metabolism, collection and analysis of respiratory gases, experiments to determine energy expanded at various speeds of walking, etc.

CANALS

LOCKS. Unusual Lift-Locks Proposed for Rhine-Danube Divide. Eng. News-Rec., vol. 89, no. 18, Nov. 2, 1922, pp. 754-756, 6 figs. German engineers plan lifts greater than 60 ft., using hydrostatic device and special conterweight designs. Based on information obtained from Dr. Karl Haller and Emil Krahnen, Germany.

PANAMA. Capacity of Panama Canal Ample for at Least 30 Years, J. K. Baxter. Eng. News-Rec., vol. 89, no. 16, Oct. 19, 1922, pp. 648-651, 7 figs. Dimensions of locks, operating efficiency, and water supply will suffice for estimated traffic; difficulties of sea-level proposal.

CARBURETORS

CONTROLS. Tests of Back-Suction and Air-Bleed Type Mixture Controls in Flight, C. F. Taylor. Air Service Information Circular, vol. 4, no. 368, Sept. 1, 1922, 12 pp., 5 figs. Tests to determine effect on engine performance of several types of back-suction and one type of air-bleed carburetor mixture controls under actual flight conditions, in order to develop more satisfactory forms of control.

CARS, FREIGHT

COMPOSITE BOX. The Design of a Modern 40-Ton Capacity Composite Box Ca Ry. Rev., vol. 71, no. 17, Oct. 21, 1922, pp. 545-554, 12 figs. Method of determining stresses and structural details illustrated in construction of new car of C.M. & St. P.

CASE HARDENING

COMPOUNDS. Carbonex Case-Hardening Compounds, Engineering, vol. 114, no. 2965, Oct. 27, 1922, p. 532. Describes compound in form of paste which does away with necessity for box, and of special furnace, for by its use, it is possible to case-harden ordinary objects in blacksmith's fire.

CAST IRON

TESTING. The Testing of Cast Iron, Francis W. Rowe. Metal Industry (Lond.), vol. 21, nos. 17 and 18, Oct. 27, and Nov. 3, 1922, pp. 395-396 and 421-424, 6 figs. Methods for estimation of total carbon, graphite carbon, combined carbon, sulphur, silicon, phosphorus, manganese and other constituents; physical testing, including compression and impact, and shearing strength.

CASTINGS

PRODUCTION METHODS. Wonderful Business Developed During Panic, T. H. Bell. Can. Foundryman, vol. 13, no. 10, Oct. 1922, pp. 15-17 and 25, 8 figs. Describes new plant of Dominion Eng. Co., subsidiary of Dominion Bridge Co. and its method of producing castings.

VERTICALLY POURED. Large Vertically-Poured Castings, S. G. Smith. Foundr. Trade Jl., vol. 26, no. 321, Oct. 12, 1922, pp. 296-297, 8 figs. Describes examples of important castings which are water-pressure tested; they are chiefly poured with small runners from top.

CEMENT

ALUMINA. Alumina Cement—Its Development, Use and Manufacture. Henry S. Spackman. Cement and Eng. News, vol. 34, no. 10, Oct. 1922, pp. 18-20. Discusses alumina cement as used in France, differing from portland cement by their chemical composition and developing in 48 hr. same strength as portland cement in 28 days, much greater resistance to sea water.

TESTS. A Study of Conditions Causing Disintegration of Cement Under the 'Accelerated' Test, A. G. Fleming. Soc. Chem. Industry Jl., vol. 41, no. 17, Sept. 15, 1922, pp. 300T-302T. Discusses 'boil' and other tests for cement and experiments carried out, improvements caused by storage in water, unsoundness of cement and its prevention.

CEMENT MANUFACTURE

DRY PROCESS. Mason City, Iowa, Plant of Lehigh Portland Cement Co. W. T. Greathouse. Cement Mill and Quarry, vol. 21, no. 8, Oct. 20, 1922, pp. 23-31, 23 figs. Describes equipment and operation of dry process plant producing 3250 bbl. a day.

CEMENTATION

TEMPERING AND. Recent Progress in Cementation and Tempering (Les progrès récents dans les operations de cimentation et de trempe). Léon Guillet. Génie Civil, vol. 81, nos. 13-14-15 and 16, Sept. 23, 30, Oct. 7 and 14, 1922, pp. 273-277, 292-296, 315-320 and 337-340, 45 figs. Sept. 23 and 30: Nature of cementation of metals: temperature and length of operations; cement used is 60 charcoal to 40 barium carbonate; protection by copper, nickel and tin; application of Schoop and electrolytic processes for protection. Oct. 7: Discusses failures including separation of case, development of cracks, how to observe them and eliminate them and discusses calorization. Oct. 14: Progress in furnaces, methods and apparatus used for tempering; reviews more general application of tempering.

CENTRAL STATIONS

ECONOMY OF SMALL POWER PLANTS VS. Facts About Coal Conservation. Egbert Douglas. Indus. Management (N.Y.), vol. 64, no. 5, Nov. 1922, pp. 286-300. Discussion of question as to whether central-station developments and superpower plans are in line with real economy.

HIGH PRESSURE AND SUPERHEAT IN. The Commercial Economy of High Pressure and High Superheat in the Central Station, Geo. A. Orrok. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 706-708, 2 figs. Notes on commercial limits of pressure and superheat in central station; variation of strength of materials with temperature. It is shown that pressures up to 1200-1500 lb. are commercial and may be obtained without serious difficulty; temperatures are commercial up to 700-750 deg., which should not be exceeded until materials for valves and superheaters are improved.

SUPERPOWER. A French Super-Station. Electrician, vol. 89, no. 2316, Oct. 6, 1922, pp. 382-388, 7 figs. Discusses electricity supply of Paris and how Gennevilliers station will solve them, including layout, civil-engineering work, boiler plants, turbines, auxiliary plant, alternators, 60,000-volt distributing vault.

CHAIN DRIVE

EFFICIENCY. Efficiency of Chain Drives, G. M. Bartlett. Machy. (N.Y.), vol. 29, no. 3, Nov. 1922, pp. 169-173, 7 figs. Original analysis of chain and sprocket action. Low numbers of teeth and incorrect center distances as causes of appreciable variations in angular velocity and reduction in efficiency.

CHARTS

CALCULATING. A New Calculating Chart, E. L. Rice, Jl. Indus. and Eng. Chem., vol. 14, no. 11, Nov. 1922, pp. 1032-1036, 2 figs. Presents new chart together with rules for its use and examples of its application in various branches of mathematics.

COAL

ASH FUSIBILITY. Fusibility of Ash from Coals of the United States, W. A. Selvig and A. C. Fieldner. U. S. Bur. of Mines, Bul. no. 209, 1922, 119 pp., 6 figs. General survey of "fusing" or softening" temperatures. Includes table giving softening temperatures of coal ash from coals of United States and table giving comparison of softening temperatures of coal ash from mine and car samples.

TECHNOLOGY. Recent Developments in Fuel Technology, E. R. Sutcliffe and Edgar C. Evans. So. Wales Inst. Engrs. Proc., vol. 38, no. 5, Sept. 26, 1922, pp. 445-481, 2 figs. Influence of structure upon properties of carbonized fuel, and application of same results obtained to metallurgical and iron and steel industries.

COAL HANDLING

CONVEYORS. Reducing the Cost of Handling Coal, J. M. Kelly. Coal Industry, vol. 5, no. 10, Oct. 1922, pp. 437-438, 2 figs. Statistics showing saving of cost of handling bulk material by use of better belt conveyor idlers.

HYDRAULIC CONVEYING. Hydraulic Conveying of Coal. Indus. Management (Lond.), vol. 8, no. 8, Nov. 2, 1922, pp. 257-258, 2 figs. Describes new pump for conveyance of gravel, coal and ashes, and all kinds of fibrous substances.

LOCOMOTIVE PLANTS. Coal and Ash-Handling Plant at Crewe. Engineering, vol. 114, no. 2965, Oct. 27, 1922, pp. 511-515, 41 figs. partly on p. 526 and supp. plate. Describes plant of Lond. and North-Western Ry., consisting of reinforced-concrete bunker raised sufficient height above rail level for coal to be fed to locomotives by gravity, and gear provided for dumping coal into bunker or hopper.

The latest Locomotive Coal and Ash Handling Plants of the London and North-Western Railway Co., George F. Zimmer. Indus. Management (Lond.), vol. 8, no. 7, Oct. 19, 1922, pp. 227-232, 5 figs. Details of coal and ash-handling devices built by Mitchell Conveyor and Transporter Co., Ltd., London.

PORTABLE BUCKET ELEVATORS. The Handling of Fuels (Die Stapelung von Brennstoffen), Hubert Hermanns. Feuerungstechnik, vol. 11, no. 1, Oct. 1, 1922, pp. 4-6, 4 figs. Describes improvements in portable bucket elevators, etc., developed by firm of Heinzelmann & Sparmberg, Hannover.

COAL BREAKERS

DESIGN. Dunmore Breaker Makes A Specialty of Grate or Broken Coal. Dever C. Ashmead. Coal Age, vol. 22, no. 20, Nov. 16, 1922, pp. 785-790, 9 figs. Details of new breaker of Pennsylvania Coal Co., Dunmore, Pa.

COAL MINES

HIGH-TEMPERATURE CONTROL. Controlling High Temperatures in Deep Coal Mines, H. Winkhaus. Iron and Coal Trades Rev., vol. 105, no. 2850, Oct. 13, 1922, p. 536, 4 figs. Deals with means of overcoming high ventilation temperatures and reducing temperatures at working faces. Refers to experiments carried out at coal mine with compressed-air method of colling ventilation air as suggested by Dietz, which consists in mixing expanded compressed air with ordinary air of ventilation.

COAL MINING

LONGWALL CONVEYORS. Long-Wall Conveyors in Anthracite Mining, M. S. Beddow. Coal Industry, vol. 5, no. 10, Oct. 1922, pp. 439-442, 1 fig. Describes system used for mining thin seams of coal; coal-cutting methods.

COAL STORAGE

SYSTEMS. Storing Bituminous Coal Safely, H. H. Stoek and J. V. Freeman. Iron Trade Rev., vol. 71, nos. 18 and 19, Nov. 2 and 9, 1922, pp. 1207-1211 and 1272 1273 and 1277, 6 figs. Enumerates points which should be considered in choice of storage system. Weathering tests on coking coals show deterioration is slight. Requirements of ideal storage plant. (Abstract.) Paper read before Am. Iron and Steel Inst.

COAL WASHING

METHODS. Modern Coal Cleaning Methods. Gas Engr., vol. 38, nos. 556 and 558, Aug. 15 and Oct. 16, 1922, pp. 207-209 and 268-270. Gives specific examples of flotation to coal and quality of coke produced from clean coal; describes Trent process of forming "amalgams" and their use in gas industry.

COKE

FOUNDRY. Coke and Its Influence in the Foundry. (Ueber Koks und seinen Einfluss in der Giesserei). Heinrich Koppers. Giesserei-Zeitung, vol. 19, no. 42, Oct. 24, 1922, pp. 613-617, 9 figs. Composition of coked fuels; combustion processes in blast furnace and foundry shaft furnace; influence of coke on cast iron; combustibility of coke an important factor; recommendations for modern shaft furnaces.

COKE OVENS

BY-PRODUCT. By-Product Coking with Particular Reference to New Combination Oven, Joseph Becker. Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 575-583, 18 figs. Comparison of American and European methods of coking, giving reasons for superiority of American practice; description of new Koppers oven. From paper read before Eastern States Blast Furnace and Coke Oven Assn.

BY-PRODUCT. Modifies By-Product Oven Design, Joseph Becker. Iron Trade Rev., vol. 71, no. 16, Oct. 19, 1922, pp. 1055-1062, 18 figs. Battery of five Koppers-type coke ovens recently installed at plant of Chicago By-Product Coke Co., is said to incorporate new principles of operation. Coke produced from wide range of coals.

The Operation of Koppers By-Product Coke Oven Plant, C. E. Wallin. Soc. Chem. Industry Jl., vol. 41, no. 17, Sept. 15, 1922, pp. 298T-300T. Describes new coke plant of Dominion Iron & Steel Co. at Sydney, Nova Scotia, and discusses by-product operation comparing results with present and previous plants.

SILICA BRICKS FOR. Silica Bricks for Coke Ovens. Gas World, vol. 77, no. 1994, Oct. 7, 1922, pp. 10-12. Discussion on relative merits of silica bricks and fireclay bricks for coke-oven installations and repairs, based on paper by A. H. Middleton, read before joint meeting of Ceramic Soc. and Coke Oven Mgrs. Assn.

COKE-OVEN GAS

BY-PRODUCTS FROM. Ford Principles and Practice at River Rouge John H. Van Deventer. Indus. Management (N.Y.), vol 64, no. 5, Nov. 1922, pp. 280-287, 13 figs. By-products from coke-oven gases.

COLD STORAGE

INSULATING SYSTEM. New System of Insulating Cold-Storage Rooms (Nouveau système d'isolement des chambres froides). Bul. Technique du Bureau Veritas, vol. 4, no. 8, Aug. 1922, pp. 185-186, 3 figs. Discusses new system by Pohlmann depending upon use of air spaces.

THERMOMETER LAG. Thermometer Lag in Cold Storage Practice, Ezer Griffiths and J. H. Awbery. Engineering, vol. 114, no. 2964, Oct. 20, 1922, p. 508, 6 figs. Investigation of errors which may arise in measuring temperature of atmosphere in ship's hold, and time lags likely to arise with rapidly changing temperatures. (Abstract.) Paper read before Faraday Soc.

WATERHOUSE PLANTS. Montreal Cold Storage Warehouse Plant. Power House, vol. 15, no. 20, Oct. 20, 1922, pp. 21-27, 15 figs. Describes new plant consisting of two buildings for refrigeration of food products pending shipment abroad; equipment of plant, power-house, etc.

COLLOIDS

PLAUSON MILL. Industrial Applications of the Colloid Mill, S. P. Schotz. Chem. Age (Lond.), vol. 7, no. 173, Oct. 7, 1922, pp. 493-495. Discusses possibilities of Plauson mill in varnish and other industries

COLUMNS

CONCRETE CAPS ON TIMBER. Concrete Post Caps Double Fire Endurance of Heavy Structural Timbers, Theodore F. Laist. Contract Rec., vol. 36, no. 43, Oct. 25, 1922, pp. 1025-1027, 2 figs. Tests made for Nat. Lumber Mfg. Assn. shows effectiveness of fireproof or insulated caps on timber columns when subjected to fire.

LATERAL STRENGTH. Lateral Strength of Columns Subject to Flexure, C. R. Young. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 788-789, 1 fig. Points out that serious errors arise from disregard of tendency to buckle in direction normal to plane of bending.

COMPASSES

GYROSCOPIC. Automatic Steering, Elmer A. Sperry. Soc. Nav. Architects and Mar. Engrs. advance paper no. 1, for meeting Nov. 8-9, 1922, 6 pp., 11 figs. Embodiment of mechanism has been developed in two types, which may be known as "separate" system and "unit" system; either system can be employed with telemotor system, but author prefers separate type where telemotor is not employed. Includes examples of records of automatic steering.

COMPRESSED AIR

APPLICATIONS. Some Modern Applications of Compressed Air, F. A. McLean. Can. Engr., vol. 43, no. 19, Nov. 7, 1922, pp. 522-524, 7 figs. Survey of air tools used in contracting and construction work; labour-saving feature; construction costs reduced; description of various classes of work where air tools are used.

CONCRETE

BLAST-FURNACE-SLAG. Adhesion of Steel and Concrete, and Preservation of Bright-Drawn Steel Embedded in Slag and Other Concretes, F. C. Lea and R. E. Stradling. Concrete and Constructional Eng., vol. 17, no. 10, Oct. 1922, pp. 635-637, 2 figs. Analysis of blast-furnace slag and table of adhesive and corrosive tests of bright-drawn steel and concrete.

CONCRETE BLOCKS

CINDER. Report Made on Official Fire Test of Straub Cinder Block, Wallace S. Harris. Concrete Products, vol. 23, no. 4, Oct. 1922, pp. 33-41, 16 figs. Report of Underwriters' Laboratories of Chicago of cinder blocks supplied by Straub submitted to fire tests giving blocks fire retardant classification of 2½ hr. See also Eng. News-Rec., vol. 89, no. 17, Oct. 26, 1922, p. 694, 1 fig.

CONTAINERS AND SEPARATOR. Making Separator and Diffuser Container Blocks, R. R. Lundahl. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 785-788, 8 figs. Manufacture for aeration units of Milwaukee sewage works carried out by force account. Cost data.

FIRE TESTS. Cinder Block Fire Tests. Concrete, vol. 21, no. 4, Oct. 1922, pp. 123-125, 6 figs. Report of Underwriters' Laboratories, Chicago of hollow cinder concrete block including absorption, compression, freezing and thawing tests, fire resisting properties, durability, strength and uniformity.

CONCRETE CONSTRUCTION, REINFORCED

FIRE RESISTANCE OF. Reinforced Concrete and Fire-Resistance, J. Singleton-Green. Concrete and Constructional Eng., vol. 17, nos. 9 and 10, Sept. and Oct., 1922, pp. 579-583 and 645-647, 1 fig. Discusses insurance and inspection. Shows that there is no absolutely fireproof building but that fire resistance is matter of degree. Gives examples of failures from fires.

CONCRETING

COLD-WEATHER. Methods of Placing Concrete in Cold Weather, A. J. Curtis. Building Age, vol. 44, no. 11, Nov. 1922, pp. 39-42, 12 figs. Notes on planning for winter concreting, protective coverings, heating mixing water and aggregates, etc. See also Contract Rec., vol. 36, no. 45, Nov. 8, 1922, pp. 1067-1068.

COST ESTIMATION. Estimating the Cost of Plain Concrete Work, Chas. F. Dingman. Concrete, vol. 21, no. 4, Oct. 1922, pp. 112-116. Estimation of materials and labour; mixing and placing; form work, sidewalks, floors, etc.

COPPER

ELECTROLYTIC EXTRACTION. The Greenawalt Electrolytic Copper-Extraction Process, William E. Greenawalt. Eng. and Min. Jl.-Press, vol. 114, no. 17, Oct. 21, 1922, pp. 712-717, 3 figs. Principal reduction of ferric salts accomplished by hot sulphur-dioxide gas in special reducers that afford ample time for reaction. Copper sulphide, obtained by hydrogen-sulphide precipitation of lean solutions, also used.

COPPER METALLURGY

MELTING AND CASTING. One Phase of the Problem of Increasing the Consumption of Copper, H. H. Stout. Min. and Metallurgy, no. 191, Nov. 1922, pp. 8-15, 33 figs. Discusses melting of copper in form of cathodes, or pure native copper, in reverberatory furnace and casting it into final marketable shapes and bars. Operation consists of charging, melting, flapping, poling and casting.

CONSTRUCTIONAL WORK

LOST TIME IN. Lost Time in Construction, C. S. Hill. Eng. News-Rec., vol. 89, nos. 14, 15, 16 and 17, Oct. 5, 12, 19 and 26, 1922, pp. 548-551, 600-602, 645-647 and 696-698. Oct. 5: Causes of lost time: winter hibernation, weather delays, poor service, plant faults and inefficiency. Oct. 12: Winter idleness: methods of doing work in cold weather; economics of year-around construction in unsolved problem. Oct. 19: Rain and mud delays: remedies; drainage, machine design, trackways, housing, waterproofing, drying methods offer possibilities. Oct. 26: Management delays: interruption of operations; poor utilization of time worked; plant and service delays; delays due to proper direction.

CONDENSERS, STEAM

EJECTORS. The Gaseous Fluid Ejector, Henry A. Hepburn. Engineer, vol. 134, nos. 3486 and 3487. Oct. 20 and 27, 1922, pp. 401-402 and 429-430, 7 figs. Writer presents various factors in new light, which shows clearly relationship between fundamentals of problem and gives opportunity of forecasting design of more efficient types of ejector apparatus.

CONNECTING RODS

EXPLOSION ENGINES. Connecting Rods of High-Speed Explosion Engines, Especially for Aviation (Étude sur les bielles de moteurs à explosions à grande vitesse et plus particulièrement de moteurs d'aviation), G. Bourcier. Arts et Métiers, vol. 75, no. 24, Sept. 1922, pp. 257-259, 4 figs. Stresses in main and secondary connecting rods.

CORE OVENS

HEAT LOSS. Study Core Oven Heat Loss, C. F. Mayer. Foundry, vol. 1, nos. 20 and 21, Oct. 15 and Nov. 1, 1922, pp. 839-843 and 885-889 18 figs. Tests made on two electrically heated and one oilfired core oven. Results analyzed to determine efficiency of ovens and relative heating costs. Paper presented at Am. Foundrymen's Assn.

CORROSION

PREVENTIVE APPARATUS. Corrosion — Apparatus to Prevent It. Power, vol. 56, no. 19, Nov. 7, 1922, pp. 728-730, 4 figs. Describes two types of deaërators, the Contraflo and the Cochrane vacuum deaërating heater.

PROTECTIVE PAINTS AND VARNISHES. Examination of Varnishes and Paints As to Their Protection Against Rusting (Untersuchungen verschiedener Firnisse und Austrichfarben unter Berucksichtigung ihrer rostschutzenden Eigenschaft), Maass and Junk. Zeit. fur angewandte Chemie, vol 35, nos. 54 and 55, July 7 and 11, 1922, pp. 353 and 360-362. Reviews substitutes worked out during war for varnishes; results of investigations covering testing of three classes of varnish and three classes of paint.

COST ACCOUNTING

DROP FORGING. Symposium on Cost Accounting. Forging and Heat Treating, vol 8, no. 10, Oct. 1922, pp. 471-473. Record of discussion at convention of Am. Drop Forging Inst. lead by members of Cost Committee.

INVENTORY TAKING. Organizing for Taking Inventory, O. C. Kiehne. Iron Trade Rev., vol. 71, no. 17, Oct. 26, 1922, pp. 1125-1127. Points out that modern methods of accounting make physical inventories unnecessary except for determining accuracy of accounting procedure procedure; best to create temporary organization of department heads; counting and checking started in advance. (Abstract.) Paper prepared for Indus. Cost Assn.

COSTS

RELATION TO SELLING PRICE. Production Costs and Selling Price During a Depression, Wallace Clark. Taylor Soc. Bul., vol. 7, no. 4, Aug. 1922, pp. 128-130, 2 figs. Points out that when there is plenty of work ahead, prices should be quoted which will produce profits, but when there is little work to be had, prices should be quoted which will reduce losses.

COUPLINGS

FLEXIBLE. Flexible Couplings. Machy. (Lond.), vol. 21, no. 524, Oct. 12, 1922, pp. 33-35, 4 figs. Where and how they should be used.

CRANES

ELECTRIC. 10-Ton Electric Overhead Travelling Crane. Engineering, vol. 114, no. 2966, Nov. 3, 1922, pp. 553-554, 3 figs. partly on p. 556. Details of cranes recently constructed for Pekin-Mukden Ry. Co. of China, each having span of 40 ft. and lifting capacity of 10 tons.

CRANKSHAFTS

GRINDING. Crankshaft Grinding. British Machine Tool Eng., vol. 2, no. 17, Sept.-Oct. 1922, pp. 535-540, 10 figs. Discusses finishing of single and multi-throw crankshafts on precision grinding machine.

CUPOLAS

DESIGN AND TYPES. Foundry Cupolas. E. A. Roper. Foundry Trade Jl., vol. 26, no. 322, Oct. 19, 1922, pp. 321-323, 2 figs. Notes on reducing cupola chimneys; drop bottoms; blast volume and pressure; tuyeres; cupola wells. Discussion of cupola types.

LINING. A New Cupola Lining. Iron Age, vol. 110, no. 20, Nov. 16, 1922, p. 1279. Describes patented adjustable liner rings in place of usual block patterns which may either solid or split, and which are moved upward in cupola as ramming up lining proceeds. Translated from article in Giesserei by Karl Crocholl, inventor of patent.

CUTTING TOOLS

DIAMOND. Diamond Tools as Cost Reducers, Machy, (Lond.), vol. 21, no. 526, Oct. 26, 1922, pp. 108-111, 7 figs. Use of diamonds for cutting various materials; preparation of diamond; economics introduced by application as manufacturing tools.

D

DAMS

SPILLWAY REPAIR. Repairing the Spillway to the Gibraltar Dam, R. A. Hill. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 798-801, 6 figs. Unexpected floods in winter tore out part of concrete spillway. Details of repair to water-supply dam for Santa Barbara, Cal.

SPILLWAYS. The Gatum Spillway, Panama Canal, R. Z. Kirkpatrick. Military Engr., vol. 14, no. 77, Sept.-Oct. 1922, pp. 295-296, 3 figs. Design of dam, spillway and sluice gates; control of water and its use in hydroelectric plant.

DIES

COMPOUND. Combination Piercing, Blanking and Forming Dies, C. J. Dorer. Am. Mach., vol. 57, no. 17, Oct. 26, 1922, pp. 649-651, 4 figs. Construction and operation of two dies which replaced four; safety features taken care of; wearing parts easily replaced and adjusted.

DIESEL ENGINES

CARE AND MAINTENANCE. The Care and Maintenance of Diesel Engines, George E. Windeler. Engineer, vol. 134, nos. 3487 and 3488, Oct. 27 and Nov. 3, 1922, pp. 447-448 and 478-479, 5 figs. Deals with important points in running of engines. (Abstract.) Paper read before Diesel Engine Users' Assn.

EXHAUST-GAS UTILIZATION. Recovery of Heat from Diesel-Engine Exhaust Gases. Mar. Engr. and Naval Architect, vol. 45, no. 541, Oct. 1922, pp. 391-392, 2 figs. Land and marine installations contrasted. System sdopted in oil-tank vessels; service conditions.

DRILLING MACHINES

GANG. Gang Drilling Machine. Machy. (Lond.), vol. 21, no. 526, Oct. 26, 1922, pp. 114-117, 8 figs. Heavy-duty manufacturing machine for repetition drilling on articles required in moderately large quantities. Developed by J. Archdale & Co., Birmingham, England.

MULTIPLE-SPINDLE. Multiple-spindle Drilling Machine. Machy. (Lond.), vol. 21, no. 527, Nov. 2, 1922, pp. 135-137, 5 figs. Describes machine representing new line of development of J. Archdale & Co., Birmingham, England, and intended for rapidly drilling number of holes simultaneously in light work.

DROP FORGING

INDUSTRY, GROWTH OF. The Drop Forging Industry, F. A. Ingalls. Forging and Heat Treating, vol. 8, no. 10, Oct. 1922, pp. 458-462 and (discussion) 462-464. Recounts growth of industry from technical and commercial viewpoints; compares departmental and commercial forge shops; urges importance of co-operation. Paper read before Am. Drop Forging Inst.

DROP HAMMERS

OPERATING COST. Power Plant Cost of Operating Hammers, R. E. Wadlow. Forging and Heat Treating, vol. 8, no. 10, Oct. 1922, pp. 474-476, 4 figs. Causes of variation in steam consumption; steam consumption per hour for various-size hammers; basis of comparison for steam costs, labour and overhead in boiler house charges. Paper read before Am. Drop Forging Inst.

DRYING PLANTS

VACUUM. New Vacuum Drying Plant. Chem. Trade Jl. and Chem. Engr., vol. 71, no. 1847, Oct. 13, 1922, pp. 451-452, 1 fig. Plant consists of [illegible] air-tight drying tank, in which paste or articles to be dried are placed, 2 barometric jet condenser where gases from articles to be dried are condensed, [illegible] Delas air exhaustor for purpose of producing and maintaining vacuum in tank and condenser. Built by Societe Condenseurs Delas.

SAMPLING, INSTRUMENT. A New Instrument for Sampling Aerial Dust, Leonard Greenburg and George W. Smith. U.S. Bur. of Mines Reports of Investigations, no. 2392, Sept. 1922, 3 pp. Describes apparatus [illegible] making use of principle of impingement [illegible] ted glass surface together with that of bubbling air through [illegible] consists of hand pump or electrically operated blower, [illegible] collecting device.

E

EDUCATION, ENGINEERING

FUTURE PROBLEM. Preparing the Engineer for the New Era, John H. Dunlap. Eng. Education, vol. 13, no. 2, Oct. 1922, pp. 48-64. Symposium on [illegible] preparation of engineer.

ELECTRIC DISTRIBUTION

Changing Two-Phase to Three-Phase. Changing Two-Phase System to Three-Phase, T. J. Pritchard. Elec. World, vol. 80, no. 20, Nov. 11, 1922, pp. 1045-1046, 2 figs. T-connected auto-transformer on buses allows easy transition as existing equipment wears out; interconnections in two-phase machines must be removed.

ELECTRIC DRIVE

Tanneries. Electric Drive in Tanneries, J. A. Horne. Gen. Elec. Rev., vol. 25, no. 10, Oct. 1922, pp. 618-624, 9 figs. Describes electric drive of two tanneries, one operated by vegetable process and other by chrome process showing ready adaptability of electric motor.

ELECTRIC FURNACES

Ajax-Wyatt. The Ajax-Wyatt Furnace in the Brass Mill Casting Shop, Russell P. Heuer. Jl. Indus. and Eng. Chem., vol. 14, no. 11, Nov. 1922, pp. 1021-1024, 3 figs. Describes construction, casting equipment and application. Describes construction, casting equipment and application. Develops method of bringing furnace into better electrical balance. Investigates operating characteristics of improved furnace and compares performance with that of coal-fired crucible furnace.

Aluminum-Melting. New English Electric Furnace, A. Glynne Lobley. Metal Industry (N.Y.), vol. 20, no. 10, Oct. 1922, pp. 386-387, 1 fig. Describes simple electric crucible furnace for melting aluminum.

Arc, Regulator for. A New Regulating-Arrangement for Electric Arc Furnaces (Eine neue Regeleinrichtung für elektrische Lichtbogenöfen), E. Fr. Russ. Giesserei-Zeitung, vol. 19, no. 39, Oct. 3, 1922, pp. 575-577, 3 figs. Details and useful possibilities of the Area electrode regulator.

Electrode Design. Changes Design of Electrodes, G. Vitali. Foundry, vol. 50, no. 19, Oct. 1, 1922, pp. 799-800, 2 figs. New furnace in steel plant of Fiat corporation in Turin, Italy has sealed electrodes to prevent oxidation through contact with air. Lower voltage employed for refining operation. Translated from Stahl u. Eisen.

Steel. The Electric Steel Furnace System "Elektrometali" (Der Elektro-Stahlofen System "Elektrometali"), Assar Grönwall and Felix Horschitz. Elektrotechnik u. Maschinenbau, vol. 40, no. 42, Oct. 15, 1922, pp. 485-487, 6 figs. Describes new steel furnace developed by Grünwall, Lindblad and Stalhane in Sweden, their electric equipment and operation.

Use, Expansion of. Use of Electric Furnace Expands, John A. Mathews. Iron Trade Rev., vol. 71, no. 18, Nov. 2, 1922, pp. 1203-1205. Half of world's furnaces in United States; Italy ranks second. Causes of expansion. (Abstract.) Paper presented before Am. Iron and Steel Inst. See also Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 542-544.

ELECTRIC LOCOMOTIVES

Design. Electric Locomotives, Vincent L. Raven. Instn. Mech. Engrs.-Proc., no. 4, June 1922, pp. 735-774 and (discussion) 774-781, 19 figs. Deals with general questions of (1) requirements which locomotive must be designed for, (2) various designs worked out to meet these requirements, and (3) advantages and disadvantages of various designs. Deals with shunting, freight and passenger locomotives.

Paris-Orleans Railway, France. Paris-Orleans Railway Begins Electrification Program, A. H. Candee and L. E. Lynde. Ry. Rev., vol. 71, no. 20, Nov. 11, 1922, pp. 662-663. Purchase 200 locomotives from French firms for initial electrification; dimensions and other particulars of electric locomotives.

ELECTRIC POWER

Service Costs. The Cost of Electric Service, W. J. Greene, C. F. Schoonmaker and C. B. Gorton. Elec. World, vol. 80, no. 17, Oct. 21, 1922, pp. 878-880, 1 fig. Method of analyzing costs of central-station service to consumer devised by Iowa Company. Plan, based on regular accounting system, reduces book accounts to unit consumer, capacity and energy costs.

ELECTRIC RAILWAYS

Systems. Report of Committee on Heavy Electric Traction, Association of Railway Electrical Engineers Thirteenth Annual Convention. Ry. Elec. Engr., vol. 13, no. 10, Oct. 1922, pp. 333 adn 339. Gives tabulation of data relating to electrified systems of North and South America.

ELECTRIC RAILWAYS, TRACK

Rebuilding. Excavating Track in Chunks with a Derrick, R. C. Ram. Elec. Ry. Jl., vol. 60, no. 19, Nov. 4, 1922, pp. 735-738, 10 figs. Describes replacing of solid concrete construction with steel ties and granite block pavement by wood-tie construction and sheet-asphalt pavement in Fulton Street, Brooklyn.

ELECTRIC TRANSMISSION LINES

Calculation. A Graphic Method for the Exact Solution of Transmission Lines, Collis H. Holladay. Am. Inst. Elec. Engrs. — Jl., vol. 41, no. 11, Nov. 1922, pp. 807-810, 3 figs. Describes quick method of constructing vector diagram of power line, from which it is possible to read directly voltage, current, power and power factor at either end of line.

The Electrical Design of A.C. High Tension Transmission Lines, H. H. Jeffcott. Royal Dublin Soc., Sci. Proc., vol. 17, nos. 1-10, Aug. 1922, pp. 71-88. Method for calculating performance of high tension transmission lines, based on direct evaluation by complex quantities, phase angles and magnitudes of various vector quantities have not to be separately considered and process is almost entirely arithmetical. Method is illustrated in its application to three-phase overhead transmission lines and may also be applied to single-phase working.

High-Tension. High-Voltage Power Transmission, F. W. Peek. Am. Soc. Civ. Engrs., Proc., vol. 48, no. 9, Nov. 1922, pp. 1766-1780, 8 figs. Sets forth limitations imposed by engineering difficulties resulting from use of high voltages. Consideration of insulation regulation, and reliability of operation.

Inductive Interference. Meaning of Inductive Co-ordination, J. C. Damon. Elec. World, vol. 80, no. 20, Nov. 11, 1922, pp. 1037-1041, 7 figs. Consideration of conditions encountered on power and telephone systems in actual operation and suggestions for practical handling of problem. Paper presented before Pa. Elec. Assn.

ELECTRIC WELDING, ARC

Automatic. Automatic Arc Welding, A. K. West. Am. Mach., vol. 57, no. 20, Nov 16, 1922, pp. 753-754, 4 figs. Applications of process at Gen. Elec. Co.'s Schenectady plant; manufacturing solenoid brake wheels; seam welding; repairing armature shafts.

Cast Iron. Arc Welding of Cast Iron, W. H. Namack. Am. Welding Soc. Jl., vol. 1, nos. 8-9, Aug.-Sept., 1922, pp. 47-71, 13 figs. Notes on carbon arc welding, metallic arc welding, use of steel studs, the Allard and Holslag methods of welding cast iron. Bibliography. Report of sub-committee of Northern N.Y. Section of Am. Welding Soc.

Developments. Electric Arc Welding (La Soudure électrique à l'arc), R. Verdier. Nature (Paris), no. 2530, Sept. 30, 1922, pp. 215-220, 12 figs. Historic developments, Zerener process, Kjellberg process, testing of welds, effect of different kinds of current used in electric welding in steel foundries.

ELECTRIC WELDING, RESISTANCE

Methods and Apparatus. Resistance Welding, A. L. De Leeuw. Am. Mach., vol. 57, no. 19, Nov. 9, 1922, pp. 721-724, 7 figs. Notes on methods of welding; current required for electric welding, principles of apparatus.

EMPLOYMENT MANAGEMENT

Employment Bureau. The Employment Bureau. Eng. Production, vol. 5, no. 108, Oct. 26, 1922, pp. 388-390, 7 figs. Consideration of its important functions.

ENAMELLING

Cast Iron. Wet Process Enamels for Cast Iron, R. R. Danielson and H. P. Reinecker. Am. Ceramic Soc. Jl., vol. 5, no. 10, Oct. 1922, pp. 647-669. Results of investigations on effect of varying composition and treatment on wet-process enamels; develops number of satisfactory enamels and gives information on technical side of this type of enameling.

ENGINEHOUSES

Erie R. R. Jersey City. Erie Builds New Engine-house at Jersey City, N.J. Ry. Age, vol. 73, no. 20, Nov. 11, 1922, pp. 877-881, 8 figs. Old structure is replaced without interference with locomotive operations. New Building is combination of radial type 105-ft. enginehouse and rectangular building.

ENGINEERS

Classification and Remuneration. Report of Committee on Classification and Remuneration of Engineers. Eng. Jl. (Eng. Inst. Can.), vol. 5, no. 11, Nov. 1922, pp. 541-544, 1 fig. Published by authority of Council for information of members of Institute with view to discussion and consideration by branches regarding its adoption by Institute.

EXCAVATORS

Land Drainage, for. Excavating Machinery Used in Land Drainage, D. L. Yarnell. U. S. Dept. of Agriculture, Professional Paper, Bul. No. 300, 1922, 59 pp., 31 figs. Development; comparison of kinds of power; determination and analysis of cost data; floating dipper dredge, drag-line scraper excavator; dry-land dipper dredge, wheel excavator, hydraulic dredge, and other machines.

EXHAUST STEAM

Commercial Value. Commercial Value of Exhaust Steam, Fred W. Bosch. Power Plant Eng., vol. 26, nos. 20 and 21, Oct. 15 and Nov. 1, 1922, pp. 997-999 and 1047-1048, 3 figs. Notes on exhaust steam required for feedwater heating; heating value of exhaust steam shown by indicator diagrams. Enlargement of article by A. Langstaff Johnston, Jr.

Utilization. Utilization of Waste Steam in the Railroad Shops at Cassel (Anlage zur Verwertung des abdampfes in der Eisenbahnhauptwerkstätte Kassel-Verschiebebahnhof), H. Bartels. Organ für die Fortschritte des Eisenbahnwesens, no. 14, July 15, 1922, pp. 205-209, 3 figs. Discusses applications of waste steam for heat, hot water, drying, preheating feedwater, etc., and describes some apparatus.

F

FACTORIES

American Branches in Canada. Branch Factories in Canada, Earle W. Gage. Indus. Management (N.Y.), vol. 64, no. 5, Nov. 1922, pp. 305-308 and 318, 4 figs. Why American industries are crossing border. States that there are 1000 American branch factories operating in Canada at present time.

Layout and Equipment. A Model Factory. Eng. Rev., vol. 36, nos. 1 and 2, July and Aug. 1922, pp. 8-10 and 45, 3 figs. Describes Greenford factory of J. Lyons & Co. especially arrangements in handling and conveying tea from the barges to the finished packages; short account of boiler house and power plant.

FEEDWATER HEATERS

Locomotive. Feed-Water Heaters for Locomotives, Edouard Sauvage. Instn. Mech. Engrs.-Proc., no. 4, June 1922, pp. 715-726 and (discussion) 727-734, 9 figs. Discusses different types Davies and Metcalfe injector, Caille-Potonié, Worthington and Knorr heaters. Advantages and suggestions for use.

Test Code, A.S.M.E. Test Code for Feedwater Heaters. Mech. Eng., vol. 44, no. 11, Nov. 1912, pp. 759-760 and 765. Preliminary draft of seventh in series of nineteen test codes being formulated by A.S.M.E. committee on power test codes.

FILTERS

Oil and Fuel. Points to Remember in Designing Oil and Fuel Filters, J. B. Ferguson. Automotive Industries, vol. 47, no. 17, Oct. 26, 1922, pp. 818-820, 4 figs. Fundamentals underlying logical design of filtering systems.

FILTER PLANTS

Hydrogen-Ion Concentration. Relation of Hydrogen-Ion Concentration to Filter-Plant Operation, William D. Hatfield. Jl. Indus. and Eng. Chem., vol. 14, no. 11, Nov. 1922, pp. 1038-1040. Account of work undertaken to find percentage value at which best results in coagulation, sedimentation, and filtration were obtained under conditions of operation of Highland Park, Mich., filtration plant.

FILTERS, SAND

Air Binding of Rapid. An Experience with Air-Binding of Rapid Filters, William D. Hatfield. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 783-784. Water supersaturated at leaking pump glands gave up 2000 ga. of air in filters at Highland Park, Mich.

FIRE PREVENTION

EQUIPMENT. The Chicago Fire of March 15, 1922, W. D. Matthews. Nat. Fire Protection Assn., vol. 16, no. 1, July 1922, pp. 19-48, 18 figs. Details of construction of Burlington and other buildings, their fire fighting equipment, sprinklers, etc., and damage done by fire.

FIRECLAY

MANUFACTURE. Fireclay Refractories, Alan G. Wikoff. Chem. and Met. Eng., vol. 27, no. 20, Nov. 15, 1922, pp. 969-971, 6 figs. Outline of manufacturing operations at Laclede-Christy Clay Products Co., St. Louis.

FLOATING DOCKS

8,000-TON. Eight Thousand-Ton Floating Dock. Shipbldg. and Shipg. Rec., vol. 20, no. 18, Nov. 2, 1922, p. 516, 3 figs. on pp. 518-519. Double-sided self-docking type dock under construction at Burgerhout's Eng. and Shipbldg Wks., Rotterdam, for "Tandjong Priok" Drydock Co., Singapore.

FLUE-GAS ANALYSIS

CO_2 CONTENT. The Carbonic-Acid Content of Flue Gas, Hourly Steam Output and Boiler Efficiency (Rauchgaskohlensäuregehalt, Stundenleistung und Wirkungsgrad), J. Hudler. Feuerungstechnik, vol. 11, no. 1, Oct. 1, 1922, pp. 1-4, 3 figs. It is shown that chimney loss is reduced throught increase of CO_2 content of flue gas with unvarying hourly output, not only beacuse of low flue-gas volume, but also because of low discharge temperature, and this is true to greater extent with water-rich than with dry fuels.

FLYWHEELS

CALCULATION. Error Due to Neglecting Electrical Forces in Calculating Flywheels for Reciprocating Machinery Driven by Synchronous Motors, A. R. Stevenson, Jr. Gen. Elec. Rev., vol. 25, no. 11, Nov. 1922, pp. 690-699, 5 figs. Discusses and illustrates correct method of flywheel calculation and verifies results by actual tests.

SAFETY REGULATIONS. Flywheel Explosions and Their Prevention. Universal Engr., vol. 36, no. 4, Oct. 1922, pp. 30-31. Computation of stresses and suggestions for flywheel regulations on lines of boiler regulations; maximum speed for solid, link-jointed, flange-jointed and other cast-iron flywheels.

FORGE SHOPS

HEAVY FORGINGS. Forge Shop Has New Provisions for Operating Economies, Herbert R. Simonds. Iron Trade Rev., vol. 71, no. 20, Nov. 16, 1922, pp. 1347-1350, 7 figs. Review of operating features of plant of Kropp Forge Co., Chicago, giving outline of modern practice in forging billets and blooms.

FORGING

DROP HAMMERS. Application of Board Drop Hammers, H. Terhune. Forging and Heat Treating, vol. 8, no. 10, Oct. 1922, pp. 479-481. Should be limited to work requiring but little blocking or breaking down; the power requirements will be from one-fifth to three-fifths that of steam drop hammer.

FOUNDATIONS

BUILDINGS. A Method of Erecting Foundations and Building Simultaneously, A. E. Wynn. Concrete and Constructional Eng., vol. 17, no. 10, Oct. 1922, pp. 639-644, 6 figs. Discusses method of foundations by "protest" concrete piles and its advantages for heavy buildings on bad foundation soils.

The New Standard Oil Building, Ralph W. Chambers. Am. Architect and Architectural Rev., vol. 122, no. 2403, Sept. 27, 1922, pp. 282-292, 19 figs. Describes foundation difficulties encountered in erection of modern tall building in New York City and of means taken to protect rights of adjacent ownership.

RECONSTRUCTION UNDER BUILDING. Putting New Foundations Under an Occupied Building. Eng. News-Rec., vol. 89, no. 18, Nov. 2, 1922, pp. 750-752, 4 figs. Reconstruction of foundations of Chicago theatre and office building without interrupting occupation of either portion of structure. Work done in sections; economical combination of deep pies and surface footings for heavy and light loading.

FOUNDRIES

ALLOY-STEEL. A Modern Alloy Steel Foundry. Iron and Steel of Canada, vol. 5, no. 10, Oct. 1922, pp. 176-178, 2 figs. Describes plant of Hull Iron and Steel Foundries, Ltd., for plain carbon steels, manganese, chrome-nicked, chrome-vanadium and other alloy steels and its equipment. See also Can. Min. Jl., vol. 43, no. 41, Oct. 13, 1922, pp. 690-692

FREQUENCY CHANGERS

TYPES. The Operation of Frequency Changers, L. M. Smith. Assn Iron and Steel Elec. Engrs., vol. 4, no. 10, Oct. 1922, pp. 701-719, 6 figs. Discusses general features and different types of frequency changers.

FUELS

HOGGED. Hogged Fuel Used Instead of Oil in Portland Dredges. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, p. 795, 1 fig. Four dredges on Columbia River, Portland, Ore., find it more economical to burn mill refuse.

UTILIZATION. Seventh Report of the Commission for Utilization of Fuels. Septième rapport de la Commission d'utilisation des combustibles. Génie Civil, vol. 81, no. 15, Oct. 7, 1922, pp. 322-325. Describes operations at establishments of Homécourt and Creusot on effect of utilization of fuel and French associations interested in conservation of fuel.

See also Coal; Oil Fuel; Pulverized Coal.

FURNACES, BOILER

OPERATION. Boiler Furnaces. Les foyers de chaudières. G. Radiguet. Revue Industrielle, vol. 52, nos. 7, 8, 9, 11 and 12, May, June, July, Sept. and Oct. 1922, pp. 213-220, 263-267, 292-294, 367-375 and 407-415, 19 figs. Grates and mechanical stoking systems of various types; means for facilitating combustion by mixing fuels, combustion chamber, intensity of combustion, dimensions of grates, pulverized coal and its efficiency, pulverization and pulverizers, conveying by compressed air, burners, discusses removal of ashes, danger of explosion from pulverized coal, conveying of pulverized coal, efficiency, etc.

FURNACES, ELECTRIC

See Electric Furnace.

FURNACES, FORGING

CONSTRUCTION. Forging Furnace Construction, H. Johnson. Forging and Heat Treating, vol. 8, no. 10, Oct. 1922, pp. 477-479. Results of tests emphasizing necessity of sufficient combustion space and value of insulating brick; reverberatory flame, proper oil temperature and atomization important; sufficient free air to complete combustion is vital. Paper read before Am. drop Forging Inst.

FURNACES, INDUSTRIAL

TEMPERATURE CONTROL. Automatic Electric Temperature-Regulating System for Furnaces, I. William Chubb. Am. Mach., vol. 57, no. 18, Nov. 2, 1922, pp. 685-686, 3 figs. Describes system employed by Adolphe Saurer, Switzerland, which automatically controls temperature of furnaces by varying position of damper; fuel consumption is said to be minimized.

FURNACES, METALLURGICAL

ENRICHED AIR, EFFECT OF. The Metallurgical Aspect of the Production of Cold, Cosmo Johns. Engineering, vol. 141, no. 2965, Oct. 27, 1922, p. 524. Points out that oxygen enrichment of air would alter conditions under which metallurgical operations depending upon oxidation of some fuel (carbon, silicon, phosphorus and sulphur) are carried out. Contribution to discussion on Generation and Utilization of Cold held by Faraday Soc. and Brit. Cold Storage and Ice Assn.

LIQUID FUEL IN. Liquid Fuel in Metallurgical Furnaces, R. C. Helm. Iron Age, vol. 110, no. 18, Nov. 2, 1922, pp. 1137-1139, 4 figs. Handling and burning tar and fuel oil; use in open-hearth and in heat treating wire. (Abstract.) Paper read before Am. Iron and Steel Inst. See also Iron Trade Rev., vol. 71, no. 19, Nov. 9, 1922, pp. 1281-1283, 8 figs.

Use of Liquid Fuel in Metallurgical Furnaces, R. C. Helm. Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 549-555, 14 figs. Success in using this type of fuel depends on furnace design, proper methods for its distribution to furnace, and on burners which will atomize fuel so thermal value is utilized. Paper read before Am. Iron and Steel Inst.

G

GAGES

PRESSURE, PIEZO-ELECTRIC. A Piezo-Electric Method for the Instantaneous Measurement of High Pressures, J. C. Karcher. U. S. Bur. of Standards Sci. Papers, vol. 18, no. 445, Aug. 4, 1922, pp. 257-264, 1 fig. Describes construction of pressure gage and recording galvanometer.

GAS PRODUCERS

MECHANICAL NON-REVOLVING. Modifies Gas Producer Design. Iron Trade Rev., vol. 71, no. 20, Nov. 16, 1922, pp. 1351-1354, 4 figs. Describes new type of mechanical gas producer, embodying water-sealed ash pan and other features, patented by F. H. Treat, Cleveland; is stationary or non-revolving type.

SUCTION WASTE-WOOD. Power Can Be Obtained From Refuse, F. Johnstone-Taylor. Power House, vol. 15, no. 20, Oct. 20, 1922, pp. 31-33, 1 fig. Describes arrangement of suction gas plant, generator, scrubbers and gas engine which consumes power.

GAS TURBINES

APPLICATION. The Future of the Internal-Combustion Turbine (La turbine à combustion interne; son avenir), Marcel de Coninck. Usine, vol. 31, no. 42, Oct. 21, 1922, p. 27. Possibility of using a hot-air turbine for propulsion of automobiles, ships, airplanes, etc.

GASOLINE

GUM-FORMING CONSTITUENTS. Gum-Forming Constituents in Gasoline, N. A. C. Smith and M. B. Cooke. U. S. Bur. of Mines Reports of Investigations, no. 2394, Sept. 1922, 12 pp. New and convenient method is developed for determining "gum" in gasoline. Study of gums and their formation leads to conclusion that they polymerized aldehydes, probably formed by oxidation of olefins, etc.

GEAR CUTTING

BEVEL GEARS. Cutting Spiral Type Bevel Gears, Franklin D. Jones. Machy. (N.Y.), vol. 29, no. 3, Nov. 1922, pp. 204-210, 8 figs. Principles of spiral bevel gear cutting; operation and adjustment of generators designed for cutting gears of different sizes.

GEARS

AUTOMOBILE, ERRORS IN. Production Errors in Gears. Automotive Industries, vol. 47, no. 18, Nov. 2, 1922, pp. 869-873, 14 figs. Gear noises, causes of trouble found in hardening process, cutting machines and in some cutters; methods of checking gears in production.

AUTOMOBILE, NOISES IN. Some Causes of Gear-Tooth Errors and Their Detection, K. L. Herrmann. See Automotive Engrs. Jl., vol. 11, no. 5, Nov. 1922, pp. 391-397, 14 figs. Discusses different gear noises, gives examples of defects that cause noise, and describes device for checking tooth spacing, also instrument for analyzing tooth forms that produce noises.

BEVEL. The Continuous Generation of Spiral Bevel Gears, Chas. S. Pettit. Eng. Production, vol. 5, no. 106, Oct. 12, 1922, pp. 341-343, 7 figs. Consideration of factors involved.

EPICYCLIC. Epicyclic Gears; The Gear Ratio Diagram, P. Cormack. Engineering, vol. 114, no. 2965, Oct. 27, 1922, p. 511, 4 figs. Presents diagram which is said to give complete generality in solution of problems on wheel trains and to bring under intuition the properties of trains when used epicyclically; applicability of diagram extends also to rotational accelerations.

POWER TRANSMITTING CAPACITY. Mechanical Transmission of Power, Forrest L. Cardullo and Franklin D. Jones. Machy. (N.Y.), vol. 29, no. 3, Nov. 1922, pp. 201-203, 1 fig. Power-transmitting capacities of different types of gearing.

SPHERICAL. Spherical Gears, Charles H. Logue. Mech. Engr., vol. 44, no. 11, Nov. 1922, pp. 713-719, 25 figs. Elementary features of bevel gear design are brought out and applied to spur gears, and real connection between the two types is shown. Author points out necessity for difference in design of teeth here and is not considered.

TEETH, STRENGTH OF. Strength of Internal Spur Gear Teeth, Douglas P. Hartman. Machy. (Lond.), vol. 21, no. 525, Oct. 19, 1922, pp. 84-86, 5 figs. Based on review of improved method for determining strength of teeth. Factors governing strength, application of Lewis formula to internal gear teeth.

GOLD METALLURGY

CYANIDE MILLS. The New Treatment of the United Comstock Mines, George J. Young. Eng. and Min. Jl.-Press, vol. 114, no. 20, Nov. 11, 1922, pp. 846-853, 25 figs. Largest cyanide mill built in Western states is of permanent steel and concrete construction. Method of treatment, ore receiving and coarse crushing, fine grinding and concentration, electrical installation, features of plant.

GOLD MINES

COMSTOCK, NEV. Geology, Mining and Metallurgy of the New Comstock, Min. and Metallurgy, no. 191, Nov. 1922, pp. 39-49, 5 figs. 1 on p. 16. Contains following papers; Resume of Geology of United Comstock Mines, Wilbur H. Grant. Proposed Mining Methods of United Comstock Mines Company, John R. Reigart. Design and Construction of United Comstock Mills, Walter L. Read. United Comstock Metallurgy, A. J. Weimig.

ONTARIO. New Plant of Northern Ontario Gold Mine Possesses Unique Features, F. A. McLean. Can. Min. Jl., vol. 43, no. 41, Oct. 13, 1922, pp. 693-694, 3 figs. Describes equipment furnished by Ingersoll-Rand Co. consisting of 4 drill air compressor driven by two stroke oil engine and reversing air hoist of capacity of 4000 lb.

H

HANDLING MATERIALS

CONTINUOUS PACKAGE ELEVATORS. What It Pays to Know About Material Handling, W. T. Spivey. Factory, vol. 29, no. 5, Nov. 1922, pp. 529-531, 572, 574, 576 and 578, 9 figs. Tells how continuous package elevators can be fitted into general material-handling plan, thereby effecting economies.

FACTORY. Handling Materials Economically, B. A. Hildebrant. Iron Trade Rev., vol. 71, no. 16, Oct. 19, 1922, pp. 1069-1071, 3 figs. Eastern grinding-wheel manufacturer uses special trucks and conveyors for transporting abrasives and wheels; simple method of carrying work through shop; method of storage prevents damage to finished product.

FINISHED PRODUCTS. Handling the Finished Products of Industry, Graham L. Montgomery. Chem. and Met. Eng., vol. 27, no. 17, Oct. 25, 1922, pp. 824-826. How to study existing handling systems; where to seek decrease in non-productive labour; studying flowsheets to reduce non-productive labour. Suggested procedure in layout of new systems.

IRON ORE. Carrying Iron Ore to Ford Furnaces, A. J. Hain. Iron Trade Rev., vol. 71, no. 17, Oct. 26, 1922, pp. 1121-1123, 3 figs. Ore is taken from lake vessels in Detroit River, dumped into hoppers, fed onto belt conveyor and into small barges for shipment up River Rouge. Describes mechanical equipment in use.

HARBOR IMPROVEMENT

BUENOS AIRES. Port Improvements of Buenos Aires. Eng. World, vol. 21, no. 5, Nov. 1922, pp. 313-317, 9 figs. Details of scheme adopted for extensions to northerly end of existing docks; undertaking includes ante-port of about 82 acres and four large docks.

HARBOURS

WASTE FUEL-OIL CONTROL. The Control of Waste Fuel Oil in Harbours, Bancroft Hill. World Ports, vol. 10, no. 12, Oct. 1922, pp. 102-107 and (discussion) 107-111. Results of author's experience in Baltimore harbour.

HEAT TRANSMISSION

THERMAL-CONDUCTIVITY VALUES. Transfer of Heat, Terrell Croft. Combustion, vol. 7, no. 5, Nov. 1922, pp. 277-281, 9 figs. Examples of thermal-conductivity values are given in tabular form for various metals, heat-insulating materials, liquids and gases. Portion of author's forthcoming book, Practical Heat.

HEATING AND VENTILATION

HUMIDIFYING PLANTS. The Humidification of Air (Luftbefeuchtung), H. Körting. Zeit. des Vereines deutscher Ingenieure, vol. 66, no. 42, Oct. 21, 1922, pp. 1000-1001, 6 figs. Points out advantages of local over central humidification, in textile mills, distinction between pressure-water and pressure-air humidification, and describes working process of local pressure-air plant.

HEATING, ELECTRIC

IRONLESS INDUCTION. Electric Heating by Ironless Induction, E. F. Northrup. Gen. Elec. Rev., vol. 25, no. 11, Nov. 1922, pp. 656-666, 2 figs. Principles which apply in heating inductance with currents of frequencies sufficiently high to make use of iron unnecessary for increasing magnetic induction.

HEATING, STEAM

FRANCE. Central Heating (Le chauffage central). Journal des Usines à Gaz, vol. 46, no. 20, Oct. 20, 1922, pp. 312-316, 3 figs. Discusses boilers of various types, including magazine boilers, anthracites and coke, firing and combustion.

HOUSING

PROGRESS IN. Housing. Monthly Labor Rev., vol. 15, no. 4, Oct. 1922, pp. 113-158. Building permits in principal cities, January to June, 1922. Work of New York Building Congress. Housing situation in Philadelphia. Progress of housing programme in England.

HYDRAULICS

CHART SOLUTION OF FORMULAS. Chart Solution of Hydraulic Formulas, J. B. Cutler. Power, vol. 58, no. 20, Nov. 14, 1922, pp. 768-770, 3 figs. Presents charts for calculating speed of turbine runner and for determining rise of pressure in hydraulic system resulting from retardation of water's velocity.

HYDROELECTRIC DEVELOPMENTS

NEW YORK STATE. Present Tendencies of Water-Power Development in New York State, John P. Hogan. Am. Soc. Civ. Engrs.-Proc., vol. 48, no. 9, Nov. 1922, pp. 1741-1757, 6 figs. Describes present developments on interior or intermittent streams and tendencies of power developments on them.

NEW ZEALAND. The Commercial Aspect of Water-Power Developments in New Zealand, F. T. M. Russell. New Zealand Jl. Sci. and Technology, vol. 5, no. 4, Sept. 1922, pp. 210-219. General objections to supply from small stations; comparison with Canadian conditions; probable load; proposals. Reply to paper by W. Lancelot Moorcraft same jl. vol. 5, no. 2.

NIAGARA FALLS. Proposed 450,000-Hp. Development at Niagara Falls. Power, vol. 56, no. 17, Oct. 24, 1922, pp. 636-637, 4 figs. Project proposed by American Super-Power Corp., Buffalo, N.Y., plans development of 450,000 hp., taking water through canal from 4 mi. above falls and discharging it into lower gorge near Lewiston under effective head of 301 ft.; associates building 400-mi. transmission line from power house to metropolitan district of New York City, distance of 315 mi.

HYDROELECTRIC PLANTS

ABITIBI RIVER, CAN. Hydro-Electric Development on the Abitibi River, James Dick. Can. Engr., vol. 43, no. 19, Nov. 7, 1922, pp. 509-513, 9 figs. Description of 24,000-hp. development at Twin Falls, Ont., for Abitibi Power and Paper Co.; concrete gravity-type dam 85 ft. high; earth dam 950 ft. long; reinforced-concrete power house; Westinghouse generators and Morris turbines.

AUTOMATIC. Automatic Plant Replaces Cable Drive, Raph B. Parmiter. Elec. World, vol. 80, no. 19, Nov. 4, 1922, pp. 977-979, 4 figs. Details of installation of automatic hydroelectric generating plant at Fairbury, Neb.

SITES. Aspects of Study and Selection of Water-Power Sites, William T. Taylor. Elec. Rev., vol. 91, no. 2341, Oct. 6, 1922, pp. 474-476. Discusses water resources, records of run-off, storage, dam, tunneling and other facts to be considered in survey.

I

INDUSTRIAL MANAGEMENT

COMMITTEE WORK. Committee Work in Management, R. J. Baker. Indus. Management (N.Y.), vol. 64, no. 5, Nov. 1922, pp. 263-264. What committees are, why they exist and how they function. Deals with staff committees acting in advisory capacities.

DEPRESSION PERIODS. Scientific Management During Times of Depression, Richard A. Feiss. Taylor Soc. Bul., vol. 7, no. 4, Aug. 1922, pp. 126-128. Advantages.

ECONOMICS. Study of Economics as a Need in Industry. Iron Age, vol. 110, no. 17, Oct. 26, 1922, pp. 1086-1089. Value to management; selection employees; labor relations; cost reducing; material handling. Outline of papers presented at Soc. Indus. Engrs.

OVERHEAD COSTS. The Puzzle of the Overhead, W. L. Churchill. Management Eng., vol. 3, no. 5, Nov. 1922, pp. 257-259. Discusses overhead in connection with reduction of costs.

PRICE ANALYSIS. Price Changes, Joseph E. Pogue. Management Eng., vol. 3, no. 5, Nov. 1922, pp. 267-272, 7 figs. Studies which help purchasing agent. Purpose of price investigation is properly to sample measurements available, concentrate them into series of workable figures, and submit figures to quantitative analysis by means of graphic chart.

PRODUCTION METHODS. Modern Production and Costing Methods in Locomotive Shops, A. E. Howell. Ry. Engr., vol. 43, no. 513, Oct. 1922, pp. 377-382, 7 figs. Outline of general scheme of organization which can be modified and adapted to suit most manufacturing plants. (Abstract.) Paper read before Instn. Locomotive Engrs.

ROUTING. Combination Routing, D. J. Walsh, Jr. Taylor Soc. Bul., vol. 7, no. 4, Aug. 1922, pp. 131-134 and (discussion) 134-141, 1 fig. To meet problem of small quantities and short operations.

TOOL AND SUPPLY CONTROL. The Control of Operating Tool and Supply Cost, F. A. Mance. Soc. Automotive Engrs. Jl., vol. 11, no. 5, Nov. 1922, pp. 407-408. By alloting to each department precise amounts of tools and supplies to be used for each operation, a control is established throughout factory that must accord with number of cars built. Over period of 4 years in plant cited, system has shown decrease in cost of renewals of 71 per cent.

See also Time Study.

INDUSTRIAL ORGANIZATION

DEPARTMENTAL. Departmenta Organization, Lee H. Mandeville and R. F. Gale. Assn. Iron and Steel Elec. Engrs., vol. 4, no. 10, Oct. 1922, pp. 725-737, 3 figs. First article contains brief description in connection with three different organizations. Second article describes operating department in manufacturing steel plant, employing 2500 to 3000 men.

TRAINING FOR ADMINISTRATION. Training for Administration in Industry, H. Riall Sankey. Indus. Management (Lond.), vol. 8, no. 7, Oct. 10, 1922, pp. 215-216. Author emphasizes importance of recognizing administration as one of four factors in industry, and necessity of establishing adequate means for proper education and training of its personnel. (Abstract.) Address before Instn. Indus. Administration.

INSULATORS, HEAT

HEAT-TRANSMISSION CALCULATION. Heat Insulation (Varmeisolering,) E. Suenson. Teknisk Tedsskrift, vol. 46, nos. 35 and 37, Aug. 30 and Sept. 13, 1922, pp. 137-144 and 145-152, 12 figs. Aug. 30: Propogation and transmission of heat; table of heat-transmission coefficient of various materials. Sept. 13: Heat radiation, air spaces, Rietschels and other methods for calculation; examples.

IRON

PHOSPHORUS FORMATIONS IN. Phosphorus Formations in Iron, J. W. Bolton. Foundry, vol. 50, no. 19, Oct. 1, 1922, pp. 787-791, 25 figs. Micrographs indicate existence of phosphorus; rich alloys in gray iron; theories on effects of phosphorus network are contradicted and new ideas submitted, etching methods outlined.

IRON AND STEEL

ANALYSES. Suggests Analyses of Iron and Steel, Paul V. Kline. Iron Trade Rev., vol. 71, no. 17, Oct. 26, 1922, p. 1124. Describes methods for determination of quantity of phosphorus and manganese in iron and steel, found by author to be short and to give accurate results.

INTERNAL-COMBUSTION ENGINES

ELECTRIC MOTORS, VS. Steam, Gas, Electricity, Oil, Dampf - Gas - Elektrizität - Oel), Constantin Redzich. Wärme- u. Kälte-Technik, vol. 24, no. 18, Sept. 15, 1922, pp. 209-211. A technical comparison, showing economic advantages of internal-combustion engines as small power plants.

See also Airplane Engines, Automobile Engines, Diesel Engines, Oil Engines; Semi-Diesel Engines.

K

KEYWAYS

PLATES, MANUFACTURE OF. The Operating Scope of the Eccentric Press and Slot Stamping Machine in the Manufacture of Keyway Plates (Arbeitsbereich der Exzenterpresse und der Nutenstanzmaschine bei der Herstellung der Nutenbleche), F. Bluhm. Maschinenbau (Betrieb), vol. 1, no. 12-13, Sept. 23, pp. 750-753, 14 figs. Comparison of methods of making keyway plates by use of stamping machines of modern design and by use of eccentric presses taking different plate sizes into consideration.

L

LABOR

HOURS OF WORK. Union Scale of Wages and Hours of Labor, May 15, 1921. U.S. Bur. of Labor Statistics, no. 302, Aug. 1922, 219 pp.

Working Hours, Engineer, vol. 134, nos. 3484 and 3485, Oct. 6 and 13, 1922, pp. 363-364 and 377-379. Abstracts of report of special committee set up to study question of hours of work and other subject.

THREE-SHIFT SYSTEM. The Three-Shift System in the Iron and Steel Industry. Colliery Guardian, vol. 124, no. 3227, Nov. 3, 1922, p. 1087. Summary of results of inquiry conducted by Int. Labor Office, Geneva, abstracted from Int. Labor Rev., Oct.

LABOR TURNOVER

REDUCTION. Reducing Turnover in Seasonal Industries, H. S. Gilbertson. Management Eng., vol. 3, no. 5, Nov. 1922, pp. 286-288, 2 figs. Outlines plan which removes incentive on part of employer to overman establishment.

LABORATORIES

RESEARCH. The Research Laboratory and Its War on Waste, Fred Grotts. Indus. Management (N.Y.), vol. 64, no. 5, Nov. 1922, pp. 309-314 and 317, 3 figs. Specific organization, procedure and suggestions. Notes on how to conduct plant survey; how to design for standardization of component materials; proper application of various product steels; waste reclamation; lubricating oils and their use as fuel oil.

LATHES

AUTOMATIC. Automatic Production in a Locomotive Works. Can. Machy., vol. 28, no. 16, Oct. 19, 1922, pp. 17-20, 15 figs. Discusses auto lathe and its operation: operations on piston rod plants, valve heads, bull rings, etc.

RAILWAY-WHEEL. Railway Wheel Lathe Practice. Ry. Gaz., vol. 37, no. 19, Nov. 10, 1922, pp. 583 and 588, 1 fig. Tests on new 48-in. lathe in Cowlairs Works North British Ry.

TYPES. Modern Machine Tools (Les Machines-Outils modernes), A. Catherine. Outillage, vol. 6, nos. 23, 32, 34, 36, 38, 41 and 42, June 10, Aug. 12, 26, Sept. 9, 23, Oct. 14 and 21, 1922, pp. 750-751, 995-997, 1150-1152, 1198-1200, 1259-1262, 1400-1402 and 1433-1435, 62 figs. Discusses power and precision of modern machine tools, precision being a function of power. Packing-off lathes of Smith & Coventry, Ontario, and French types; lathes for railway locomotive wheels and tires; machine tools used in manufacture of rolling stock, including presses, cylinder boring and grinding machines, etc.; tapping machines; sliding lathes of French construction, and other types of lathes; lathe attachments.

LIGHTING

STREET. The Development of Street Lighting in 1922. Am. City, vol 27, no. 5, Nov. 1922, pp. 411-415, 7 figs. Report of Committee on Street Lighting, Am. Soc. for Mun. Improvements, describes some new installations and gives results of street lighting practice.

LIME

HYDRATED. Hydration of Lime to Meet More Critical Demands, William B. Eastwood. Cement, Mill and Quarry, vol. 21, no. 8, Oct. 20, 1922, pp. 35-38, 5 figs. Describes improvements in hydrators, its operation, interior equipment, chemical properties and reactions of lime, mixing apparatus, etc.

LIQUID AIR

LIQUEFACTION PROCESS. The Linde Refrigerating Machine and Air-Liquefaction Process. Zeit. für komprimierte u. flüssige Gase (Linde festival no.), vol. 22, no. 6, 1922. Contains following articles: The Importance of the Linde Refrigerating Machine for the Development of Modern Refrigerating Engineering, M. Hirsch, pp. 68-69; The Development of the Air-Liquefaction Industry, F. Pollitzer, pp. 70-74, 3 figs. The Spectral Origin of Oxygen, Philipp Siedler, pp. 74-77, 4 figs; The Production of Hydrogen and Water Gas, N. Caro, pp. 77-80, 5 figs.; Liquid Oxygen in Engineering, R. Lelsius, pp. 80-87, 11 figs.

LOCOMOTIVES

CONNECTING-ROD FAILURES. Locomotive Connecting Rod Failures. Ry. Engr., vol. 43, no. 514, Nov. 1922, pp. 401-403 and 406, 1 fig. Report submitted to Ministry of Transport by A. Mount on failure of two engines belonging to Lond. & N.W. Ry.

ELECTRIC. *See Electric Locomotive*

HEAVY TYPES. Heavy Locomotives in South America. Ry. Jl., vol. 28, no. 11, Nov. 1922, pp. 14-16, 3 figs. Describes new Pacific, Mountain and Santa Fé locomotives and operation in Argentina, built by Baldwin Locomotive Works. Tractive force of Pacific type, 10,000 kg. at 80 km. per hr.; Mountain type, 9400 kg. at 60 km. per hr., and Santa Fe type, 12,500 kg.

HIGH-CENTER-OF GRAVITY. The Rise of the Firing Floor. Ry. and Locomotive Eng., vol. 35, no. 10, Oct. 1922, pp. 259-261, 6 figs. Points out that locomotive development has increased height above rails with proportionate rise of center of gravity of engine as a whole.

OPERATION AND MAINTENANCE. 30th Annual Convention of the Traveling Engineers Ass'n. Ry. and Locomotive Eng., vol. 35, no. 11, Nov. 1922, pp. 298-306, 4 figs. Abstract of reports presented covering flange oilers, operation and maintenance of oil-burning locomotives, mechanical lubrication of locomotives, relation of air-brake defects to traffic delays and fuel consumption.

STARTER. Locomotive Starter Designed to Eliminate Taking Slack. Ry. Rev., vol. 71, no. 19, Nov. 4, 1922, pp. 613-615, 3 figs. New device applied to trailed or tender truck axle adds 12,000 lb. to maximum tractive effort. Patented by Clement F. Street. See also Ry. Age, vol. 73, no. 19, Nov. 4, 1922, pp. 858-859.

STOKER FIRING. Effect of Mechanical Firing on Cost of Train Operation. Ry. Rev., vol. 71, no. 20, Nov. 11, 1922, pp. 656-658. Road tests show that stoker increases economy and capacity of locomotive; improves passenger as well as freight train operation. (Abstract.) Paper read before Traveling Engrs. Assn.

THREE-CYLINDER. Characteristics of Three-Cylinder Locomotives, F. Meineke. Ry. Mech. Engr., vol. 96, no. 11, Nov. 1922, pp. 617-619, 5 figs. Attain 15 per cent more hauling power for same adhesive weight; reduction in coal consumption.

LUBRICANTS

GRAPHITE. Graphite as a Lubricant. Oil News, vol. 10, no. 20, Oct. 20, 1922, pp. 35-36. Discusses addition of graphite to oil for lowering friction resistance of journal; efficiency of flake graphite in lubrication.

LUBRICATING OILS

PROPERTIES. Lubricating Oil (Schmieröl), F. E. Kretzschmar. Dinglers Polytechnisches Journal, vol. 337, no. 16, Aug. 12, 1922, pp. 163-166, 4 figs. Kinds of lubricants and their properties, choice, examination, and purification.

M

MACHINE SHOPS

DESIGN. New Workshops for the Gas Light and Coke Company. Concrete & Contructional Eng., vol. 17, no. 9, Sept. 1922, pp. 571—578, 9 figs. Constructional features of new workshops at Beckton for centralizing mechanical work attached to upkeep and repair throughout works, showing design, precast concrete purlins, etc.

MACHINE-TOOL INDUSTRY

UNITED STATES. The Machine Tool Exhibition, New Haven, Conn. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 728-730 and 776. Symposium of following addresses: Influence of the Machine Tool in America, James Hartness; Income Analysis in United States, Oswald W. Knauth; German Industry's New Export Policy Based on Standardization, Oscar R. Wikander; Precision, Standardization and Production, Earle Buckingham.

MACHINE TOOLS

MANUFACTURE. Building Machine Tools. Eng. Production, vol. 5, nos. 106 and 107, Oct. 12 and 19, 1922, pp. 349-353 and 373-377, 33 figs. Plant and methods of Cincinnati Milling Machine Co.

STANDARDIZATION. Suggestions as to Standardization of Machine Tools, Fred H. Colvin and K. H. Condit. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 720-721. Points out advantage of uniformity. Notes on interchangeability and accuracy; T-slots; problem of securing adoption of standards.

MACHINERY

INSTALLATION SERVICE. A Machinery Installation Service, F. E. Lister. Management Eng., vol. 3, no. 5, Nov. 1922, pp. 283-286, 1 fig. Costs decreased 55 per cent; machines increased 53 per cent. It is shown that operations of installation-service work can be definitely and easily controlled, eliminating considerable waste in industry.

MAGNESIUM

CASTINGS. Magnesium Castings (Magnesiumguss), Carl Irresberger. Giesserei-Zeitung, vol. 19, no. 41, Oct. 17, 1922, pp. 599-602. Notes on magnesium, magnesium alloys and their properties; smelting; molds; precautions in casting; cleaning; properties of castings and their useful possibilities.

MALLEABLE IRON

TESTING. Testing Malleable Iron, M. L. Piedbœuf. Foundry Trade Jl., vol. 26, no. 321, Oct. 12, 1922, p. 290. Describes system established by author at foundry in Herstal, Belgium. Translated from paper read before Assn. Technique de Fonderie.

METALS

ELASTICITY. Elasticity of Some Metals and Alloys Up to Temperatures Near Melting Point (Die Elastizität einiger Metalle und Legierungen bis zu Temperaturen, die ihrem Schmelzpunkt naheliegen; B. Elastizitätsmodul), K. R. Koch and R. Dieterle. Annalen der Physik, vol. 68, no. 13, Aug. 31, 1922, pp. 441-462, 3 figs. Discusses modulus of elasticity and experiments carried out to determine it, concluding that with rising temperature modulus of elasticity decreased more slowly than the modulus of torsion, constant of Poisson, therefore, increasing with increasing temperature.

HOT WORKING. The Hot Working of Metals, R. Genders. British Non-Ferrous Metals Research Assn. Bul., no. 7, Oct. 1922, pp. 7-11. Notes on temperature at which hot working is finished, forging or stamping temperatures, experiments on hot working of brasses of various compositions carried out by F. Doerrinckel and J. Trockels, and the extrusion process. Bibliography.

INVAR AND ELINVAR. The Invar and Elinvar Metals, Their Properties and application. Les métaux "Invar" et "Elinvar," leurs propriétés, leurs applications, Ch.-Ed. Guillaume. Revue de l'Industrie Minérale, no. 44, Oct. 15, 1922, pp. 545-568, 17 figs. Describes research work carried out to find substitute for platinum for production of standards. Discusses mechanical properties of nickel steels of various nickel content, production of invar and elinvar and their application, use of nickel steels in watch manufacture, etc.

OVERSTRAIN IN. Internal Stresse and Creep. Zay Jeffries and R. S. Archer. Chem. and Met. Eng., vol. 27, no. 17, Oct. 25, 1922, p. 833-837, 5 figs. Effects similar to those caused by working iron at blue heat have been observed in nickel and certain alloys, these phenomena and results of overstrain are all due to rapid acquisition of increased strength on slip planes.

POLISHING. Principles of Metal Polishing. Machy. (Lond.), vol. 21, no. 524, Oct. 12, 1922, pp. 45-47, 2 figs. Notes on terms used in polishing, field relation of design to finish, properties of glue for polishing wheels, preparation and use of glue, glue heaters.

QUENCHING. Quenching. A Mathematical Study of Various Hypotheses on Rapid Cooling, K. Hemelhofer. Physical Rev., vol. 20, no. 3, Sept. 1922, pp. 231-242, 9 figs. Mathematical study of temperature changes in a hot body after quenching, assuming various conditions of heat flow from surface. Heat flow from a metal cylinder quenched in water.

Strained. X-Ray Examination of. X-Ray Examination of Inner Structure of Strained Metals. I. Chiefly on Copper Wires, Mitsuma Ono. Kyushu Imperial University Memoirs of College of Eng. vol. 2, no. 5, 1922, pp. 241-260, 19 figs. X-ray examination was performed on copper wires, and [illegible] after straining by taking interference figures which show that crystal lattices form fibrous structure in pulled or drawn state, and the structural rearrangement proceeds as degree of strain increases.

Temperature, Effect on. The Effect of Temperature on Some of the Properties of Metals, F. C. Lea. Instn. Mech. Engrs. — Proc., no. 4, June 1922, pp. 885-904 and (discussion) 905-912, 12 figs. Results of tests show clearly that below 250 deg. cent. effect of temperature, particularly on steels, does not give cause for anxiety in their use in cases where above limit is not exceeded. Many alloys of copper and of aluminum are considerably affected by temperatures of 250 cent.

MILLING

Fixtures. Multiple Fixtures for Milling Small Parts, C. E. Stevens. Am. Mach. vol. 57, no. 20, Nov. 16, 1922, pp. 759-763, 6 figs. Describes fixtures used in milling service-airplane parts, design applicable to fixtures for parts of other machines.

MOLDING MACHINES

Turnover Table. A New Turnover Table Moulding Machine. Eng. Production, vol. 5, no. 107, Oct. 19, 1922, pp. 369-370, 1 fig. Details of machine manufactured by Darling & Sellers, Ltd., Keighley, Yorks, England.

MOLDING METHODS

Loam Molding. History of Loam Molding in Province of Liége, J. Varlet. Can. Foundryman, vol. 13, no. 9, Sept. 1922, pp. 20-23 and 37, 7 figs. Gives examples of topical loam-molding jobs including those for large fiywheels, pouring calender marine-engine cylinder, etc.

MINE SHAFTS

Concrete. A New Construction for Levels and Shafts, Hans Neubauer. Coal Industry, vol. 5, no. 10, Oct. 1922, pp. 427-428, 3 figs. Describes new construction (System Neubauer), developed in Germany and used with satisfactory results. Continual expense of timber linings in tunnels eliminated by new method. Translated from Montanistische Rundschau.

MINES

Electrical Equipment. Explosion-Proof Electrical Equipment, L. C. Ilsley. U.S. Bur. of Mines Reports of Investigations, no. 2398, Sept. 1922, 2 pp. Gives reasons why permissible equipments approved under schedules 2B and 15 are safer than unapproved types.

Operation and Maintenance of Electrical Equipment Approved for Permissibility by the Bureau of Mines, L. C. Ilsley. U.S. Bur. of Mines, Tech. Paper, no. 306, 1922, 23 pp. 2 figs. Rules relating to general safety. List of publications on electrical equipment for mines.

Fans, Selection of. A Rational Method of Selection a Mine Fan, Thomas Bryson. Colliery Guardian, vol. 124, no. 3224, Oct. 13, 1922, pp. 897-898, 2 figs. Notes on fundamental principles; expression of a mine's resistance; characteristics curves of fan; limiting curves of resistance.

Surveying. Methods of Surveying Horizontal Angles involving Steep or Precipitous Sighting, L. H. Cooke. Instn. Min. and Metallurgy Bul., no. 216, Sept. 1922, pp. 11-34. Contributed remarks by Alfred Taylor on author's paper with above title, and author's reply to discussion.

Surveying, Tacheometric. Tacheometric as Applied to Underground Surveying, James Cooper. Colliery Guardian, vol. 124, no. 3227, Nov. 3, 1922, pp. 1083 1084, 7 figs. Advantages of tacheometric method; instruments required; experimental work with stadia-theodolite underground; comparison of measuring apparatus; stadia diaphragms; staffs; general applications of tacheometric surveying.

N

NICKEL METALLURGY

Electrolytic Refining. Some Applications of Electrical Equipment in the Metallurgy of Nickel, J. L. McK. Yardley. Eng. and Min. Jl.-Press. vol. 114, no. 19, Nov. 4, 1922, pp. 810-812, 4 figs. Most of metal recovered by pyrometallurgical methods, but electric furnaces are used to some extent. Describes new electrolytic refinery in Canada.

NOZZLES

Flow Curves. The Supersaturated Condition as Shown by Nozzle Flow, A. L. Mellanby and William Kerr. Instn. Mech. Engrs., — Proc., no. 4, June 1922. pp. 855-878 and (discussion) 878-883, 11 figs. Gives flow curves for simple convergent-type nozzles in order to demonstrate clearly discharge effect; and to show degree of support afforded application of theoretical conception to nozzles, by actual experimental results.

O

OFFICE MANAGEMENT

Filing. New Wrinkles in Filing Systems, H. H. Greene. Office Management, vol. 8, no. 1, Sept. 1922, pp. 13-14. Suggestions and ideas relating to best methods of securing papers withdrawn from files; keeping track of "charge outs" and getting them back to file.

OIL ENGINES

Double Acting Two Stroke. Working Practice in the Design of Large Double-Acting Two-Stroke Engines, A. E. L. Chorlton. North-East Coast Instn. Engrs. and Shipbldrs., advance paper, no. 2345Q, for meeting Nov. 3, 1922, 35 pp., 54 figs. Mechanical treatment of subject dealing with factors of design of principal parts of engine.

Solid-Injection. Solid Injection Oil Engine in Isolated Power Plant, H. E. Briggs. Nat. Engr., vol. 26, no. 11, Nov. 1922, pp. 531-534. Compares installation and service costs with other forms of prime movers; lays stress on skilled help required. Paper read at convention of Indiana State Assn. N.A.S.E.

OIL FUEL

Burners. Steam Atomizing Oil Burner Gives Conical Flame. Power, vol. 56, no. 20, Nov. 14, 1922, pp. 764-765, 4 figs. Describes Enco burner which is said to be exceptionally adaptable for burning tar oil in gas-works plants.

Sediment in. Methods for Determining Sediment in Fuel Oils, A. D. Bauer. U.S. Bur. of Mines Reports of Investigations, no. 2408, Oct. 1922, 3 pp. Investigation undertaken to aid in determining satisfactory limits for different methods for determining sediment.

OIL SHALES

American Industry. What's Wrong With the American Oil-Shale Industry? Arthur J. Hoskin. Eng. and Min. Jl.-Press, vol. 114, no. 19, Nov. 4, 1922, pp. 815-818, 1 fig. Reasons for present quiescent condition. Shale oil is said to be superior to well oil for many purposes, not competitive but complementary; commercial development believed to be practicable.

OPEN HEARTH FURNACES

100-Ton. Design of a Proposed 100-Ton Open-Hearth Furnace, C. L. Kinney, Jr. and G. R. McDermott. Iron Age, vol. 100, no. 18, Nov. 2, 1922, pp. 1131-1135, 12 figs. Thermal efficiency and heat balance of furnace of 1912 and one of 1922. Study of furnace operation and heat balance results in improvements which minimize losses; construction of checker work important; modifications in port design to obtain efficient flame propagation. Abstract. Paper read before Am. Iron and Steel Inst. See also Iron Trade Rev., vol. 56, no. 19, Nov. 9, 1922, pp. 1274-1277, 1 fig.

OXY-ACETYLENE WELDING

Cast Iron. Cast Iron Welding by the Oxyacetylene Process, S. W. Miller. Am. Welding Soc. Jl., vol. 1, nos. 8-9, Aug.-Sept. 1922, pp. 72-83. Points out that acetylene is best gas for welding because of its high flame temperature, preheating is necessary in all complicated cast-iron pieces, greatest difficulty is to take care of strains which occur during preheating, welding and cooling.

Defects in Welds. Defects in Gas Welds, Marcel Piette. Welding Engr., vol. 7, no. 10, Oct. 1922, pp. 19-23, 14 figs. Lack of penetration and adhesion said to be most common sources of trouble. Remedies. Translated from Revue de la Soudure Autogène.

Water Content of Gases. The Influence of Water Content in Acetylene and Oxygen in Oxy-Acetylene Welding (Ueber den Einfluss des Wassergehaltes im Acetylen und Sauerstoff bei der autogenen Schweissung), Theo. Kautny. Autogene Metallbearbeitung, vol. 15, no. 15, Aug. 1, 1922, pp. 207-210, 1 fig. Includes table showing influence of impurities in oxygen on costs of autogenous welding and danger of explosion.

P

PAPER MILLS

Electric Drive. Simplification of Paper Mill Drive Control. Elec. World, vol. 80, no. 20, Nov. 11, 1922, pp. 1032-1036, 8 figs. Describes paper mill of West Virginia Pulp & Paper Co., Tyrone, Pa., as typical example of development of sectional drive. Utilizes principle of differential frequency.

PETROLEUM

Fire Hazards. Fire and Explosion Hazards of Petroleums and Petroleum Products, S. H. Katz and N. A. C. Smith. U.S. Bur. of Mines Reports of Investigations, no. 2400, Sept. 1922, 11 pp., 3 figs. Discusses fire hazards associated with crude oil, and petroleum products, and in oil-refineries, Flammability of petroleum and its products; vapor pressure and volatility; flash point; fire points; explosive limits; ignition temperatures.

PILES

Sheet. Modern Methods of Piling. Practical Engr., vol. 66, no. 1860, Oct. 19, 1922, pp. 246-247, 5 figs. Describes side groove system of sheet metal piling reinforced with joists or channels.

PIPE, CAST IRON

Corrosion. The Corrosion of Cast Iron and Lead Pipes in Alkaline Soils, J. W. Shipley. Soc. Chem. Industry Jl., vol. 41, no. 18, Sept. 30, 1922, pp. 311T-316T. Corrosion of iron by soil; soils of Winnipeg district; composition of corroded material; soil corrosion of lead.

PIPE CONCRETE

Frictional Coefficient. Frictional Coefficient of Concrete Surfaces in Pipe and Channels, E. Parry. Eng. World, vol. 21, no. 5, Nov. 1922, pp. 321-323. Frictional characteristics of concrete surfaces and loss of head due to joints and other inequalities. Results of tests made by U.S. Bur. of Agriculture with three types of pipes: pipe made in lengths and jointed, tunnels lined with concrete having timber or iron forms, and cement-lined metal pipes.

Lock-Joint, Manufacture and Installation. Manufacture and Installation of Lock-Joint Concrete Pipe, W. H. Nalder. Eng. World, vol. 21, no. 5, Nov. 1922 pp. 301-305, 1 fig. General description of pipe, and description of work on three projects, the Yuma Auxiliary, Ariz., North Platte, Nebr., and King Hill, in connection with manufacture of lock-joint pipe.

Precast. Manufacture and Installation of Precast Lock-Joint Concrete Pipe, W. H. Nalder. Reclamation Rec., vol. 13, no. 9, Sept. 1922, pp. 223-228, 1 fig. Discusses method of reinforcing and methods of rendering flexible and water-tight joints between pipe units and gives examples.

PISTONS

Aluminum. Aluminum Pistons. Automobile Engr., vol. 12, no. 167, Sept. 1922, pp. 277-282, 16 figs. Reviews recent work in Germany. Gives composition of alloys, piston clearance, compression ratio, fuel consumption and other matter.

PLATES

Circular, Deformation of. Deformation of Circular Plates Supported at Individual Points (Die Verbiegungen in einzelnen Punkten unterstützter kreisförmiger Platten). A. Nadai. Physikalische Zeit., vol. 23, no. 18, Sept. 15, 1922, pp. 366-376, 6 figs. Discusses elastic deformation and torsion as applicable to steam-turbine plates.

Drilling vs Punching. Drilling versus Punching, J. D. Hope. British Machine Tool Eng., vol. 2, no. 17, Sept.-Oct. 1922, pp. 541-543, 3 figs. Relative advantages and merits of drilling and punching processes as applied to structural steel work and shipbuilding. Writer concludes that each process has its own spheres wherein it proves itself most efficient.

POWER FACTOR

CORRECTION. Cash Value of Power-Factor Correction, Fred C. De Weese. Elec. World, vol. 80, no. 19, Nov. 4, 1922, pp. 980-982, 2 figs. Points out that lower power requires use of larger line conductors. Analysis of costs at coal pile; possibility of reducing station generating capacity for given load.

POWER PLANTS

EQUIPMENT. Power Plant of Forest Laundry, Walter C. Edge. Nat. Engr., vol. 26, no. 11, Nov. 1922, pp. 518-521, 6 figs. Describes mechanical and electrical equipment.

INDUSTRIAL. Power Plant of the Hoover Suction Sweeper Company. Power, vol. 56, no. 20, Nov. 14, 1922, pp. 750-754, 8 figs. Plant designed to supply heating-season-load; arrangements made for installation of three 320-hp. uniflow engines and four 3430-sq. ft. boilers.

TEXTILE MILLS. The American Printing Co.'s Plant at Fall River. Power Plant Eng vol. 26, no. 21, Nov. 1, 1922, pp. 1037-1042, 9 figs. Describes power plant of large textile plant, electrical system of which is interconnected with lines of local public-service company.

12,000-KW. A 12,000-Kw. Industrial Power Plant. Power, vol. 56, no. 18, Oct. 31, 1922, pp. 674-679, 7 figs. Details of Kokomo plant of Pittsburgh Plate Glass Co. Three turbine units of 4000 kw. each supply 2300-volt power to factory substation.

POWER TRANSMISSION

HYDRAULIC WAVES. Wave Transmission of Power. Engineer, vol. 134, nos. 3487 and 3488, Oct. 27 and Nov. 3, 1922, pp. 444-445 and 466-468, 7 figs. Discusses system of power transmission by means of hydraulic waves developed by George Constantinesco, and describes Dorman portable wave-power generator and rock drill for Bombay municipality. See also description of wave-transmission plant for Bombay in Indian and Eastern Engr., vol. 51, no. 3, Sept. 1922, pp. 141-146, 2 figs.

PRESSES

METAL-WORKING. Progress in the Construction of Presses for Metalworking (Fortschritte im Bau von Pressen für die Metallbearbeitung). Metall-Technik, vol. 48, no. 28, July 6, 1922, pp. 318-322, 2 figs. The Huber pressing process. Hydraulic presses for pressing of hollow bodies; wheel-drawing presses; horizontal and inclined presses; eccentric breakers and crank presses.

PUBLIC UTILITIES

VALUATION. Principles and Practices for the Valuation of Public Utilities, R. A. C. Henry. Eng. Jl. (Eng. Inst. Can.), vol. 5, no. 11, Nov. 1922, pp. 527-533. Important considerations entering into various methods of valuating.

PULVERIZED COAL

BOILER FIRING. Firing With Pulverized Coal (Die Verfeuerung staubförmiger Braunkohlenprodukte im Rahmem unserer Energiewirtschaft), M. Dolch. Montanistische Rundschau, vol. 14, nos. 18, 19 and 20, Sept. 16, Oct. 1 and 16, 1922, pp. 381-384, 396-399 and 411-413. Discusses question of complete gasification and compares thermal efficiency of pulverized coal and generator gas.

OPEN-HEARTH FURNACES. Firing Martin Furnace with Pulverized Coal (Le chauffage des fours Martin au charbon pulvérisé). Métallurgie, vol. 54, no. 43, Oct. 26, 1922, p. 1575. Gives particulars of new patent based on injecting pulverized coal with air preheated to high degree and discusses results.

TESTS. French Mine Uses Pulverized Anthracite, J. Gould Coutant. Combustion, vol. 7, no. 4, Oct. 1922, pp. 196-198, 4 figs. Describes 5 series of tests carried out with anthracite fines and culm waste from which it is concluded that coal of no commercial value produces as much steam according to calorific value as best quality, that anthracite waste can be burned in pulverized form, etc.

PUMPS

ROTARY. New Idea in Pumps With Rotating Pistons (Nouvelle conception de pompe rotative à palettes), A. Poitrineau. Arts et Métiers, vol. 75, no. 24, Sept. 1922, pp. 260-264, 9 figs. Discusses piston pumps, rotary piston pumps and centrifugal pumps, and describes new design, advantages of which are minimum cost, wear-practically nihil and high efficiency.

PUMPS, CENTRIFUGAL

REES-ROTURBO. Turbine Pumps. Beama, vol. 11, no. 5, Nov. 1922, pp. 762-764, 6 figs. Single-stage and multi-stage types made by Rees Roturbo Mfg. Co., Ltd.

QUARRYING

BLASTING. Bethlehem, Pa., Blast Brings Down 100,000 Tons of Stone. Cement, Mill and Quarry, vol. 21, no. 8, Oct. 20, 1922, pp. 39-40, 2 figs. Describes blasting operations in limestone producing 4 tons per lb. of explosive with few rocks for secondary blasting.

R

RADIOTELLEGRAPHY

DIRECTION FINDING. The Effect of Underground Metalwork on Radio Direction Finders, R. L. Smith-Rose and R. H. Barfield. Wireless World, vol. 11, no. 168, Nov. 4, 1922, pp. 165-171, 7 figs. Investigation of all errors, both fixed and variable, to which radio direction finders are subject when used on land. Results of experiments suggest possible application of radio direction for location of masses of metalwork underground, such as water and gas mains, streaks of minerals, metal ores, etc. Paper read before Wireless Soc. of London.

RAILS

WELDED JOINTS. Welded Rail Joints, M. T. Ryder. Am. Welding Soc. Jl., vol. 1, nos. 8-9, Aug.-Sept. 1922, pp. 21-25. Deals with cast, resistance, seam and thermit welds. Present condition and future developments. See also Welding Engr., vol. 7, no. 10, Oct. 1922, pp. 24-25.

RAILWAY CONSTRUCTION

CONCRETE IN. Development of Concrete in Railway Construction, M. Hirschthal. Ry. Age, vol. 73, nos. 16, 18 and 19, Oct. 14, 28 and Nov. 4, 1922, pp. 705-709, 791-797 and 843-846, 47 figs. Review of steps in adoption of concrete on Delaware, Lackawanna & Western. Study of design of minor structures. Application to other than bridge construction, importance of waterproofing.

RAILWAY MAINTENANCE

CONTRACT SYSTEM. Contract System for Railway Maintenance Work, E. R. R. Tratman. Eng. News-Rec., vol. 89, no. 17, Oct. 26, 1922, pp. 702-704. Review of situation based upon extended inquiry as to practice, experience and opinion on number of railways. Management and cost of work by contract and by railway-force account.

RAILWAYS

DEVELOPMENT. Railway Development Lags Behind Traffic Increase, Ry. Age, vol. 73, no. 20, Nov. 11, 1922, pp. 883-886. Tells how inadequate facilities menace prosperity. Abstracts of addresses by C. H. Markham and James A. Emery before Ry. Business Assn.

RAILWAY ELECTRIFICATION

BERLIN. Electrification of the Berlin Municipal und Suburban Railway (Einführung der elektrischen Zugförderung auf den Berliner Stadt-, Ring- und Vorortbahnen), H. Heyden. Glasers Annalen, vol. 91, no. 7, Oct. 1, 1922, pp. 105-109, 7 figs. Three-rail system with use of direct current was adopted. Electric power is to be supplied from central stations of 100,000 volts through two transformer stations, one in eastern and one in western suburb. Details of driving cars.

BRAZIL. Electrification of the Paulista Railway. Tramway and Ry., World, vol. 52, no. 18, Oct. 12, 1922, pp. 169-173, 13 figs. Describes recent railway electrification in Brazil and gives details of equipment of rolling stock, transformer substations, etc.

CHICAGO. I. C. Adapts Electrification to Terminal Traffic. Ry. Age, vol. 73, no. 17, Oct. 21, 1922, pp. 743-745. Extended investigation leads to selection of 1500-volt direct current with overhead contact for Chicago terminals of Illinois Central.

CHILE. The Electrification of Zone 1 of the Chile State Railways (Die Elektrisierung der Zone 1 der Chilenischen Staatsbahnen), W. Musswitz. Elektrotechnische Zeit., vol. 43, no. 40, Oct. 5, 1922, pp. 1234-1236, 6 figs. Notes on power supply; power stations; locomotives.

RAILWAY MAINTENANCE

CONTRACT SYSTEM. Contract System for Railway Maintenance Work, E.E.R. Tratman. Eng. News-Rec., vol. 89, no. 18, Oct. 26, 1922, pp. 702-704. Review of situation based upon extended inquiry as to practice, experience and opinion on number of railways. Management and cost of work by contract and by railway-force account.

RAILWAY MANAGEMENT

GREAT BRITAIN. Railway Management, Sam Fay. Engineer, vol. 134, no. 3484, Oct. 6, 1922, pp. 361-362. Discusses British Railway Act. 1921; management under groups; American plan. (Abstract.) Presidential address delivered before Inst. of Transport.

ORGANIZATION OF WORK. Organization in Railroad Work, R. N. Begien. Ry. Rev., vol. 71, no. 19, Nov. 4, 1922, pp. 620-623. Discusses duties of officers and executives.

PURCHASES AND STORES DEPARTMENT. The Real Functions of the Department of Purchases and Stores, H. C. Pearce. N.Y.R.R. Club—Official Proc., vol. 32, no. 8, Oct. 1922, pp. 6757-6764 and (discussion) 6764-6784. Its purpose, scope and organization.

RAILWAY MOTOR CARS

ELECTRIC. New Motor Coaches for the Burgdorf-Thun Railway. Ry. Gaz., vol. 37, no. 17, Oct. 27, 1922, pp. 514-517, 5 figs. Constructed on 3-phase system, but designed to permit of their conversion to high-tension single-phase when required.

FRANCE. New Railway Motor Cars (Les nouvelles automotrices à moteur à explosion des Chemins de fer de l'Etat), P. Callas. Génie Civil, vol. 81, no. 18, Oct. 28, 1922, pp. 381-384, 9 figs. Describes some new cars driven by explosion engines of French state railways, tests of which show decided advantages, viz., reduction of materials, attendants and cost of operation, etc.

GASOLINE. Motor Driven Rail Car with High Power Unit. Ry. Age, vol. 73, no. 21, Nov. 18, 1922, pp. 943-944, 2 figs. Maryland & Pennsylvania train consisting of gasoline motor coach and trailer, 120-hp. engine; seats 76 passengers.

STEAM. Steam-Propelled Unit Railway Motor Car. Ry. Mech. Engr., vol. 96, no. 11, Nov. 1922, pp. 620-622, 5 figs. Oil-burning, steam-driven car built by Unit Ry., Car Co., Boston, Mass. for Can. Nat. Ry.; has water-tube-type boiler.

STORAGE-BATTERY. Trial Trips with Storage-Battery Self-Propelled Cars on the Austrian Federal Railway (Versuchsfahrten mit Speichertriebwagenzügen auf den österreichischen Bundesbahuen), Robert Meixner. Elektrotechnik u. Maschinenbau, vol. 40, no. 32, Aug. 6, 1922, pp. 373-379, 6 figs. Results of trial runs carried out in 1921.

RAILWAY OPERATION

TRAIN CONTROL. Automatic Train Control From Four Viewpoints. Ry. Age, vol. 73, no. 18, Oct. 28, 1922, pp. 805-808. Abstracts of three papers presented before Railroad Section of West. Soc. Engrs. as follows: Development of Train Control, W. J. Eck; Automatic Train Control from a Mechanical Standpoint, C. F. Giles; Train Control from the Operating Standpoint, A. W. Towsley. See also Ry. Signal Engr., vol. 15, no. 11, Nov. 1922, pp. 427-432 and discussion 433-434.

The Kerr Automatic Train Control and Fog Signalling Apparatus. Ry. Gaz., vol. 37, no. 14, Oct. 6, 1922, pp. 423-424, 8 figs. In its design special attention was paid to making apparatus weather-proof, that both "danger" and "clear" signals should be given positively, that no signal indication should depend upon a spring for its action, etc.

RAILWAY SIGNALLING

AUTOMATIC REMINDER. Mechanical Automatic Reminder of Shunted and Waiting Trains. Ry. Engr., vol. 43, no. 513, Oct. 1922, p. 365, 1 fig. Describes apparatus, installed at signal boxes, said to be inexpensive and efficient, besides being automatic in its action.

COLOR LIGHT SIGNALS. Modern Signals Expedite Heavy Suburban Traffic. Ry. Age, vol. 73, no. 18, Oct. 28, 1922, pp. 785-788, 5 figs. Color light signals and traffic levers increase capacity of available tracks on Lackawanna.

ELECTRIC LIGHT. Electric Lighting of the Signals at the Railway Stations. Illuminazione elettrica dei segnali nelle stazioni di Padova centrale e Padova campo di marte. G. C. Palmieri. Rivista Tecnica delle Ferrovie Italiane, vol. 22, no. 3, Sept. 15, 1922, pp. 77-93, 26 figs. partly on [illegible] description of signal cabin and equipment, day and night signals [illegible] equipment, control and safety engines, etc.

POWER OPERATED FACING POINTS. Long Distance Operation of Facing Points. Ry. Gaz., vol. 37, no. 17, Oct. 27, 1922, pp. 509-510, 6 figs. partly on p. 511. Details of 28 cases of long-distance operation of points cited by E. L. Pearson, President of N.Y., N.H. & H.R.R.

THREE POSITION AND UPPER-QUADRANT. Traffic Improvements and New Signalling at King's Cross, Great Northern Railway. Ry. Gaz., vol. 37, no. 18, Nov. 3, 1922, pp. 541-544, 10 figs. partly on pp. 545-546. Describes reorganization of Signalling arrangements, no point alterations having been made, applications of three position and upper quadrant signalling. Details of Siemens electric route indicating signal, employed in connection with new signalling at this station, given on p. 549, 1 fig.

THREE POSITION SYSTEM. Weissenbruch's Signal System on the Belgian State Railways. T. S. Lascelles. Ry. Gaz., vol. 37, no. 15, Oct. 13, 1922, p. 457. Describes three-position system introduced in Belgium in 1919. Signals are mechanically worked by double-wire system. (Abstract.) Paper read before Instn. Ry. Signal Engrs.

TRACK CIRCUITS. Direct Current Track Circuits, W. J. Thorrowgood. Ry. Engr., vol. 43, no. 514, Nov. 1922, pp. 404-406. Contribution to report of Sub-Committee "D" of Am. Ry. Assn. on factors involved in standard of safety for track circuits.

TRANSIENT CIRCUITS. Transient Track Circuits. Ry. Engr., vol. 43, no. 513, Oct. 1922, pp. 371 and 386, 1 fig. With transient track circuit, current is only applied to rails for approximately half a second for every train.

RAILWAY TRACK

CROSSINGS. Lackawanna Continues Grade Crossing Elimination. Eng. News-Rec., vol. 89, no. 19, Nov. 9, 1922, pp. 778-781, 10 figs. Suburban tracks elevated through East Orange, N.J. Depression vs. elevation compared; flat-slab elevated structure developed. Station layout is described.

RAILWAYS

BRAZIL. The Railways of Brazil (Die Eisenbahnen Brasiliens), H. Bargheer. Archiv für Eisenbahnwesen, nos. 4 and 5, July-Aug. and Sept.-Oct. 1922, pp. 860-877 and 1085-1107. July-Aug.; Natural and economic difficulties; export railways. Sept.-Oct.: Colonization railways; government subsidies and private enterprises; transportation of low-grade bulk goods; railways and waterways. Bibliography.

REDUCTION GEARS

DOUBLE. Double-Reduction Gears for Marine Use. United States Practice, J. Livingston Booth. Engineering, vol. 114, no. 2965, Oct. 27, 1922, pp. 516-517. Calls attention to progress made in United States in gear design and manufacture, and points out that it would be well to determine whether many of troubles experienced with double-reduction gears have not arisen from causes which can be overcome with better knowledge of art of design and manufacture.

REFRACTORY MATERIALS

THERMAL CONDUCTIVITY. Determination of Thermal Conductivity of Fire-Resisting Materials (Die Bestimmung der Wärmeleitfähigkeit feuerfester Stoffe), K. Arndt. Dinglers Polytechnisches Journal vol. 337, no. 18, Sept. 9, 1922, pp. 185-187. Distinguishes between interior and exterior heat conductivity; methods of heating and cooling of refractories.

REFRIGERANTS

LIQUID SULPHUR DIOXIDE. Liquid Sulphur Dioxide. Chem. Trade Jl. and Chem. Engr., vol. 71, no. 1843, Sept. 15, 1922, pp. 318-319, 1 fig. Describes new system of manufacture in Argentine Republic of liquid sulphurous anhydride for refrigerating purposes, being an improvement of Hänsch and Schroeder processes. Also construction and operation of plant. Translated from Giornale di Chimica Industriale ed Applicata.

REFRIGERATING MACHINES

AIR. Refrigerating Machines with Air as the Agent, Maurice Leblanc. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 731-733, 8 figs. Describes new machine designed by author. Translated from Revue Universelle des Mines, vol. 14, no. 3, Aug. 1, 1922, pp. 1-36.

COMPRESSION, EFFICIENCY TABLES FOR. Principles and Methods for the Calculation of Efficiency Tables of Compression Refrigerating Machines (Grundlagen und Methoden für die Berechnung der Leistungstabellen für die Kompressionskältemaschinen), E. Altenkirch. Zeit. für die gesamte Kälte-Industrie, vol. 29, no. 9, Sept. 1922, pp. 165-172, 7 figs. Recalculation of tables for ammonia SO_2 and CO_2 in connection with rules published by German Refrig. Soc., and curves for each.

REFRIGERATING PLANTS

EFFICIENCY. Refrigerating Plant Economy, Victor J. Azbe. Universal Engr., vol. 36, no. 4, Oct. 1922, pp. 19-22. Results of investigation showing that refrigerating plants are least efficient of all; gives figures to show that production of ice should be double what it is; also discusses boiler room, cooling towers and auxiliaries.

REFRIGERATION

GENERATION AND UTILIZATION OF COLD. The Generation and Utilization of Cold. Engineering, vol. 114, no. 2964, Oct. 20, 1922, pp. 498-500. Abstract of discussion at joint meeting of Faraday Soc. and Brit. Cold Storage and Ice Assn., including following notes: Refrigeration and Inversion Points, A. W. Porter; The Lowest Temperature Yet Attained, Kamerlingh Onnes; The Leiden Cryogenic Laboratory, C. A. Crommelin; Ethyl Chloride C_2H_5Cl, C. Frowen Jenkin; Some Materials of Low Thermal Conductivity, Ezer Griffiths; etc.

RESERVOIRS

CONCRETE. Constructing the New Covered Reservoir at Perth Amboy, New Jersey, Alexander Johnson. Contractor's and Engrs. Monthly, vol. 5, no. 2, Aug. 1922, pp. 44-46, 4 figs. Details of 40,000,000-gal. unit reservoir recently constructed, 900-ft. long with width varying from 230 ft. to 370 ft. and water depth of 25 ft., reinforced concrete reservoir floor.

OPERATION. Hungry Reservoir Operation, G. Edward Gibson. Cornell Civil Engr., vol. 31, no. 1, Oct. 1922, pp. 3-8, 3 figs. Discusses storage available, water required for city supply, management of reservoir, construction of operating diagram and practical tests.

RIVERS

DISCHARGE MEASUREMENT. On a New Method of Gauging the Discharge of Rivers, J. Joly. Royal Dublin Soc. — Sci. Proc., vol. 16, no. 35-39, Apr. 1922, pp. 489-491. Based on principle of electrical hydrometry, water being analyzed for salt content at a known distance from point from which it was put in.

ST. LAWRENCE. The Improvement of the St. Lawrence from the Viewpoint of Private Capital, Hugh L. Cooper. Am. Inst. Elec. Engrs. — Jl., vol. 41, no. 11, Nov. 1922, pp. 854-865, 19 figs. Describes general plan worked out by author for part of reconstruction, and outlines ideas as to what should be done with remainder of river. It is believed best public interest demands that river should be harnessed by construction of five dams.

The St. Lawrence Project. Am. Inst. Elec. Engrs. — Jl., vol. 41, no. 11, Nov. 1922, pp. 866-876. Two articles by H. J. Harriman and S. Wallace Dempsey, the first advocating and the second opposing project.

RIVETING

MACHINES FOR. Riveting Machines (Les Machines à river). A. Landrotte. Technique Moderne, vol. 14, nos. 9 and 10, Sept. and Oct. 1922, pp. 374-379 and 418-421, 21 figs. Describes hydraulic, hydroelectric, electric, pneumatic and percussion riveters, their construction and operation, and advantages and disadvantages. Bibliography.

ROADS

MAINTENANCE AND IMPROVEMENT. Mechanical Vehicles and Road Surfaces. Montagu of Beaulieu. Instn. Mech. Engrs. — Proc., no. 4, June 1922, pp. 783-789 and (discussion) 789-793. Recommends co-operation between road makers, designers of road vehicles and road users, to promote economy in upkeep and improvement of roads.

ROADS, ASPHALTIC CONCRETE

ADVANTAGES. Asphaltic Concrete Pavements, R. G. Davidson. Good Roads, vol. 63, no. 14, Oct. 4, 1922, pp. 117-120, 5 figs. Their advantages from standpoint of construction and maintenance; durability.

ROLLING MILLS

NICKEL. Builds New Plant To Centralize Nickel Rolling Operations. Iron Trade Rev., vol. 71, no. 18, Nov. 2, 1922, pp. 1213-1216, 6 figs. Describes new rolling mills of International Nickel Co., largest nickel rolling mill in United States. Equipment is almost identical with that employed for rolling steel.

S

SAND BLAST

CLEANING MACHINE PARTS. Cleaning of Machine Parts by Sand Blasting. Can. Foundryman, vol. 13, no. 10, Oct. 1922, pp. 22-23 and 25, 3 figs. Discusses variety of application, mechanical handling and screening of sand, exhaust system and automatic equipment.

SCREW THREADS

WORM. The Normal Chordal Thickness of a Worm Thread, A. Fisher. Machy. (Lond.), vol. 21, no. 526, Oct. 26, 1922, pp. 118-119, 4 figs. Points out that problem of determining normal is not same as determining minimum chordal thickness, and that common term, normal thickness, appears to have different interpretations.

SEAPLANES

F-5-L- BOAT. F-5-L. Boat Seaplane—Performance Characteristics, W. S. Diehl. Nat. Advisory Committee for Aeronautics Tech. Notes, no. 118, Oct. 1922, 8 pp., 8 figs. Notes on wing characteristics, resistance and velocity, engine and propeller characteristics, power chart and indicated performance, cruising and calculated performance.

See also Flying Boats.

SEMI-DIESEL ENGINES

SOLID-INJECTION. A Semi-Diesel Engine. Mar. Engr. and Naval Architect, vol.45, no. 541, Oct. 1922, pp. 396-398, 2 figs. New marine-type solid-injection engine, manufactured by Norris, Henty & Gardners, Ltd., and built in powers from 10½ to 134 b. hp.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Fertilizing Value of Activated Sludge, H. D. Brown. Can. Engr., vol. 43, no. 15, Oct. 10, 1922, pp. 440-441. Account of experiments with fertilizer conducted by Ontario Provincial Board of Health at experimental station, Toronto.

DIRECT-OXIDATION TREATMENT. The Direct Oxidation Method of Sewage Treatment. Eng. News-Rec., vol. 89, no. 16, Oct. 19, 1922, pp. 658-662. Two papers read before Am. Soc. for Municipal Improvements, as follows: Electrolytic or Direct Oxidation and the Luna Deadlock, George W. Fuller. One Year's Operation of Direct Oxidation Sewage-Works at Allentown, Harry F. Bascom. Discussion of papers.

PUMPING STATION. Sewage Pumping Station for London, Ontario, Hector S. Phillips. Can. Engr., vol. 43, no. 16, Oct. 17, 1922, pp. 447-449, 7 figs. Describes layout of plant, construction of pumping station, pumping equipment and its operation.

TREATMENT. Recent Developments in Sewage Treatment, George W. Fuller. Mun. and County Eng., vol. 63, no. 4, Oct. 1922, pp. 148-158. Discusses chemical tanks, fine screening, separate sludge digestion tanks, Imhoff or two-story tanks, contact beds, trickling filters, sludge handling and recent developments generally.

SHAPERS

TABLE SUPPORTS. Shaper Table Supports. Fred Horner. Machy., N.Y., vol. 29, no. 3, Nov. 1922, pp. 178-183, 17 figs. Devices employed by various manufacturers to counteract downward thrust of cut.

SOLIDS

ELECTRON THEORY OF. Further Studies on the Electron Theory of Solids. The Compressibilities of a Divalent Metal and of the Diamond. Electric and Thermal Conductivities of Metals. J. J. Thomson. Lond. Edinburgh and Dublin Philosophical Mag. and J. of Sci., vol. 44, no. 262, Oct. 1922, pp. 657-679. Shows that electric and thermal conductivity in metals is due to movement of chains of electrons and accounts for variation of electric resistance with temperature, for supra-conductivity of metals at very low temperatures and for proportion between electric and thermal conductivity.

SPRINGS

AUTOMOBILE. Four New Methods in Spring Production. J. Edward Schipper. Automotive Industries, vol. 47, no. 17, Oct. 26, 1922, pp. 821-823, 7 figs. Describes production system of American Auto Parts Co.

Helical. Helical Springs (Ressorts en hélice cylindrique), C. Reynal. Arts et Métiers, vol. 75, no. 24, Sept. 1922, pp. 272-279, 2 figs. Discusses theory and formulas for elasticity, torsion, flexure, loads, and gives table of data including cross sections, loads and flexures.

STANDARDIZATION

International. International Standardization, P. G. Agnew. Am. Mach., vol. 57, no. 17, Oct. 26, 1922, pp. 633-638, 1 fig. Process of industrial standardization is classified into four stages, namely, by individual firms, by societies or associations, on national scale, and on international scale. Points out obstacles in way of development of international standardization.

STEAM

High-Pressure. Experimental Results with Steam at High Pressures and Temperatures (Sui risultati sperimentali relativi all'impiego del vapore ad alte pressioni ed alte temperature e sulle loro conseguenze), Gaetano Ivaldi. Industria, vol. 36, no. 18, Sept. 30, 1922, pp. 343-346. Discusses experiments of Schmidt with steam at high pressures and temperatures and makes calculations to show some errors.

STEAM ENGINES

High-Pressure. High Pressure Steam Engines (Über die Höchstdruckdampfmaschine und ihre Bedeutung für den vereinigten Kraft- und Wärmebetrieb), Hermann Franke. Zeit. für angewandte Chemie, vol. 35, no. 71, Sept. 5, 1922, pp. 485-489. Describes steam engine of Schmidt Superheat Co., working under steam pressure of up to 60 atmos. and discusses in detail new conditions due to high pressure.

Patent Specifications. Steam-Engines, Kinds or Types of, and Details Not Otherwise Provided for (including Steam and Other Fluid-Pressure Hammers and Presses). Abridgments of Specifications, Class 122 (iii), period 1909-15, 1922, 174 pp. Patents for inventions.

Portable. The Care and Maintenance of Small Steam Portable Engines (Die Wartung und Instandhaltung kleiner Dampflokomobilen), Hugo Schnell. Zeit. des Bayerischen Revisions-Vereins, vol. 26, nos. 17, 18 and 19, Sept. 15, 30 and Oct. 15, 1922, pp. 138-140, 146-147 and 155-157, 8 figs. Notes on attendance of water level, feed, furnace and auxiliary parts, smoke box, etc.; cleaning and maintenance. Suggestions for selection of portable engine.

Uniflow. A Uniflow Engine with Single-Beat Poppet Valves. Power, vol. 56, no. 20, Nov. 14, 1922, pp. 766-767, 4 figs. Design and method of setting valves of Chuse uniflow engine, which employs light single-beat steam valves and has novel means of providing additional clearance volume in case vacuum is lost.

Auxiliary Exhaust Valves on Uniflow Engines. Power, vol. 56, no. 19, Nov. 7, 1922, pp. 718-719, 6 figs. Describes Skinner uniflow-engine valve gear and method of setting valves.

STEAM GENERATORS

Electric. Generating Steam by High Voltage Current. Can. Machy., vol. 28, no. 17, Oct. 26, 1922, p. 18, 1 fig. Describes "electro" steam generator constructed by F. T. Kaelin and developed by Elec. Furnace Construction Co., Phila.

Steam From Electricity. Can. Min. Jl., vol. 43, no. 43, Oct. 27, 1922, pp. 735-736. Reviews recent developments in steam production by electricity. Steam Generators. Abridgments of Specifications, class 123 (ii), period 1909-15, 1922, 321 pp. Patents for inventions.

STREAM POLLUTION

Investigation. Stream Pollution Investigation. Pub. Works, vol. 53, no. 8, Oct. 1922, pp. 172-173. Outline of work being done by U.S. Public Health Service on Illinois River to determine definitely nature of polluting substances and fundamental laws that operate in stream purification.

STEAM POWER PLANTS

Fuel Economy in. Fuel Economy in Steam Power Plants, John B. C. Kershaw. Beama, vol. 11, no. 5, Nov. 1922, pp. 745-752, 2 figs. Control of combustion process.

STEAM TURBINES

Steam Consumption. The Steam Consumption of Steam Turbines (Der Dampfverbrauch fon Dampfturbinen), G. Forner. Zeit. des Vereines deutscher Ingenieure, vol. 66, nos. 40 and 43-44, Oct. 7 and 28, 1922, pp. 955-958 and 1025-1026, 10 figs. Approximate formulas for calculation of steam consumption of most important types of turbines without of entropy or steam charts. Approximate formulas for calculation of saturation temperature of steam.

STEEL CASTINGS

Manufacture. Notes on the Development of the Manufacture of Steel Castings, F. A. Melmoth. Foundry Trade Jl., vol. 26, no. 324, Nov. 2, 1922, pp. 355-358, 2 figs. Various methods and operations in production of medium-weight and light castings.

STEELS

Requirements of. Steel Requirements of the Automotive Industry, Henry Chandler. Iron Age, vol. 110, no. 18, Nov. 2, 1922, pp. 1136-1137. Classified as to various parts. Test for mechanical properties; importance of heat treatment. (Abstract.) Paper read before Am. Iron and Steel Inst. See also Iron Trade Rev., vol. 71, no. 18, Nov. 2, 1922, pp. 1192-1194 and 1205, 2 figs. and Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 541-548, 2 figs.

Non-Metallic Inclusions in. Non-Metallic Inclusions and Ferrite Segregation in Steel, E. G. Mahin and H. W. Botts. Chem. and Met. Eng., vol. 27, no. 20, Nov. 15, 1922, pp. 980-985, 11 figs. Traces of manganese and sulphides are present in steel surrounding sulphide inclusion, and cause precipitation of ferrite shells, such tiny inclusions have much to do with locus of excess ferrite.

Structure. The Structure of Steels from the Standpoint of Colloid Chemistry, J. C. A. H. [illegible]. Soc. Chem. Industry Jl., vol. 41, no. 19, Oct. 16, 1922, pp. 409R-411R, 8 figs. Deals with existence of non-metallic enclosures in steel, which are divided into two classes, namely those which are solid above temperature of fusion of steel, certain silicates and aluminates, and those which have melting point below that of steel, sulphides.

Titanium in. Determination of Titanium in Steel. Chem. Trade Jl. and Chem. Engr., vol. 71, no. 1848, Oct. 20, 1922, pp. 479-480. Describes new rapid volumetric method worked out by L. [illegible] and L. Carozzi, method of reduction and manipulative details. Translated from Giornale di Chimica Industriale ed Applicata, Sept. 1922.

STEEL, HEAT TREATMENT OF

Bath. Heat Treating Bath Composed of Sodium Chloride, Sodium Carbonate, and Sodium Cyanide, E. V. Schaal. Air Service Information Circular, vol. 4, no. 363, Aug. 15, 1922, 4 pp., 6 figs. Mixture of 40 per cent sodium chloride and 60 per cent sodium carbonate is found to decarburize steel considerably, but this decarburizing tendency is neutralized by addition of about 15 per cent of sodium cyanide.

Machine Parts. Heat Treatment of Steel for Machine Construction (Värmebehandlingen av stål för konstruktionsändamal), Arvid Johansson. Teknisk Tidskrift, vol. 52, nos. 25 and 29, June 23 and July 22, 1922, pp. 407-409 and 469-472. Properties of steels and their various treatments for different machine parts.

STEEL MANUFACTURE

Power Economy. Industry Needs Power Economy, E. F. Entwisle. Iron Trade Rev vol. 71, no. 18, Nov. 2, 1922, pp. 1201-1202 and 1205-1206. Points out that plants have not kept pace with increased demands made during peak-load periods; effort should be made to eliminate wasteful steam plants; electrification appears economical. Paper presented before Am. Iron and Steel Inst. See also Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 585-587.

Problems. Auxiliary Problems in Steel Making. Iron Age, vol. 110, no. 19, Nov. 9, 1922, pp. 1211-1216, 2 figs. Abstracts of following papers presented before Am. Iron and Steel Inst: Heating Furnaces for Blooms, Slabs and Billets, W. P. Chandler, Jr.; Power Plants in the Steel Industry, E. F. Entwisle; Fluorspar and Its Uses, G. H. Jones.

STEEL WORKS

Duluth, Minn. From Ore to Nails in Minnesota Plant, Gilbert L. Lacher. Iron Age, vol. 110, no. 17, Oct. 26, 1922, pp. 1057-1061, 8 figs. Steel corporation adds rod mill and wire plant to its Duluth works; labor-saving devices and safety measures.

England. The Story of Hadfields, Limited. Iron and Steel of Canada, vol. 5, nos. 10 and 11, Oct. and Nov. 1922, pp. 179-186 and 193-205, 10 figs. Oct.: Discusses Hadfield research work including manganese steel, low-hysteresis steel, nickel-chromium steel, and describes East Hecla Works and equipment, reconstruction and post-war work, electric furnaces, etc. Nov.: Description of 28-in. reversing mill: 11-in. and 14-in. rolling mills; Hadfields work during war, including production of armament material.

Fuel Problems. Some Fuel Problems of the Steel Plant, E. E. Litz. Eng. Jl. (Eng. Inst. Can.), vol. 5, no. 11, Nov. 1922, pp. 533-536. Review of requirements and distribution of all available fuels.

STOKERS

Coal-Mine Power Plants. Mechanical Stokers as Applied to Coal Mine Power Plants, Ollison Craig. Coal Industry, vol. 5, no. 10, Oct. 1922, pp. 444-445, 4 figs. Points out that by use of mechanical stokers coal mines can effect considerable economies; low-grade fuel can be used and labor expense reduced. Economy of typical installations.

Underfeed. The Development of Multiple Retort Inclined Underfeed Stokers, Edwin Lundgren. Combustion, vol. 7, no. 5, Nov. 1922, pp. 258-264, 14 figs. Brief outline of development to date and discussion of trend of design to meet present and future central-station demands.

Underfeed Stokers Burn Low Grade of Coal, C. E. Reese. Blast Furnace and Steel Plant, vol. 10, no. 11, Nov. 1922, pp. 588-591, 7 figs. Underfeed stokers specially designed to burn low-grade fuel installed under 5,600 sq. ft. of boilers; plant operates at high rating and high efficiency.

SUPERHEATERS

Steam Separators and. Steam Separators and Superheaters. Abridgments of Specifications, class 123 (iii), period 1909-15, 1922, 134 figs. Patents for inventions.

Types. Superheated Steam and Superheaters, W. Erskine Dommett. Eng. Rev., vol. 36, no. 1, July 1922, pp. 4-7, 8 figs. Advantages of superheating; requirements to be met; describes representative types of superheaters, including Foster, Sugden, Bolton and Stirling types.

T

TANKS

Measurement of Contents. Measuring the Contents of a Horizontal Tank, John L. Bogert. Power, vol. 56, no. 19, Nov. 7, 1922, pp. 724-725. Presents table for calculation of contents of cylindrical tanks of any diameter and length at sixty different depths.

TELEPHONY

Automatic. The Fleetwood Automatic Telephone Exchange. Engineering, vol. 114, no. 2966, Nov. 3, 1922, pp. 548-550, 4 figs. Describes installation constructed by Relay Automatic Telephone Co., Ltd., London. See also Engineer, vol. 134, no. 3488, Nov. 3, 1922, p. 474, 6 figs. on p. 475.

Relay Automatic. The Relay Automatic Telephone System. Engineering, vol. 114, nos. 2961, 2962 and 2963, Sept. 29, Oct. 6 and 13, 1922, pp. 406-407, 422-424 and 448-451, 15 figs. partly on p. 452. Deals with main principles of system and method of assembly, with particular reference to private automatic exchanges suitable for offices, works, ships, railways, etc.

TEMPERATURE MEASUREMENT

Temperature-Heat-Content Diagram. Temperature-Heat-Content Diagram for Thermodynamic Examination of Machines Following the Gas Laws (Das Temperatur-Wärmeinhalt-Diagramm als Hilfsmittel zur thermodynamischen Untersuchung von Maschinen, deren Arbeitsmittel die Gasgesetze befolgen), Emil Wellner. Dinglers Polytechnisches Journal, vol. 337, no. 14, July 15, 1922, pp. 143-149, 6 figs. Steam and multiple-stage piston compressors, turbocompressors, gas turbines, etc.

TESTING MACHINES

Floor-Slab, Beam and Column. Floor Slab, Beam and Column Testing Machine at the National Physical Laboratory. Engineering, vol. 114, no. 2964, Oct. 20, 1922, pp. 484-485, 14 figs. Describes machine capable of testing construction of steel and concrete floors up to 16 ft. long by 6 ft. wide, and steel and concrete columns up to 20 ft. in height. Method of operating machine.

HYDRAULIC, FOR WELDED STEEL PIPE. Hydraulic Testing Machine for Welded Steel Pipes. Engineering, vol. 114, no. 2966, Nov. 3, 1922, p. 565, 4 figs. Describes machine capable of testing pipes up to 6-ft. diam. to pressure of 450 lb. per sq. in., was built from 2500-ton shell piercing press.

MODELS. Modern Testing Equipment, Eng. Production, vol. 5, no. 107, Oct. 19, 1922, pp. 378-379, 4 figs. Notes on recent developments by firm of Joshua Buckton & Co., Ltd., Leeds, England.

TESTS AND TESTING

FOUNDRY EXPERIMENTAL STATIONS. Duties and Organization of Experimental Stations in Foundries and Metallurgical Works (Aufgaben und Organisation der Versuchsanstalt in Giessereien und Hüttenwerken), E. H. Schulz. Giesserei-Zeitung, vol. 19, no. 39, Oct. 3, 1922, pp. 571-574, 6 figs. Historical review of development; mechanical equipment and organization. Details of experimental station of German-Luxembourg Min. and Met. Corp., Dortmunder Union Dept., as example of modern installation.

THERMIT WELDING

STREET-RAILWAY SHOPS. The Use of Thermit Welding in Street Railway Shops, J. H. Deppeler. Am. Welding Soc. Jl., vol. 1, nos. 8-9, Aug.-Sept. 1922, pp. 29-31, 3 figs. Making special work by means of thermit welding; making compromise joints; motor cases and truck frames.

THERMODYNAMICS

NERNST'S HEAT LAW. Nernst's New Heat Theory (Der neue Wärmesatz von Nernst), H. Schmolke. Archiv für Wärmewirtschaft, vol. 3, no. 9, Sept. 1922, pp. 165-169, 1 fig. Mathematical derivation of heat law, its general applicability and practical importance.

TIME STUDY

DAY WORK SHOP. Time Study in the Day Work Shop, Howard W. Dickson. Indus. Management (N.Y.), vol. 64, no. 5, Nov. 1922, pp. 262 and 318. By installing time-study methods, records kept show average increased production of 50 per cent accompanied by lowering of costs in spite of increased payroll.

TITANIUM

PROPERTIES AND USES. Titanium, Robert J. Anderson. U.S. Bur. of Mines Reports of Investigations, no. 2406, Oct. 1922, 12 pp. Notes on physical and chemical properties; uses for incandescent lights, dyes and mordants, colouring porcelain, pigments, smoke screens; preparation of pure titanium; minerals and ores; manufacturer of alloys; use in steel and iron metallurgy; bibliography.

TOLERANCES

GERMAN STANDARDS. The Introduction of the New D1 Standard Allowances in Fine Mechanics and the Economic Limits for Their Application (Die Einführung der neuen D1-Norm-Passungen in die feinmechanische Technik und die wirtschaftlichen Grenzen bei der Anwendung), G. Leifer. Zeit. für Fernmeldetechnik, vol. 3, nos. 5 and 6, May 16 and June 16, 1922, pp. 68-75 and 89-92, 34 figs. Discusses application of allowance system developed by the German Industry Committee on Standards (NDI) to precision tools.

TOOLS

SMALL, STANDARDIZATION OF. Standardization of Small Tools, Carl J. Oxford. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 721-723 and 777, 2 figs. How first cost of small tools can be greatly lowered, without sacrificing their efficiency, by adoption of standards that will permit their manufacture on quantity basis.

TRANSFORMERS

MILLION-VOLT. A Million Volt Testing Set, A. B. Hendricks, Jr. Am. Inst. Elec. Engrs.-Jl., vol. 41, nos. 10 and 11, Oct. and Nov. 1922, pp. 876 and 876-883, 45 figs. Oct.: Design of three 500-kw., 578,000-volt transformers; illustrations of single-phase arcs. Nov.: Three-phase arcs: effect of parallel reactance in low-voltage and series resistance in high-voltage circuit; wave forms.

TESTING. Testing Transformers for Characteristics, R. F. Gooding. Elec. World, vol. 80, no. 18, Oct. 28, 1922, pp. 935-938, 1 fig. Compact and convenient compilation of methods, instruments required and sequence of tests for engineer who is occasionally but not regularly engaged in such work.

TUNNEL

CONCRETE LINING. Concreting Liberty Highway Tunnels. Pub. Works, vol. 53, no. 8, Oct. 1922, pp. 198-200, 2 figs. Placing about 9000 yd. of concrete in more than two miles of wide vehicular tunnels from four portals at average rate of 181 yd. per day with dump cars, shoveling, and pneumatic process.

TURBO-ALTERNATORS

DESIGN. Construction of Turbo-Alternators of Great Power in Great Britain (Progrès réalisés dans la construction des turboalternateurs de grande puissange en Grande Bretagne), R. Dowson and J. Rosen. Revue Universelle des Mines, vol. 15, no. 2, Oct. 15, 1922, pp. 93-119, 16 figs. partly on supp. plate. Details of construction including Stator, rotor, cooling, peripheral speed, ventilation, Parsons turbines.

TURPENTINE

SUBSTITUTE. The Properties and Composition of Dekalin, J. B. Coleman and P. Bilham. Chem. Age, (Lond.), vol. 7, no. 175, Oct. 21, 1922, pp. 554-555, 1 fig. Investigation by Building Research Board of Dept. Sci. and Indus. Research on physical and chemical properties of dekalin to show its suitability or otherwise as substitute for turpentine.

V

VALVES

STANDARDS FOR. Report of the German Industry Committee on Standards (Mitteilungen des Normenausschusses der Deutschen Industrie). Maschinenbau, vol. 1, no. 11, Sept. 9, 1922, pp. 715-735, 21 figs. Proposed standards for straight-way valves.

VENTILATION

DEPARTMENT STORES. A Study in Department Store Ventilation, J. M. Robb. Heat and Vent. Mag., vol. 19, no. 10, Oct. 1922, pp. 40-43, 5 figs. Describes new methods for eliminating dust and providing for proper air diffusion, taking department stores as example.

VOCATIONAL EDUCATION

DEVELOPMENTS. Vocational Education. Monthly Labor Rev., vol. 15, no. 4, Oct. 1922, pp. 110-112. Industrial rehabilitation in Wisconsin; vocational guidance in Alsace and Lorraine.

W

WAGES

HOURS OF LABOUR AND. Wages and Hours of Labour. Monthly Labor Rev., vol. 15, no. 4, Oct. 1922, pp. 59-69. Wages and hours in woollen and worsted industry; wages and cost of living in Aden, Arabia; average earnings per shift in German coal and lignite mines; railway shopmen's wages in Great Britain; 48-hour week in British industry.

WASTE ELIMINATION

METAL INDUSTRY. Waste and Inefficiency in the Metal Industry, A. J. G. Smout. Metal Industry (Lond.), vol. 21, nos. 17 and 18, Oct. 27 and Nov. 3, 1922, pp. 385-387 and 409-412. Economies of metallurgy. Losses in the metallurgy; recovery of tin from waste products; zinc losses; coal conservation; froth flotation of coal; efficiency of turbo-alternator.

WASTE HEAT

UTILIZATION. Utilization of Waste Heat in Industrial Plants (Über Abwärmeverwertung in Industrieanlagen), Leo Walter. Zeit. des Österr. Ingenieur-u. Architekten-Vereines, vol. 74, nos. 40-42, Oct. 20, 1922, pp. 185-191, 17 figs. Application to heating feedwater, steam production, drying, heating, etc., and description of apparatus used.

WATER GAS

PLANTS. Baltimore's Water Gas Plant. Gas Age-Rec., vol. 50, no. 17, Oct. 21, 1922, pp. 535-537, 6 figs. Notes on Spring Gardens works of Consolidated Gas, Electric Light and Power Co. with description of new work and extensions.

WATER POWER

FEDERAL POWER ACT. The Operation of the Federal Water Power Act, O. C. Merrill. Am. Soc. Civ. Engrs.-Proc., vol. 48, no. 9, Nov. 1922, pp. 1758-1765. Discusses essential features and fundamental basis of statute passed by Congress in 1920, manner in which it is operating and results that are being accomplished.

SOCIAL AND ECONOMIC ASPECTS. Social and Economic Aspects of Hydro-Electric Power, Charles D. Marx, Am. Soc. Civ. Engrs.—Proc., vol. 48, no. 9, Nov. 1922, pp. 1781-1787. Writer seeks to present facts demonstrating important role which it is playing and will continue to play as factor in human development.

WAVE POWER

TRANSMISSION. Wave Power Transmission, W. Dinwoodie. North-East Coast Instn. Engrs. and Shipbuilders, advance paper, no. 2339Q, for meeting Oct. 27, 1922, 13 pp., 9 figs. Discussion of theory and description of practical machines and appliances which are outcome of these considerations.

WATER TANKS

WOODEN, STEEL AND CONCRETE. Relative Merits of Wooden, Steel and Concrete Tanks. Railway Rev., vol. 71, no. 17, Oct. 21, 1922, pp. 557-560. (Abstract.) Report of Committee to Am. Ry. Bridge and Bldg. Assn.

WATERWAYS

GREAT LAKES-ST. LAWRENCE. Report on Great Lakes-St. Lawrence Deep Waterway. Eng. World, vol. 21, no. 5, Nov. 1922, pp. 285-287. Report of commission showing practicability of lakes-to-ocean project.

WELDING

BUTT. Butt Welding, W. Remington. Am. Welding Soc. Jl., vol. 1, nos 8-9, Aug. Sept. 1922, pp. 84-93. Deals with slow butt method, flash method, and part flash part slow butt method.

CAST IRON. Cast Iron Welding. Am. Welding Soc. Jl., vol. 1, nos. 8-9, Aug.-Sept. 1922, pp. 37-46, 17 figs. Notes on field for cast-iron welding; control of composition and characteristics of iron castings; influence of impurities on properties of cast iron; factors affecting cast-iron welds. Joint report of electric arc, gas and thermit welding research committee of Am. Bur. of Welding.

HYDE PROCESS. Adaptability of the Hyde Welding Process to Steel Engine Cylinder Construction, E. V. Schaal. Air Service Information Circular, vol. 4, no. 364, Aug. 15, 1922, 4 pp., 5 figs. To determine feasibility of Hyde welding process and its effect upon structures of 1020 and 1045 steel, with view toward adoption for engine-cylinder construction.

RAIL JOINTS. Cast Welded Joints in Brooklyn, G. H. McKelway. Elec. Ry. Jl., vol. 60, no. 17, Oct. 21, 1922, pp. 660-662, 6 figs. Describes method of making cast welded joints in girder rail in paved streets.

See also Electric Welding, Arc; Electric Welding, Resistance; Oxy-Acetylene Welding; Thermit Welding.

WIND TUNNELS

MCCOOK FIELD. Description of McCook Field 5-Foot Wind Tunnel, E. N. Fales. Air Service Information Circular, vol. 4, no. 341, Mar. 15, 1922, 9 pp., 9 figs. New wind tunnel of Air Service Engineering Division has for object to afford more convenient aerodynamic testing facilities. Notes on cost of plant, power plant, power economy, general shape, experimental portion, balances, propellers, measurement of velocity, etc.

WOOD PRESERVATION

DECAYING ROOFS. The Preservation of Decaying Wood Roofs, Wendell S. Brown. Mech. Eng., vol. 44, no. 11, Nov. 1922, pp. 709-712, 6 figs. General theory of wood decay; methods employed in preserving wood roofs; economic considerations in prolonging useful life of repaired roofs. (Abridged.)

MINE TIMBERS. Preservatives for Mine Timbers, C. M. Gorman. Coal Industry, vol. 5, no. 10, Oct. 1922, pp. 442-443. Describes new compound, under trade name of Ac-zol, which appears to eliminate many disadvantages of old methods.

PROCESSES. Processes for Preserving Wood. (Die Holzkonservierungsverfahren. Kunststoffe, vol. 12, no. 16, Aug. 2, 1922, pp. 124-125, 3 figs. Reviews processes available and describes those depending upon impregnation with tar oil or with salt solutions and their application.

Z

ZINC ALLOYS

DIE-CASTING. Insuring Permanence in Zinc-Base Die-Casting Alloys, H. E. Brauer and W. M. Peirce. Raw Material, vol. 5, no. 9, Oct. 1922, pp. 337-340, 10 figs. Discusses failures of zinc castings by cracking and swelling, and gives results of experiments to overcome these failures.

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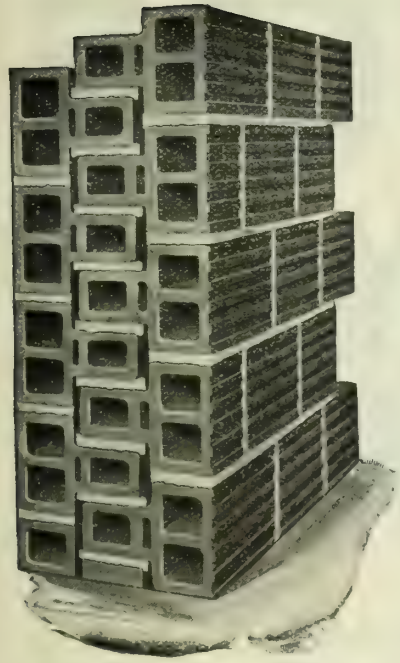
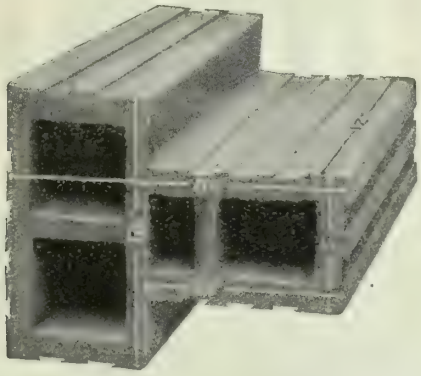


USED FOR LOAD BEARING WALLS AND PARTITIONS TO REPLACE 13" SOLID BRICK



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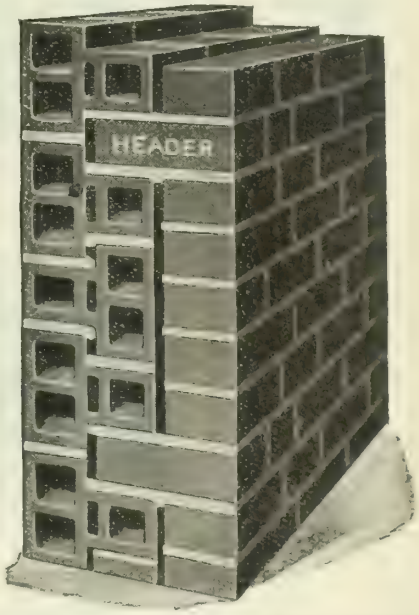
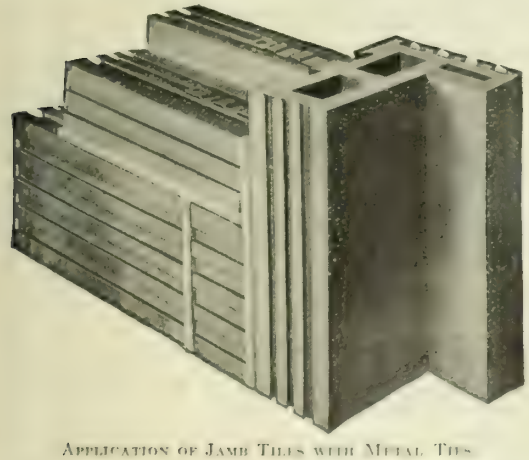
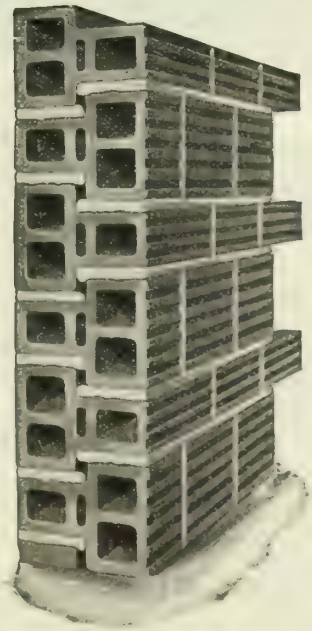


13" WALL: FOUR INCHES FACING BRICK WITH 8" INTERLOCKING TILE BACKING. USED FOR EXTERIOR LOAD BEARING WALLS, SCHOOLS, HOSPITALS, ETC. FOR SPANDREL WALLS OF STEEL OR CONCRETE FRAME B'LDGS. FOR RESIDENCE FOUNDATIONS.

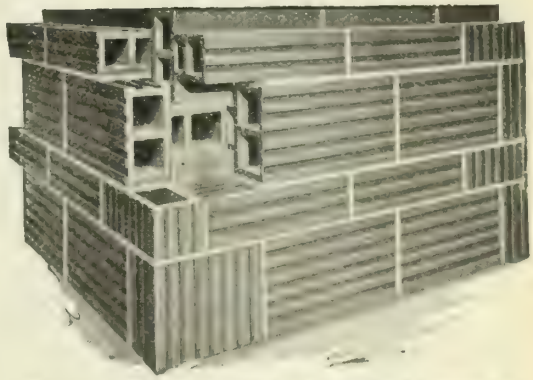


APPLICATION OF JAMB TILES WITH METAL TIES

It is the Vertical Webs that must carry the Loads. To get their full strength they must stand over each other. (Notice the cuts.)



9 INCH WALL. USED FOR LOAD BEARING WALLS, RESIDENCES, ETC., TO REPLACE 9" SOLID BRICK.



BONDING OF WALL AT CORNER. CORNER TILE OMITTED IN UPPER PART TO SHOW MANNER OF BONDING.

WEIGHT. Weight of wall, inclusive of mortar, 60 pounds per cubic foot, one half the weight of brick wall. Load allowance, Toronto Building Code, 7 tons per running foot of wall. Factors of safety 9.

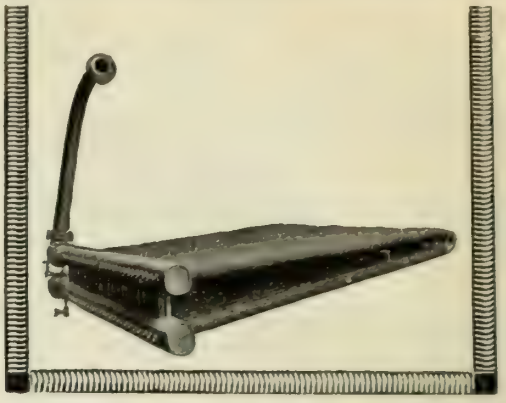
ORDERING. Each Interlocking Tile displaces 444 cubic inches, and is therefore equal to 5½ Toronto Brick or 7 American Standards. For 9" walls 2.1 Tile lay one square foot (face of wall measure); 3.3 Tile lay one square foot of 12" wall. When Interlocking Tile is used to back up Face Brick the above quantities are reduced 10% by the Through Brick Headers.

INFORMATION. Cost Data, detail drawings, catalogs, samples and prices on request.

WE ALSO MANUFACTURE TERRA COTTA PARTITION TILES.

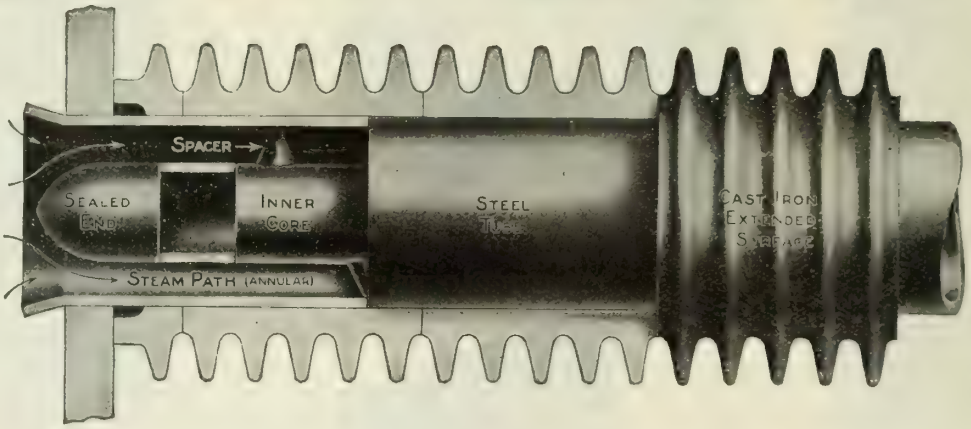
Twenty years without an equal and now in use in over 4000000 HP of Stationary Boilers

Typical Foster Superheater for use in vertically baffled Horizontal Water tube Boilers.



FOSTER SUPERHEATERS

Typical Foster Extended Superheating Surface. (Patented.)



A short uncovered portion at each end of the tube permits the ends to be inserted and expanded into the connecting headers.

Advantages of Foster Extended Superheating Surface

The unique construction of superheating surface in Foster Superheaters has for twenty years had no equal for its purpose and has been more used than all other designs put together, the following reasons for its supremacy should be thoroughly understood by all interested in the production and use of superheat.

1. Seamless Steel Tubes Protected from Corrosion by Cast Iron Rings which also increase the Heat-Absorbing Surface.
2. Four to Six times as much Heat Absorption Surface as obtained with Bare Tubes. High rate of Heat Transfer with Foster Extended Surface Permits Higher Degrees of Superheat to be obtained within the Space Available within the Setting than can be secured with any Other Type of Superheater.
3. Reserve Heat Stored for Sudden Demands in the mass of metal in the Heating Surface. It is instantly available for maintaining constant Superheat and for flashing any Moisture into Steam.
4. No Flooding is necessary in Starting or Stand-by Periods.

Special Applications of Foster Heating Surface.

In addition to the use of Superheated Steam for Economy in Power Plants Many Uses Have been found for Foster Superheaters. Low Pressure or Exhaust Steam Superheated may be used in place of High Pressure Steam.

Foster Superheaters, Preheaters, Cracking Stills etc. have been widely used in Industrial Processes involving the Heating or Heat Treatment of Oils, Chemical Gases, Liquids, Air etc.

If you have in mind any Special Application of Foster Heating Surface, we will be glad of the opportunity to make suggestions, and will regard as confidential any information placed with us.

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OF
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NO SUPERVISION
NO MAINTENANCE EXPENSE.
MINIMUM POWER LOSSES
MINIMUM CAPITAL OUTLAY.

Send particulars of your Power Factor problem for analysis, estimate of economies effected and earnings on Static Condenser investment.

Do you need our Static Condenser Bulletin H 98 ?

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We Give Guarantees under Bond as to Watertightness of our lines.
We guarantee under Bond to maintain for One Year the Pipe Lines that we Build.

WE SELL PIPE LINES not unit lengths of pipe.

Pipe Lines of Reinforced Concrete

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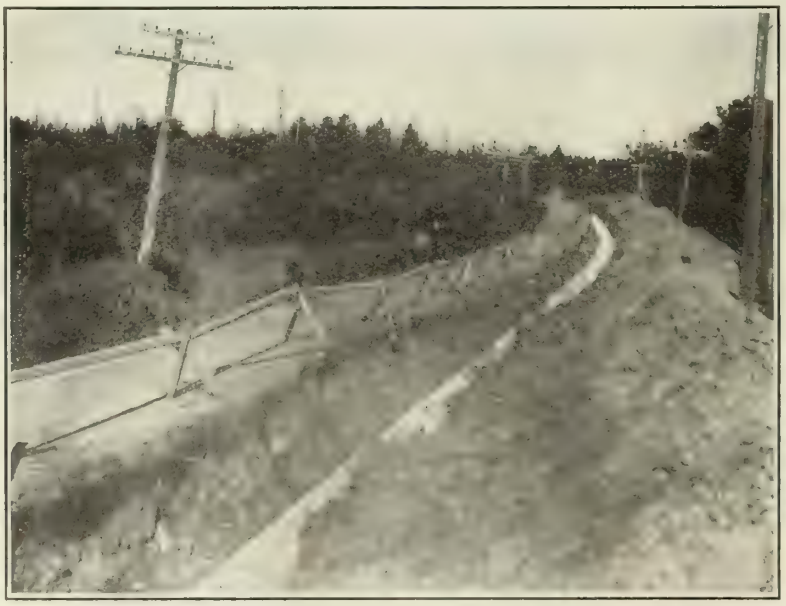
Lock Joint Pipe Company Design and Construction



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Pressure Pipe Needs.

CANADA LOCK JOINT PIPE Co., LIMITED

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Consult the advertiser, his information is valuable.

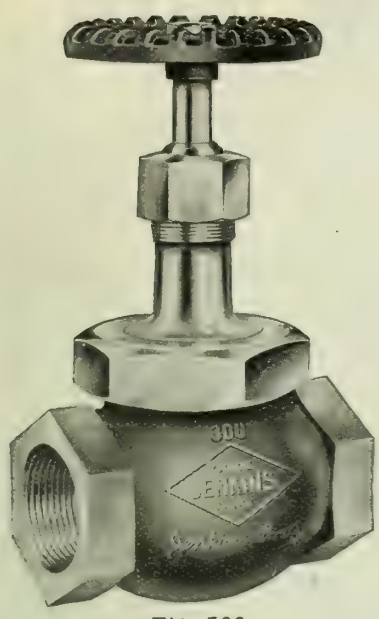

Fig. 500
"STERLING"
Regrinding Valve
Suitable for Working Pressures
up to 300 lbs.

Regrinding Valves
that give satisfaction

In "Reliance" and "Sterling" Regrinding Valves we offer a complete line of dependable valves of the regrinding type.

These valves are made from the very best materials and every detail of their construction is in keeping with the standard of workmanship which has made the name "JENKINS" a mark of valve dependability.

"Reliance" and "Sterling" Regrinding Valve are giving excellent service wherever installed.

Write for literature illustrating and describing these Jenkins Valves in detail.

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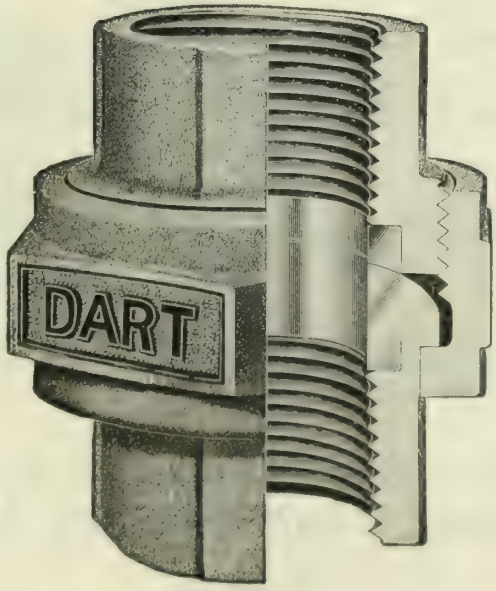
Dart

Dart Unions can be used for almost any pipe line. They can be used over and over again, because they do not deteriorate. Note the heavy Malleable castings and the bronze to bronze seats.



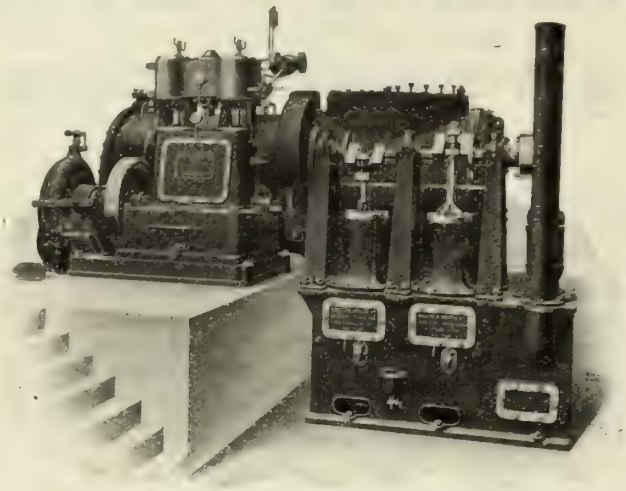
Dart Unions are carefully threaded to standard, and any part of a Dart Union is interchangeable if desired. The word "Dart" appears on the nut of every "Dart Union".

Bronze to Bronze at the Joint.

Once Tight they Never Leak.

Manufactured by DART UNION CO., Limited, Toronto

BELLISS & MORCOM LTD., BIRMINGHAM, ENGLAND



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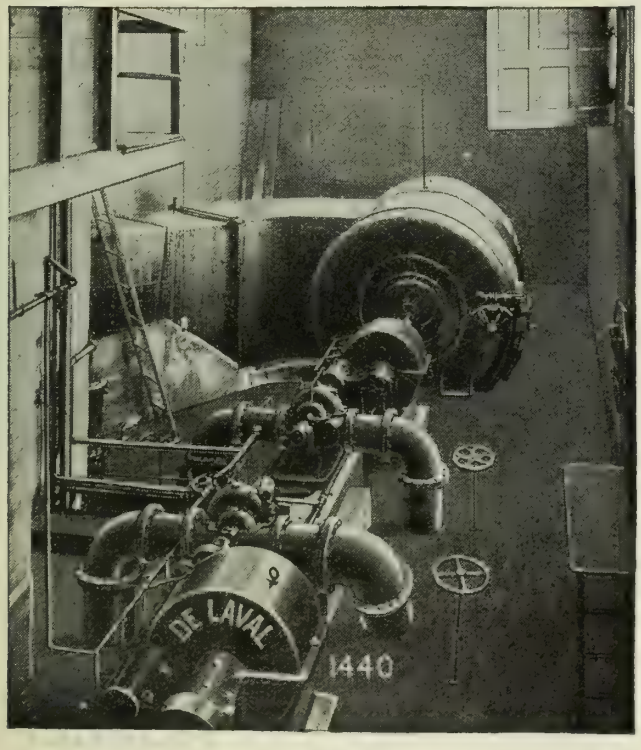

THE City of Cornwall, Ont., was formerly supplied by triplex and duplex pumps driven by a horizontal hydraulic turbine, with steam driven pumps for emergency service. Having plenty of water available under low head, the City installed two De Laval centrifugal pumps driven by low speed water turbines. Each pump can handle the normal pumping load with a capacity of 3,500,000 gallons per day against a service head of 180 it. and operates at a normal speed of 1670 R.P.M. in order to obtain the inherent high efficiency of the De Laval centrifugal pump. The pumps are driven through De Laval double helical speed increasing gears by water turbines operating at their normal speed of 200 R.P.M., with a loss in transmission of power from turbine shaft to pump shaft of less than 1½%. Through a simple piping arrangement, the two pumps can be connected in series at a moment's notice to deliver over 4,500,000 gallons per day against a head of 308 ft. for fire protection.

Read our book W-103 "Ten Years Progress in Water Works Pumps."

DE LAVAL STEAM TURBINE COMPANY

TURBINE EQUIPMENT CO., LTD.
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TAYLOR ENGINEERING CO., LTD.
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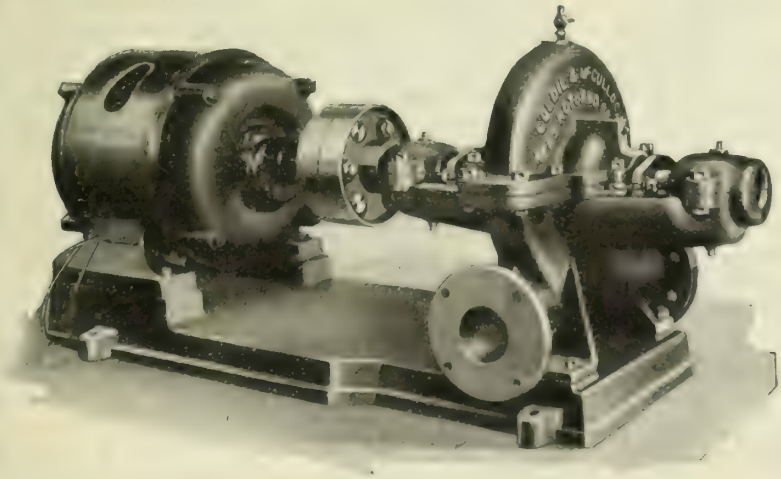

This type is built for capacities up to 1000 Imperial Gallons per minute.

"V" TYPE REES RoTURBo

Patent Pressure Chamber Pumps

These Pumps embody the advantages of our several Rees **RoTURBo** Patents and improvements. They are very compact and, like all other types of Rees Pumps, are self-regulating and highly efficient.

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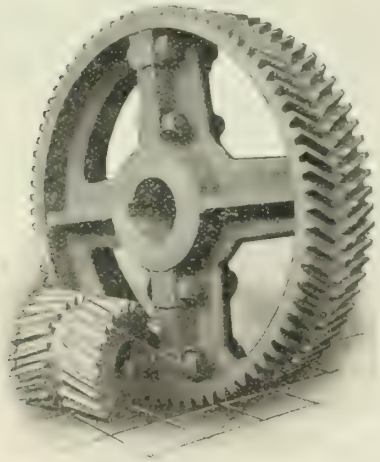

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GEAR DATA FOR YOUR NOTE BOOK

Cut this out - more coming later

"DON'TS"—ON THE USE OF GEARS

From the Hamilton Gear and Machine Co., Toronto

Don't run two soft, low carbon steel gears together. They will not wear well. Use harder steel or two different metals.

Don't use moulded or cast tooth gears for any but the slowest speeds and roughest service. Use Cut Gears.

Don't let oil or water on a rawhide pinion. For damp or oily places use Celoron which withstands steam, oil or water.

Don't use cast iron pinions. A pinion tooth is weaker than a gear tooth of the same metal, due to its form. Therefore use a tougher material for the pinion.

Don't use brass for gears. A few cents a pound more will give you bronze, which is more than double as good. Use No. 1 Government bronze: 88% copper, 10% tin and 2% zinc.

Don't forget that the Hamilton Gear & Machine Co. has the only real gear shop in this country; that their modern plant with heavy, up-to-date machinery is at your service in any emergency. Use telegraph or long distant 'phone.

Don't run gears unguarded, if there is any possible way to put a shield around them. This is to protect the gears from damage, whether you value your fingers or not.

Don't omit details when asking prices or placing orders for gears. The fuller the information the better price and delivery you will get.

Write for Quotations

Hamilton Gear & Machine Co.

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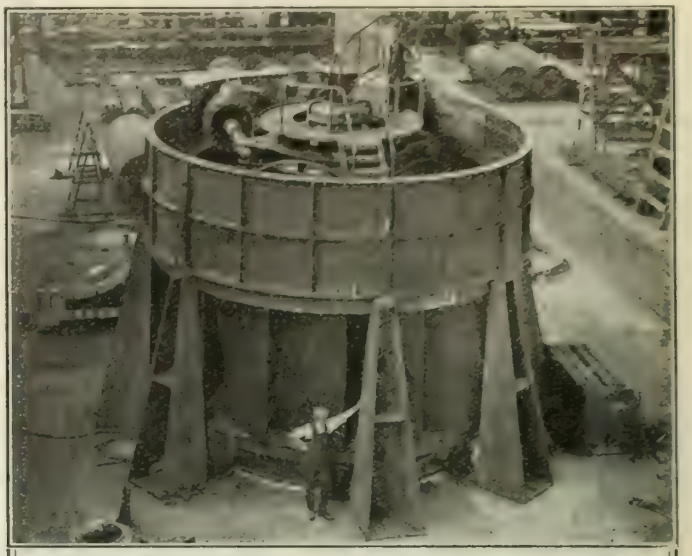
Montreal Office - 414 St. James St.



One of two 28,000 units, built in our works at Lachine, Que., for Manitoba Power Co., Limited. Working head 56 ft.

The Moody Diagonal Type Runner

WAS selected for the installation shown above, largely on account of its high speed under the given head, viz., 138.5 r.p.m., against 75 r.p.m. with a typical Francis runner of the same capacity. This means a notable reduction in weight throughout the entire installation, lighter runners, smaller generators, smaller capacity cranes, etc., all of which features tend directly to cut down the initial cost, and make the development of low and medium heads attractive investments.

Hydraulic Engineers are invited to send for our new 70 page book "Progress in Hydraulic Engineering, 1922" or for estimates on any proposed development.

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The Brush It Needs!

WHICH is the most suitable brush for any machine depends on correct analysis of all the relevant facts. That is why the Columbia Data Sheet Service improves motor and generator efficiencies. The essential facts are ascertained by Columbia Brush Specialists. These facts are carefully analyzed by the Columbia Board of Engineers. The Columbia Pyramid Brushes specified as correct for each unit are guaranteed to give satisfactory service.

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SUPERHEATERS

An Important Advance in Superheater Engineering

THE important features embodied in the design of the ELESCO Superheaters in the 12-1890 H.P. Boilers at the Hell Gate Plant of the United Electric Light & Power Company, New York City, may be briefly summarized;—

- 200° F. superheat at a low first cost.
- Safe gas temperature zone location.
- Minimum fluctuation in steam temperature at different boiler ratings.
- High steam velocities with minimum pressure drop.
- Equal distribution of steam through the superheater, at all ratings.
- Breaking up of possible slugs of water.
- Fewest possible number of steam tight joints.
- Elimination of baffle joints between superheater and boiler.

The performance of the ELESCO Superheaters in this plant fulfills the exacting requirements of a central station of large capacity.

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Works at Sherbrooke, Que.

Western Representatives: The Taylor Engineering Co., Ltd., Vancouver, B.C.

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Total value of assessable property	$120,540,965
Building permits issued, 1921	3,693,397
Bank clearings, 1921	302,237,674
Port Statistics, Imports 1921	26,663,862
" " Exports, 1921	28,799,768
" " Duty collected, 1921	4,772,693
Number of Industries and Workshops	835
Number of Industrial Employees	18,000
Value of Production in 1919	33,126,504

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QUEBEC—offers exceptional opportunities for new industries with nine railways entering the City and six miles of deep water front.

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Manufacturers desiring any information as to sites and advantages.

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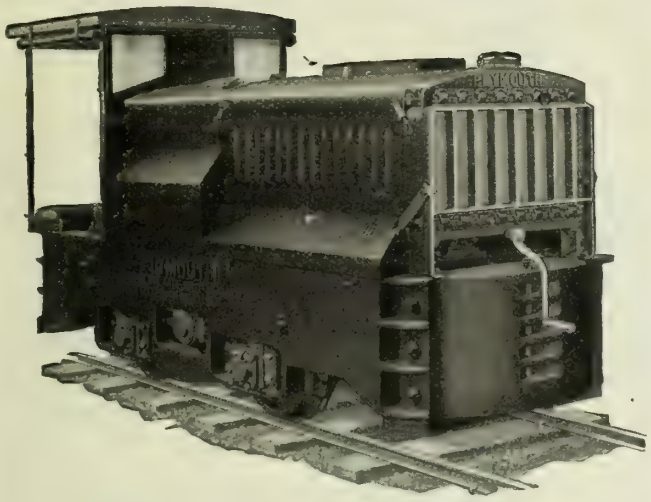

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Cinders Eliminated!

The Sturtevant cindervane fan not only eliminates cinders but speeds production by increasing draft.

Our sales-engineers will prove to you these and other advantages of Sturtevant equipment.

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SELF ALIGNING PLUMMER BLOCKS.
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THRUST BEARINGS.
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Toronto

PYROMETERS

Cambridge FÉRY RADIATION PYROMETER (Portable Pattern)

(Described in List 190)

FÉRY RADIATION PYROMETERS

Illustration shows a portable Féry radiation pyrometer outfit, consisting of Féry telescope and portable indicator, with tripod, leads, and travelling case. For permanent installations it is convenient to substitute a wall-type indicator, for the portable indicator, and a fixed iron support for the tripod stand. Indicators for multiple-point outfits can be mounted on black enamelled slate switchboards, with switches for connecting various telescopes, in exactly the same way as thermo-electric indicators. Recording or combined indicating and recording outfits for one or more points are also supplied.

If desired the indicator or recorder used with the Féry radiation pyrometer can be calibrated with a second scale for use with one of our platinum, platinum-rhodium, or Titan base-metal thermo-couples. By using this combination a wide range of temperatures can be covered, the thermo-couple being used for temperatures to 1000° C., above which the couple is removed and replaced by a Féry telescope calibrated for any required range.

LIST 190—RADIATION & OPTICAL PYROMETERS
LIST 194—THERMO — ELECTRIC PYROMETERS

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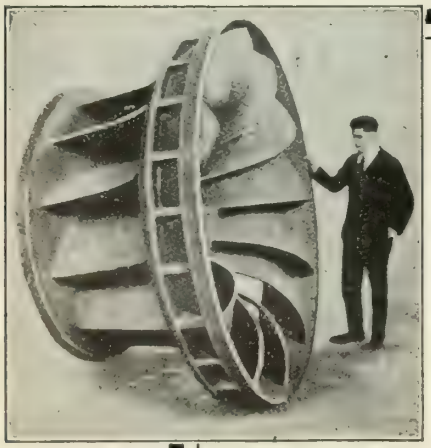

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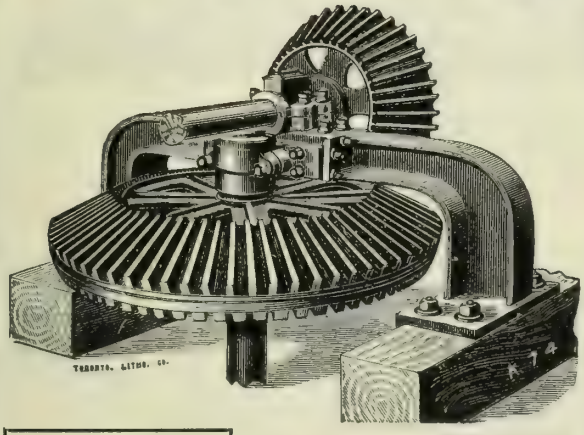

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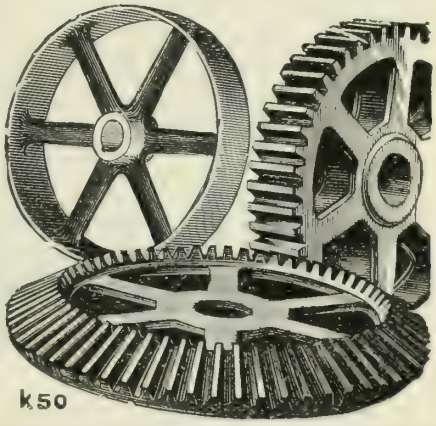

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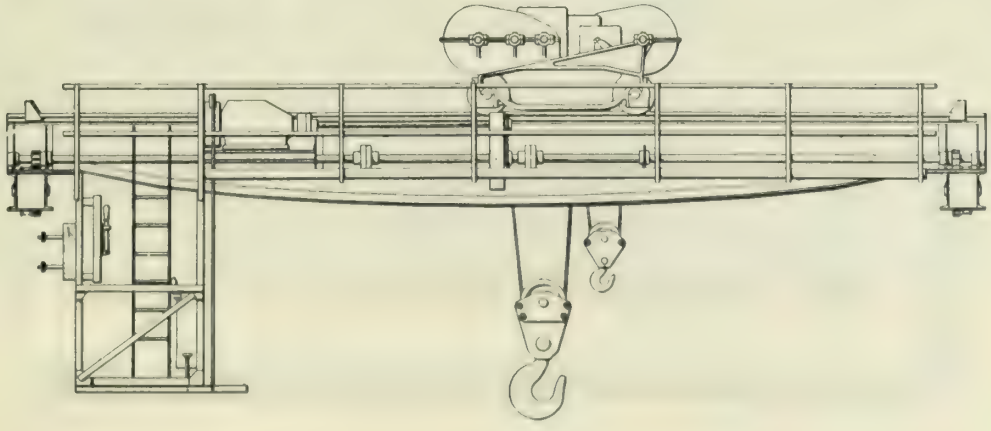

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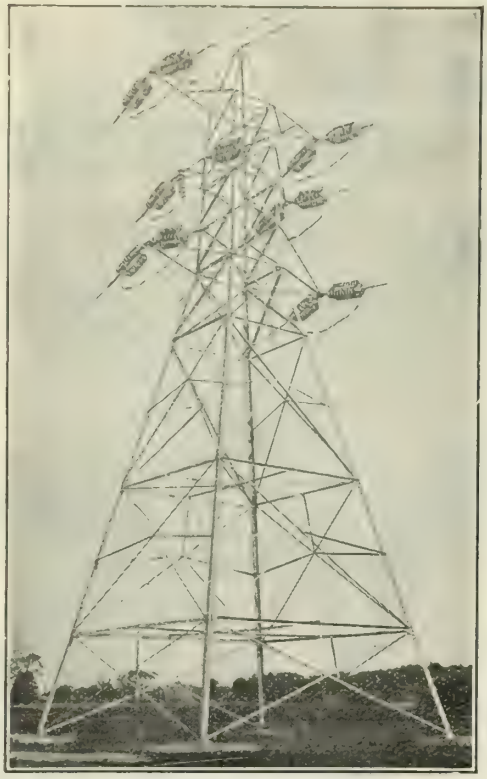

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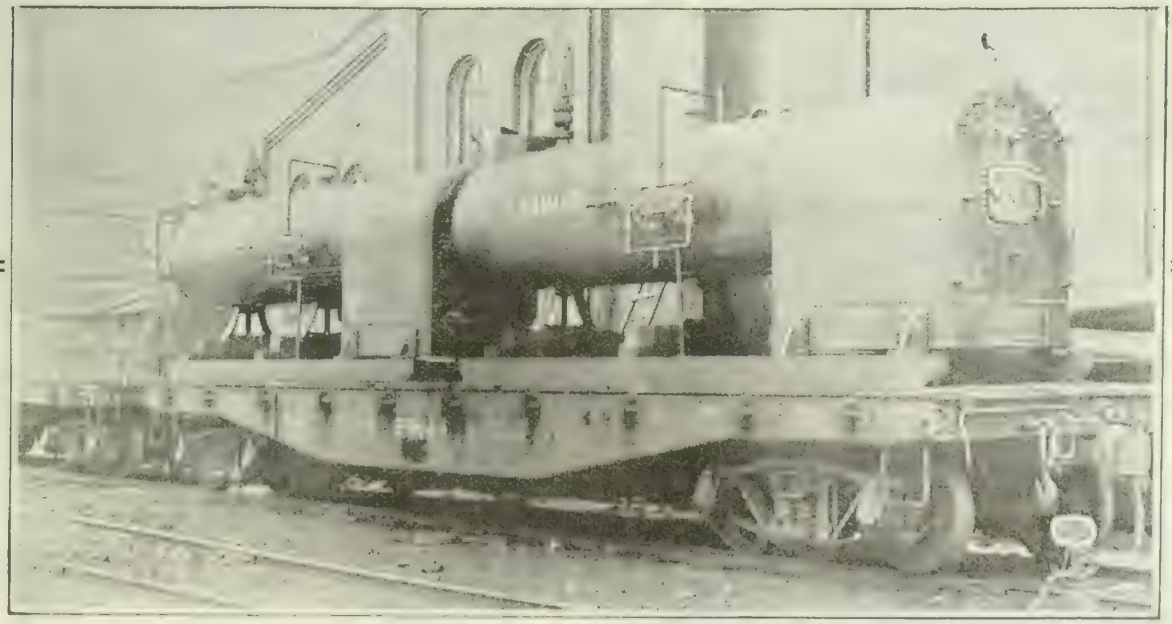

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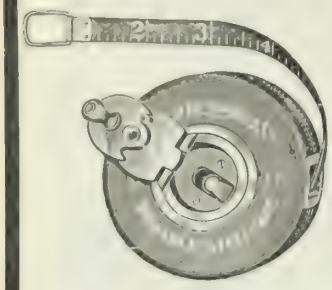

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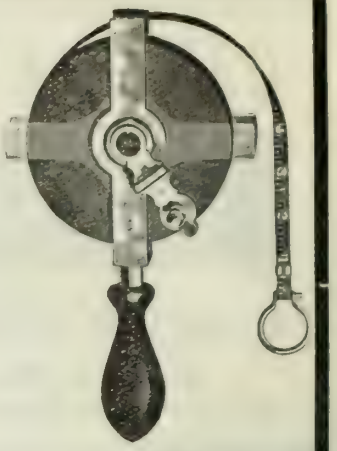

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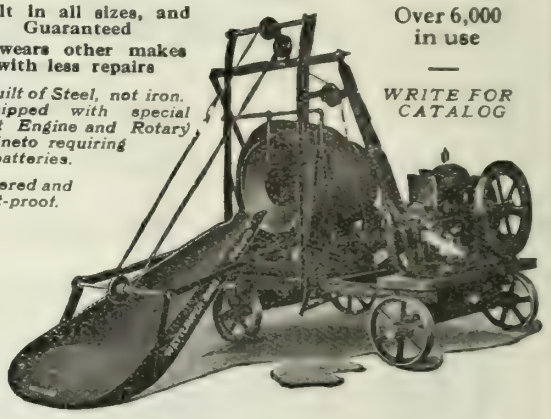

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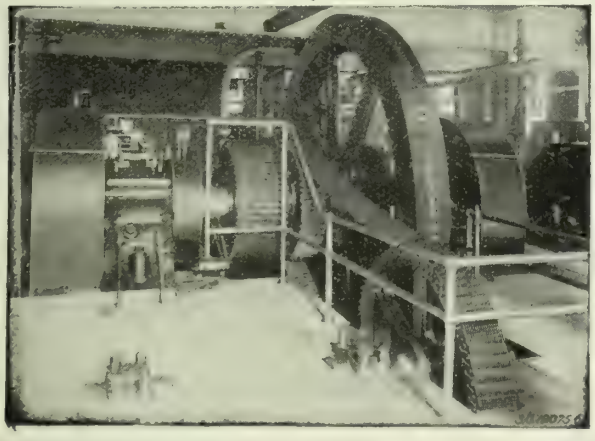

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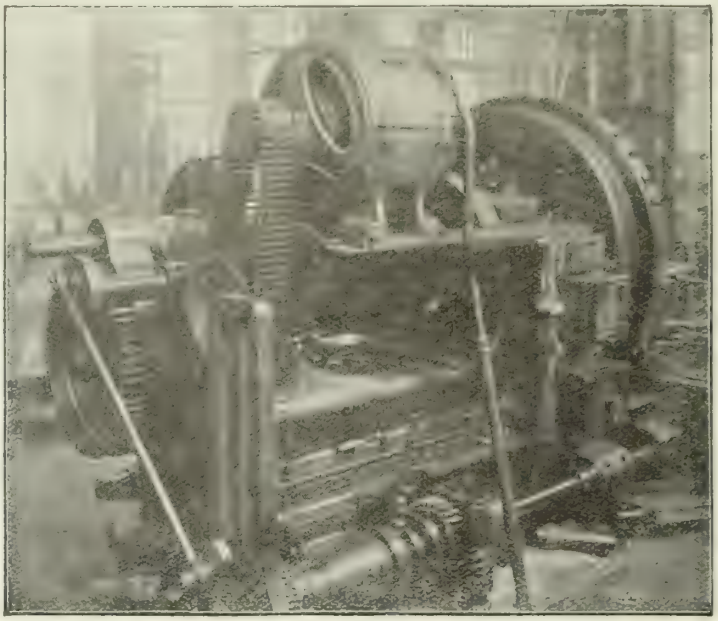

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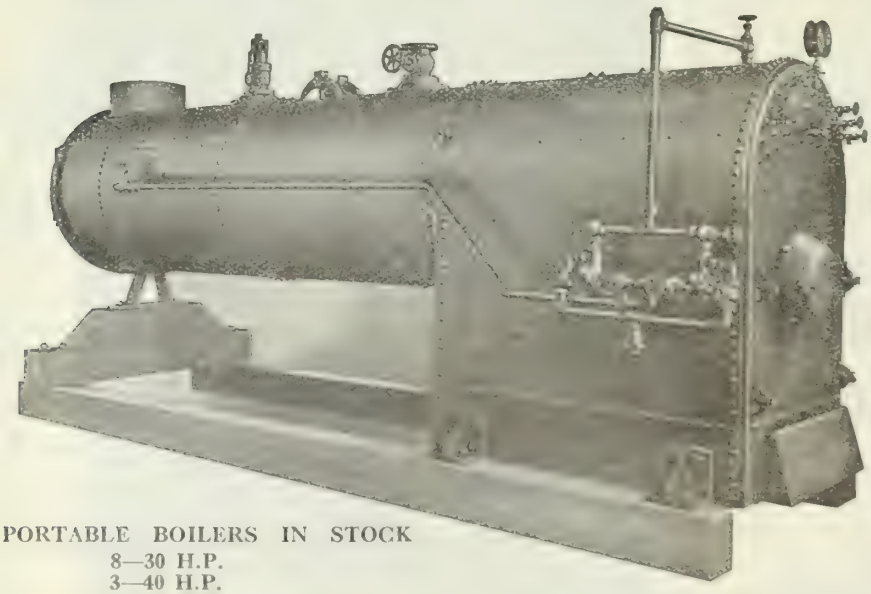

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By order,

R. C. DESROCHERS, Secretary.

Department of Public Works, Ottawa, December 7, 1922.

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FEBRUARY 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VI

No. 2

·BULLETIN·· №·7

·BURLINGTON·STEEL·Co.·LTD.·

RAIL CARBON REAL STRENGTH

·HAMILTON·ONT·

"THE·FRAYED·THREAD"

STEEL MANUFACTURERS ALL HAVE A BUG-A-BOO,—
A SKELETON IN THEIR CLOSET CALLED "PIPED STEEL".

WITH ALL THE REFINEMENTS IN MODERN STEEL MAKING, IT HAS NEVER BEEN FOUND POSSIBLE TO ELIMINATE PIPING ENTIRELY, AND IN EVERY FORM OF STEEL WORK ITS PRESENCE IS ALWAYS TO BE FEARED.

WE HAVE ALREADY EMPHASIZED THE FACT THAT RAIL-CARBON STEEL IS SUBJECTED IN ITS PRIMARY MANUFACTURE TO A VERY SEVERE INSPECTION TO GUARD AGAINST PIPING. THE INGOT FROM WHICH THE RAIL IS ROLLED IS CUT THROUGH HORIZONTALLY, AND THE TOP PORTION CONTAINING THE PIPING IS DISCARDED.

SUFFICIENT OF THE INGOT MUST BE DISCARDED SO THAT NO EVIDENCE WHATEVER OF PIPING WILL APPEAR IN THE BOTTOM PORTION RETAINED.

IN THE MANUFACTURE OF HEAVY ORDNANCE, THE INSPECTION GOES EVEN FURTHER, AND TO MAKE DOUBLY SURE ON THIS POINT, IT IS LAID DOWN THAT THE INGOT SHALL BE CUT VERTICALLY THROUGH THE CENTRE TO FIND OUT JUST WHERE THE PIPING STOPS.

A RAIL STANDING ON END IS SIMPLY AN ELONGATED INGOT AND THE FIRST OPERATION IN THE MANUFACTURE OF RAIL-CARBON BARS, IS TO SLIT THE RAIL FROM END TO END IN TWO PLACES.

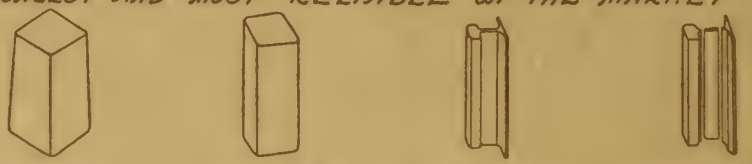
THIS AT ONCE EXPOSES ON THE SURFACE ANY PIPING THAT MIGHT HAVE CREPT PAST PREVIOUS INSPECTIONS, AND THE DEFECT AT ONCE BECOMES VISIBLE, AND THE MATERIAL CONSEQUENTLY IS REJECTED.

IF IT WERE NOT REJECTED THE DEFECTIVE MATERIAL WOULD JAM IN THE ROLLS AND CAUSE A SERIOUS DELAY.

JUST AS A FRAYED THREAD CANNOT PASS THROUGH THE EYE OF A NEEDLE NEITHER CAN A PIPED RAIL PASS THROUGH OUR ROLLS

IN OTHER WORDS, THE PRESENCE OF "PIPING" WITHIN THE THICKNESS OF A RAIL-CARBON BAR, IS JUST AS IMPROBABLE AS ITS PRESENCE IN THE STEEL OF THE "QUEEN ELIZABETH'S" 15 INCH GUNS.

THIS IS JUST ONE MORE REASON WHY RAIL-CARBON BARS ARE THE STRONGEST AND MOST RELIABLE ON THE MARKET TODAY.



·THE·INGOT· ·THE·BLOOM· ·THE·RAIL· ·THE·SLIT·RAIL·

SPECIFY RAIL-CARBON FOR REAL STRENGTH

·BULLETIN·№·8—4½·BILLION·VIBRATIONS.·

Merit Keeps Them on the Job

ON HEAVY tapping like this, P & W Staybolt Taps show their quality. They bite into the work with a precision and ease that makes them favorites with the men who use them.

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To meet all your boiler requirements, we build P & W Staybolt Taps in five standard styles, as well as Spindle Staybolt Taps with and without threaded end and also Combined Reamer and Tap to tap continuous hole in the reamer hole of the far boiler plate.

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These taps and our complete line of Small Tools are on sale at our offices in Boston, Philadelphia, Birmingham, Rochester, Cleveland, Detroit, St. Louis Cincinnati, Seattle, St. Paul, New Orleans; San Francisco.

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Let our engineering department co-operate with you in lowering trucking costs.

CANADIAN SKF COMPANY, LIMITED
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Normal View *Deflected View*

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Actual tests have proven that McCracken Sewer Pipe will resist the severe action of ordinary industrial wastes.

Let Mr. Sherer, formerly connected with the Board of Public Works of the City of Milwaukee give you his opinion of McCracken Sewer Pipe.

Read his letter:

"Few people realize the extent to which Concrete Sewer Pipe is used. Out of three hundred miles of Sewerage in Milwaukee, as near as I can learn, over two hundred miles is made of Concrete, which speaks well for a product of that kind. In all places where we had to replace the sewers that were put in in the early history of Milwaukee, we found that Concrete Pipe to be intact. For instance, only recently we were required to take up 12 inch pipe and replace it with 20 inch, and for the entire length that pipe was found to be in elegant condition—very much harder than when first placed there. There were no defects or flaws from one end to the other, and there was 1400 or 1500 ft. on that line of pipe. Our engineers of the Board of Public Works recommend Concrete Pipe to be the best, for the conveying of sewage, that is to be had."

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General Sales Agents

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Practically all the Concrete Sewer Pipe used by MILWAUKEE to-day is McCRACKEN SEWER PIPE

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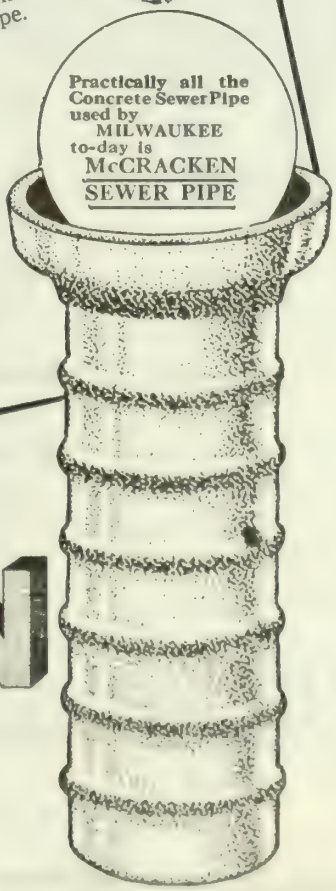
"McCracken" 6" to 24"
"Lock Joint" 27" to 108"



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Oxide Film Arresters—seven years of service is proof of their reliability

Dr. Steinmetz gave an exhibition of his artificial lightning-making machine for Mr. Edison's benefit, and in the accompanying illustration he is showing the visiting inventor broken porcelain insulators and a piece of a tree limb which he had shattered a few minutes before in a mimic lightning storm.

OK'd in the Laboratory

During Mr. Edison's recent visit to Schenectady he witnessed the operation of an Oxide Film Arrester used to protect a 2300-volt bus bar insulator when subjected to a discharge from the lightning generator developed by Dr. Steinmetz. When subjected to the same discharge without the arrester on the circuit, the insulator was shattered.

This test, using man-made lightning, is one of many which are made in the G-E Laboratory, where the Oxide Film Arrester was invented and perfected. Seven years of successful operating experience have thoroughly demonstrated the soundness of the theory, the thoroughness of the development, and the practicability of its design.

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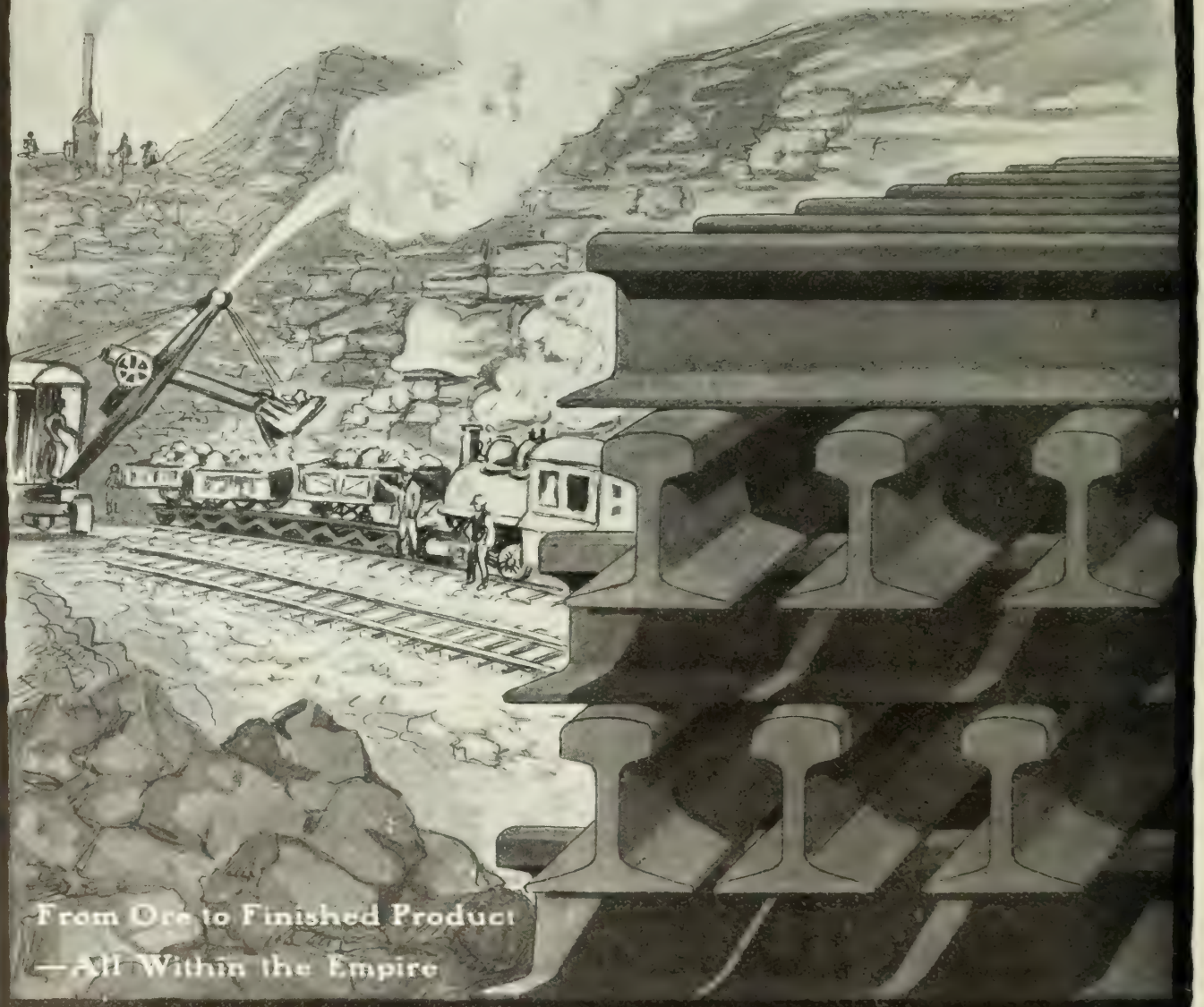

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Light Rails for Mines, Construction Operations and General Contractors' Use
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Help us Keep Down the Price
Order your Ford Today

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235

Water Supply Lines Built of Reinforced Concrete Pipe

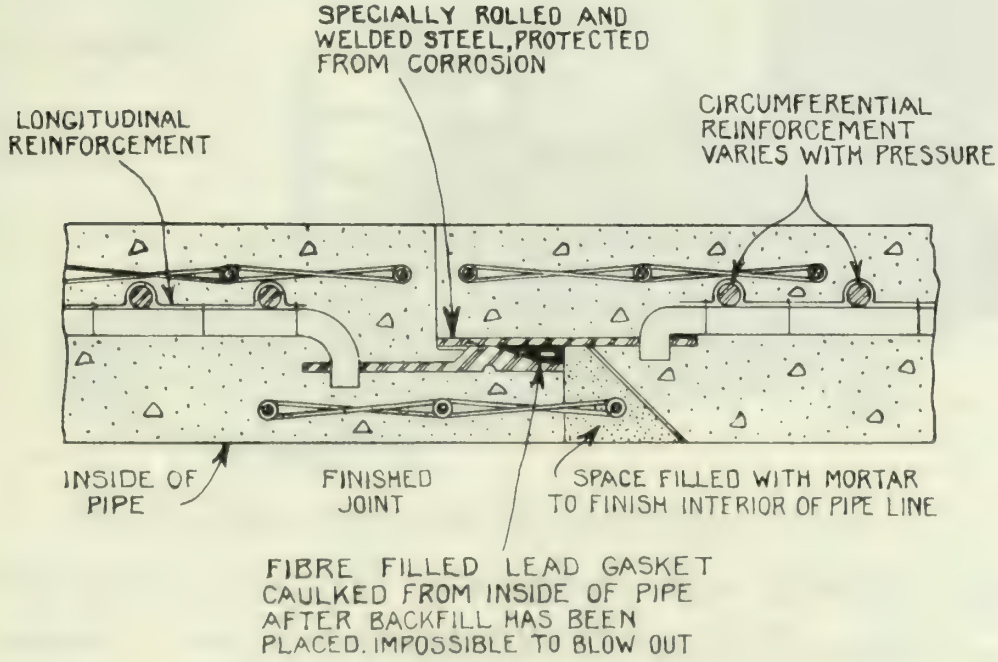
— ARE —

Permanent, Strong, Watertight, of Large Carrying Capacity, Economical, Founded on Experience.

Every Joint is a True Expansion Joint

— AND —

Settlement of backfill or of foundation cannot cause loss of water at the joint.



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The Taylor Stoker was the first underfeed stoker to use the Rotary Ash Discharge.

Notice how many stokers now include this idea.

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22,680 rated boiler horsepower forms the first unit of this station which was designed by Thos. H. Murray, Inc. It is all Taylor Stokered.

The Taylor Stoker

is standard equipment for many industries and for lighting and power stations from the largest to the smallest, or wherever the power problem consists of producing steam at the lowest costs.

Money can't buy a better Stoker.

Ask today for a copy of our new booklet, The Rotary Ash Discharge.

THE TAYLOR STOKER COMPANY, LTD.

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—and it's Koehring heavy-duty built.

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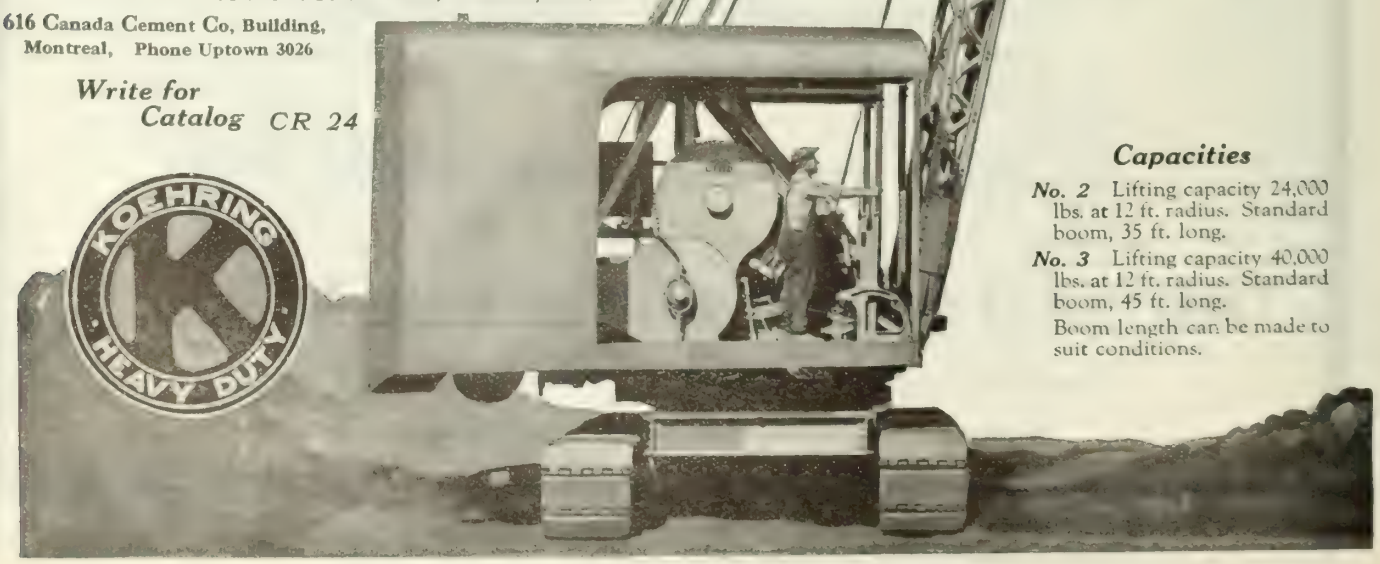
Montreal, Phone Uptown 3026

Write for Catalog CR 24



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Boom length can be made to suit conditions.

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—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

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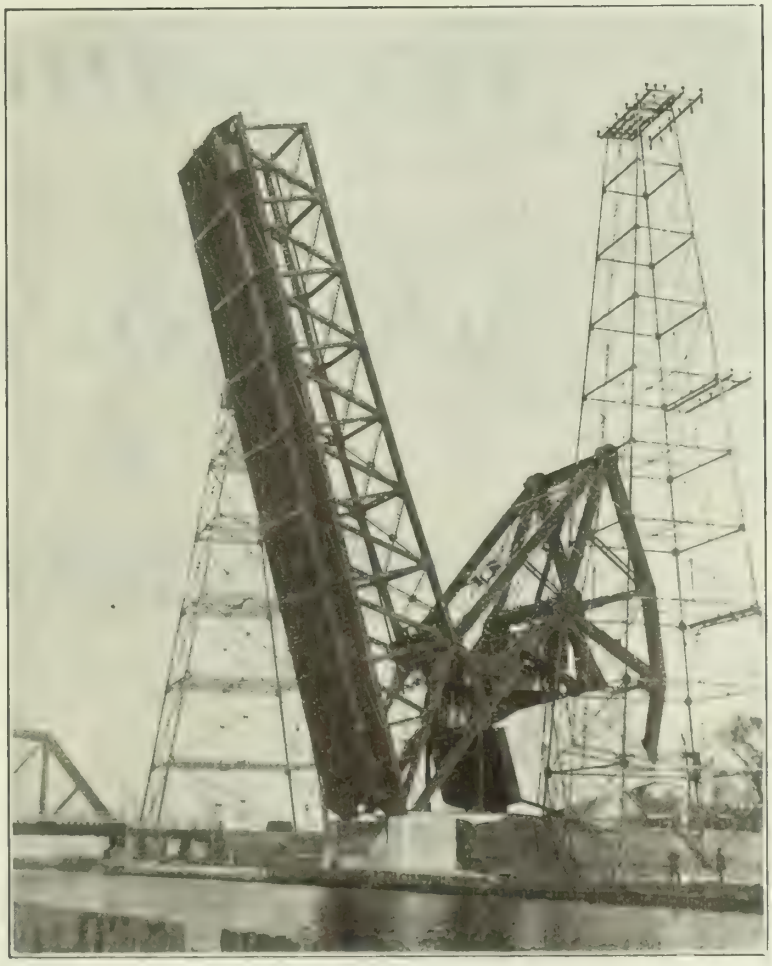

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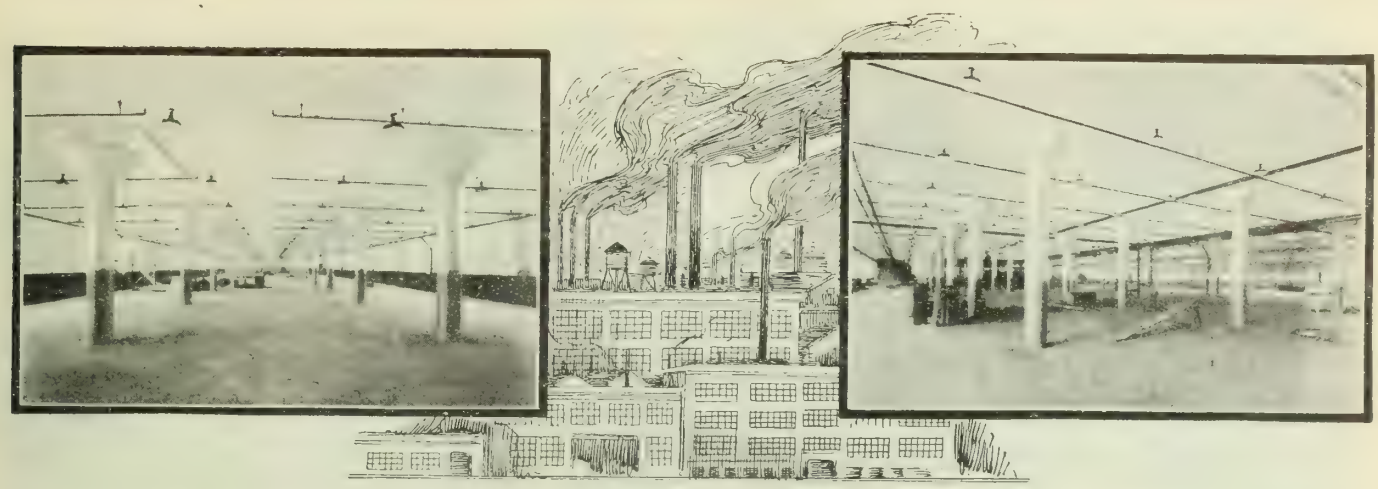

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The user of ***Sta-White*** is assured of a finish that retains its whiteness year after year. This is not a mere promise, but a statement of fact, backed and demonstrated by service records.

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D31

The
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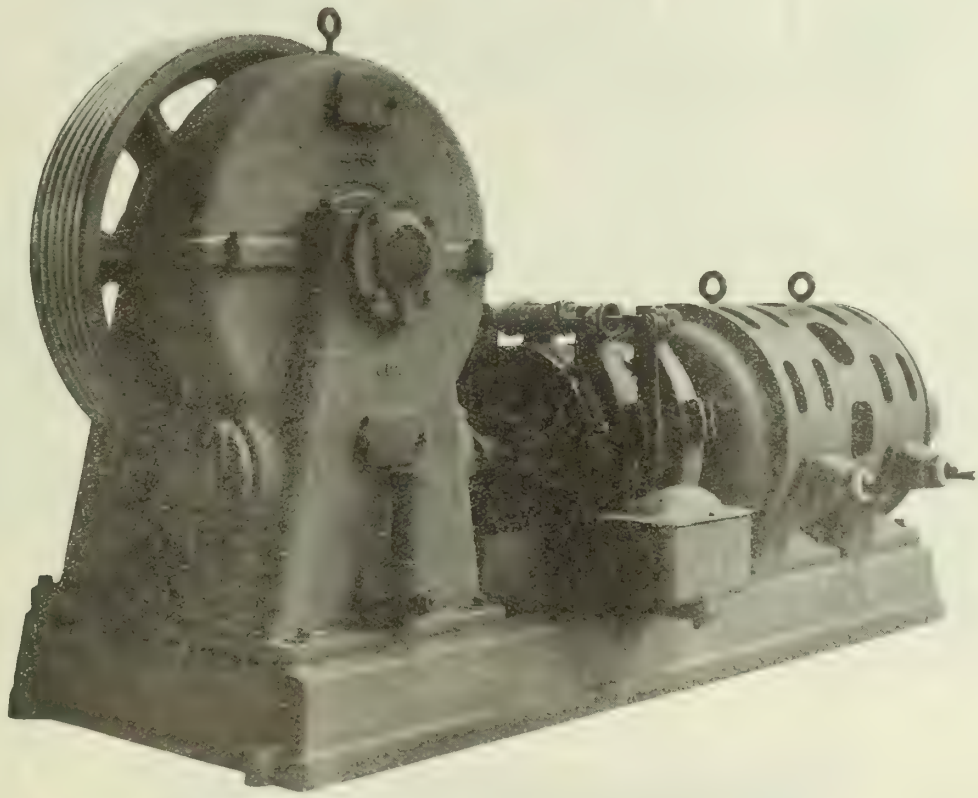

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THE MACHINE is screw gear single wrap traction type with Ball Bearing thrust on worm shaft and Roller Bearing mounting for the drum shaft.

THE MOTOR is tandem type—two units—giving three to one speed variation. Two separate Brakes are provided, operated by oil immersed A.C. Magnet, absolutely quiet and reliable.

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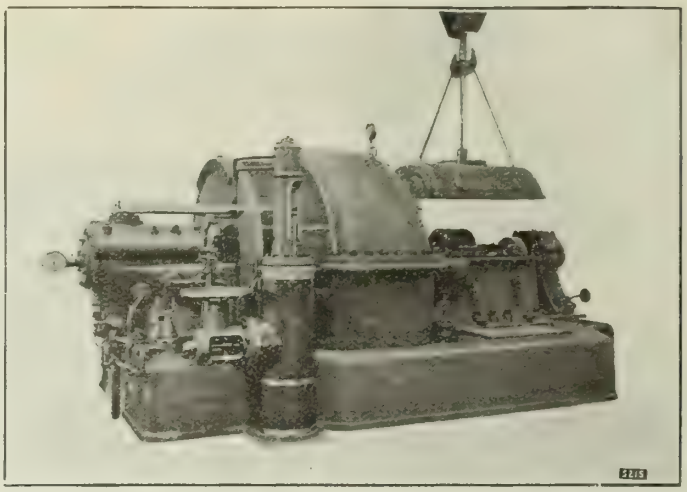
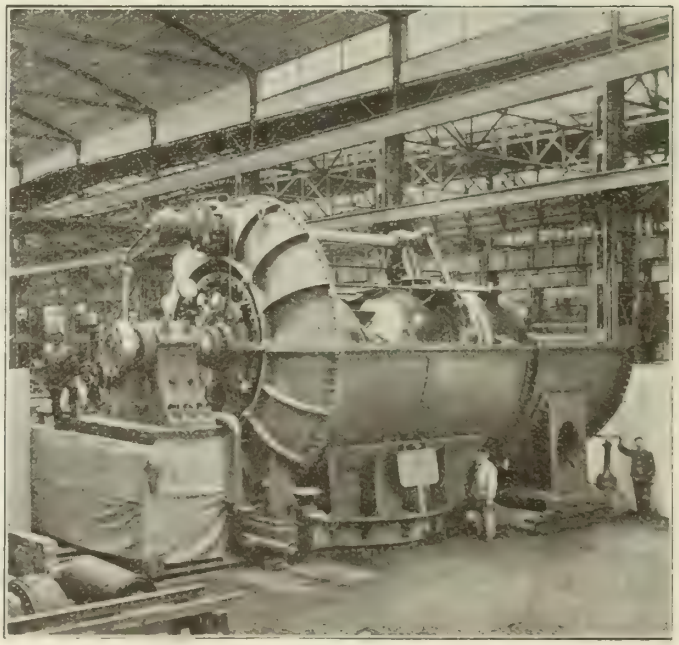
Illustrating Zoelly 2000 KW Geared Steam Turbine Operating at 6000 RPM. reduced through Gears to 3600 rpm. for Generator Shaft.



Steam Consumption In Pounds Per Hour Per Horse Power. Full Load 9.72# Three Quarters Load 9.92#

Illustration of a Francis Enclosed Type Horizontal Water Turbine Assembled in Zurich Shops. This Cut Represents one of Many Types Manufactured by Esher Wyss.



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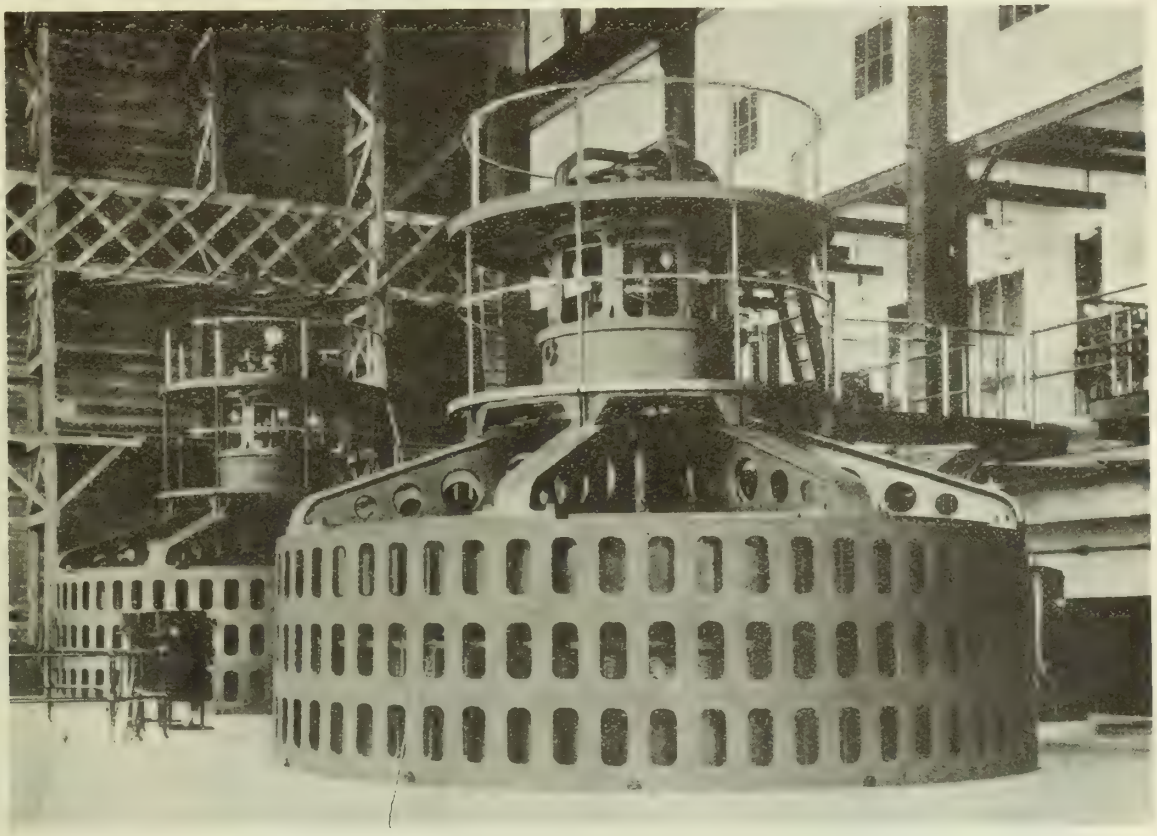

The Nipigon Power Development.

The two 10,600 Kv-a. Waterwheel Generators, illustrated, installed at the Nipigon Development of Hydro-Electric Power Commission of Ontario, are similar to the three 45,000 Kv-a units furnished for the Queenston Development.

Generators of absolute efficiency and reliability are what were demanded, and supplied.

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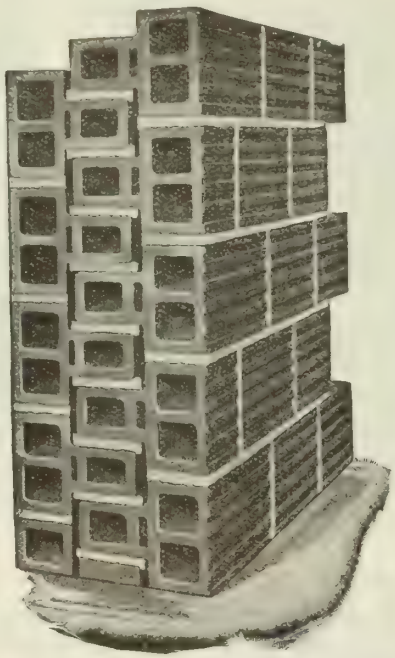
Official Test Demonstrates Advantages of *Interlocking Tile*



USED FOR LOAD BEARING WALLS AND PARTITIONS TO REPLACE 13" SOLID BRICK

Tests of Absorption and Crushing were conducted at McGill University by H. M. Mackay, M.E.I.C., Professor of Civil Engineering and S. D. MacNab, A.M.E.I.C., superintendent of Testing Laboratory, which demonstrated conclusively the qualities of Interlocking Tile.

The samples were from stock and only the light and medium burned, or the usual run of material shipped by makers of Interlocking Tile.

The test was made to determine if Interlocking Tile could be safely loaded to the Toronto Building Code Limit of four and one-half tons per square foot.

The results of the tests were so good that a building might be designed in which the walls would carry a load of six tons per square foot.

WEIGHT.

Weight of wall, inclusive of mortar, 60 pounds per cubic foot, one half the weight of brick wall. Load allowance, Toronto Building Code, 7 tons per running foot of wall. Factors of safety 9.

ORDERING.

Each Interlocking Tile displaces 444 cubic inches, and is therefore equal to 5½ Toronto Brick or 7 American Standards. For 9" walls 2.1 Tile lay one square foot (face of wall measure): 3.3 Tile lay one square foot of 12" wall. When Interlocking Tile is used to back up Face Brick the above quantities are reduced 10% by the Through Brick Headers.

INFORMATION.

Cost Data, detail drawings, catalogs, samples and prices on request.

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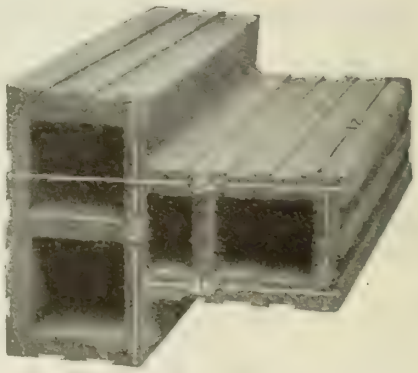
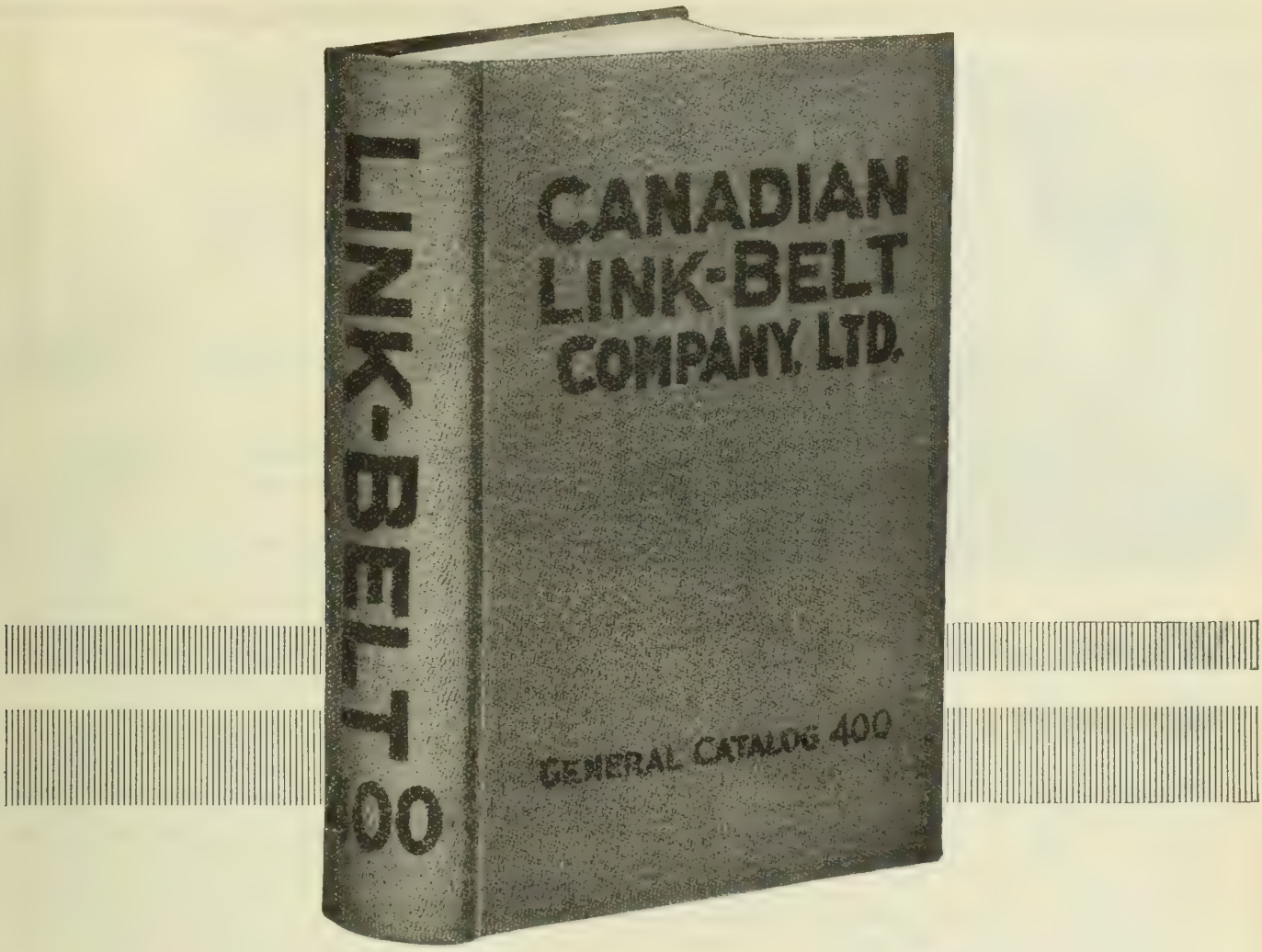


"IT INTERLOCKS."

The Interlocking Tile Company, Limited

EXCELSIOR LIFE BUILDING, TORONTO, ONT.



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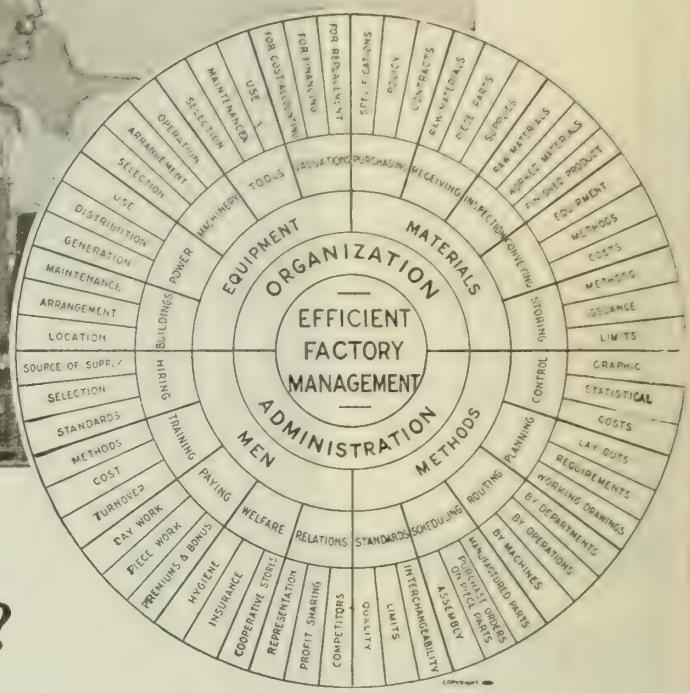

Where are the Managers of Tomorrow?

"Men, I tell you frankly that by September 1st, 1925, there'll be a lot of new faces among the managing executives of this Company,"

The "Big Boss" — Vice-President and General Manager of a widely known motor car company — was talking to a group of young men who were starting in to learn the business from the ground up.

"Doctors tell us," he went on, "that the blood in the human body renews itself every seven years. Now men are the life blood of modern business. And it is equally true that the average industrial organization undergoes a complete change in its executive personnel about once in ten years.

Casualties of Industry

"Every day managing executives become 'casualties' in the great battle of industry. Some die. Others retire. Some are promoted to even greater responsibilities. Still others, unable to keep the pace, resign.

"It's obvious, therefore, that there is a constant demand for new managers — ambitious men who have the training which qualifies them to step forward and fill the gaps.

"In this company, it's my job to pick the right men as 'replacements.' And let me tell you it's no easy thing to do. I can think of scores of promising fellows right here in this organization. But they're all 'one department men'. They lack the broad grasp of all departments so vital to the successful manager.

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"Now I know just two ways for a man to get this knowledge. One way is through the hard school of experience where the odds are against him. The other way is to train himself at home in his spare time through the "Factory Management Course and Service" of the Industrial Extension Institute.

"The second way is a short cut to success. I took this course myself It was the best investment of time and money I ever made and I'd like to see every worth while man in my organization enroll for it."

Where We Can Help You

The Industrial Extension Institute specializes in training men to become Industrial Managers. It provides this training through a home course of study based on the University plan, and consisting of lectures, talks, text books, reading assignments, problems and model solutions to these problems. The Consulting Service, which is part of the course, is designed to help you solve the questions which arise in your daily work

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FEBRUARY 1923 Volume VI, No. 2

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Vice-Chair., C. W. DILL
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W. H. GREENE J. W. CALDER
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Executive, C. D. MACKINTOSH
(Ex-Officio) SAM. G. PORTER
H. W. MEECH
H. G. COCHRANE

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Sec.-Treas., R. H. DOUGLAS
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J. D. ROBERTSON
R. W. ROSS A. J. STEWART
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Secretary, J. A. SPRECKLEY
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Treasurer, G. P. F. BOESE
Executive, V. MEEK
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(Ex-Officio) B. L. THORNE
P. TURNER BONE G. W. CRAIG

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Vice-Chair., J. MUIRHEAD
Sec.-Treas., P. H. BUCHAN
930 Birks Building, Vancouver, B.C.
Executive, W. G. SWAN
D. O. LEWIS
W. H. POWELL
T. W. FAIRHURST

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Chairman, P. PHILIP
Vice-Chair. E. F. COOKE
Secretary HUGH PETERS
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Treasurer, E. P. GIRDWOOD
Executive, E. E. BRYDONE-JACK
J. P. FORDE
(Ex-Officio) E. G. MARRIOTT
H. L. JOHNSTON

ONTARIO PROVINCIAL DIVISION
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Vice-Chair., Prof. C. R. YOUNG
Sec.-Treas., A. B. LAMBE, Ottawa, Ont.
Ex-Officio Members
Lt.-Col. R. W. LEONARD
H. G. ACRES
Brig.-Gen. C. H MITCHELL
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R. L. DOBBIN C. R. YOUNG
R. O. WYNNE-ROBERTS
E. R. GRAY
C. H. E. ROUNTHWAITE
H. B. R. CRAIG GEO. HOGARTH

Representative of Branches
P.L. ALLISON, Peterborough Branch
L. M. ARKLEY, Kingston Branch
WILLIS CHIPMAN, Toronto Branch
A. MILNE, Niagara Peninsula Branch
A. B. LAMBE, Ottawa Branch
J. J. NEWMAN, Border Cities Branch
F. W. PAULIN, Hamilton Branch
K. G. ROSS, Sault Ste. Marie Branch
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THE
ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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VOLUME VI MONTREAL, FEBRUARY 1923 NUMBER 2

Report of Council for the Year 1922

During the year nineteen hundred and twenty-two, the progress being made by the engineering profession, through *The Institute*, found a particular expression in the report of the Committee on Policy, the members of which are deserving of the thanks of *The Institute* for giving to the profession the constructive benefits of their labours. The report of the Committee on Policy is noteworthy because of the important bearing the suggestions made by this committee will have on the activities of *The Institute*. The suggestions made, as shown in the report of the committee, published in the June *Engineering Journal*, form the basis of the important suggested changes in the by-laws, which are to be voted on by the membership at large, following a discussion at the annual general meeting. The outstanding features of the proposed changes are, to have every member of *The Institute* in Canada a member of a branch, and to have every branch directly represented on the Council of *The Institute*.

After two years of activity, and having been subject to considerable delay, due mainly to the desire of the Ontario Provincial Division, the report of the Committee on Classification and Remuneration finally came to the knowledge of the entire membership by being published in the November *Journal*. This report has caused considerable discussion at various branch centres, and will be dealt with at the annual meeting.

The wisdom of the Committee on Society Affairs in establishing professional meetings was demonstrated during the past year by two very successful professional meetings held in the west, in addition to a one-day meeting in Montreal in conjunction with the annual meeting of last year. The papers presented at the western meetings were of a high order, and the enthusiasm for *The Institute* was marked.

It is with considerable satisfaction that Council records the growing strength of the branches and the growing interest in the profession as manifested by branch meetings. The branch news, as published in *The Journal*, indicates an increasing strength of fraternity in the profession that is certain to bear results.

A thriving branch was added to *The Institute's* family in September of this year by the establishment of the Lakehead Branch, embracing the cities of Fort William and Port Arthur.

During the year there has been an increase in membership, which, although not as great as last year, should be considered satisfactory under present circumstances.

The financial statement shows an operating surplus.

Arising out of the suggestions of the Committee on Policy the Council has established committees on Students' Activities, Code of Ethics, and Engineering Education, all of which have their problems under serious consideration, so that definite reports may be expected on these important phases early in the new year.

While material gains during the year have not been great, it is believed that *The Institute* has added to its strength and prestige by a greater unification of its members, which gives hope, in view of increased engineering activity in the coming year, for the belief that greater achievement may be expected in nineteen twenty-three.

Meetings

The thirty-sixth annual general meeting of *The Institute* was held at Headquarters, on Tuesday, January twenty-fourth, and in addition to the business sessions, there were two most enjoyable social functions held on the same day, a luncheon in the mezzanine dining-room of Windsor station, and the annual banquet at the Windsor hotel. The following day was given over to a professional meeting which, in addition to the social functions mentioned, was under the auspices of the Montreal Branch.

General professional meetings were held at Vancouver, B.C., June sixteenth and seventeenth, and at Winnipeg, Man., September fifth, sixth and seventh.

British Columbia Professional Meeting, held in Vancouver, B.C., June 16th and 17th, 1922, at which the following papers were read:—

"Town Planning in British Columbia", by James Ewing, M.E.I.C.

"Irrigation in British Columbia", by Ernest A. Cleveland, M.E.I.C.

"Professional Engineering in the B.C. Logging Industry", by T. W. Fairhurst, A.M.E.I.C.

In addition to the reading and discussing of technical papers presented, one session of the meeting was devoted to a discussion of *Institute* affairs. The programme further included excursions to the Ballantyne Pier, to the Scott Ranch, and Seymour Waterworks Intake and other features of interest.

General Professional Meeting, (an adjournment of the thirty-sixth annual meeting) held in Winnipeg, Man., September 5th, 6th and 7th, 1922, at which the following papers were presented:—

"Extensions to the Hydro-electric System of the City of Winnipeg", by E. V. Caton, M.E.I.C.

"Manitoba Power Company's Development at Great Falls", by F. H. Martin, M.E.I.C.

"Improvements to Moncton Yard and Engine Facilities", by S. B. Wass, A.M.E.I.C.

"Automatic Box Car Unloaders for Grain", by Fred. Newell, A.M.E.I.C.

"Fuel Value of Alberta Coals", by G. R. Pratt, A.M.E.I.C.

"Considerations of a Road Policy", by M. A. Lyons, A.M.E.I.C.

"The Chemistry of Portland Cement and Its Disintegration by Alkaline Ground Waters", by Professor T. Thorvaldson.

"Turbines for the Great Falls Development of the Manitoba Power Company", by H. S. VanPatter, A.M.E.I.C.

The programme included, in addition to the presentation of the above papers, a session for the discussion of *Institute* affairs, and excursions to the following engineering works; the Great Falls hydro-electric power development of the Manitoba Power Company, and the Point du Bois power plant of the City of Winnipeg.

Roll of the Institute

During the year nineteen twenty-two the following additions to the membership roll were made through the elections of new members: — four Honorary Members, forty-four Members, one hundred and fifty-one Associate Members, forty Juniors, two hundred and forty-five Students, and eleven Associates.

Transfers from one grade to another in *The Institute* were as follows: — Associate Member to Member, fifty-three; Junior to Associate Member, sixty-one; Student to Associate Member, twenty-three; Student to Junior, forty-one.

The detailed statement of these elections and transfers is given below. The names of those elected or transferred are published each month in *The Journal*, immediately after election and are added to the official membership roll as acceptances are received.

Elections

	Honorary Members	Associate Members	Juniors	Students	Associates
January...	1	6	13	11	—	3
February..	—	—	—	—	118	—
March....	—	5	30	12	17	4
April.....	—	5	26	—	12	2
May.....	—	12	16	3	26	2
June.....	—	5	12	5	—	—
July.....	—	—	—	—	—	—
August....	—	—	—	—	—	—
September	1	6	31	4	3	—
October...	1	2	10	2	24	—
November	1	2	7	3	17	—
December.	—	1	6	—	28	—
	—	—	—	—	—	—
	4	44	151	40	245	11

Transfers

Month	A.M. to M.	Jr. to A.M.	S. to A.M.	S. to Jr.
January.....	5	20	10	13
February.....	—	—	—	—
March.....	5	8	4	6
April.....	10	11	1	5
May.....	11	6	2	5
June.....	3	2	3	—
July.....	—	—	—	—
August.....	—	—	—	—
September.....	9	4	1	7
October.....	4	4		2
November.....	5	5	2	1
December.....	1	1	—	2
	—	—	—	—
	53	61	23	41

Removals from Roll

There is given below a complete list of former members of *The Institute* whose names have been removed from the membership roll during the year nineteen twenty-two, by resignation. These may be summarized as follows:— four Members; thirty-one Associate Members, eleven Juniors, and nineteen Students.

Members

Fisher, H. T.
Hutton, William S. H.
Scammell, John Kimball
Wilson, Lancelot E.

Associate Members

Adams, Arthur
Alston, Charles F.
Beaudet, Jos. N. R.
Bidwell, Leonard M.
Biker, W. J. R.
Blizard, John
Bourgeois, Benjamin
Cosser, Walter F. J.
Dawson, Geo. Herbert
Dingwall, Malcolm Stanhope W.
Easton, L. I.
Ehrenborg, G. B.
Garrow, Alan Balfour
Grafftey, W. Arthur
Hustwitt, S. A.
Jeffery, Chas. John
Johnston, W. J.
Jones, W. Goldsmith
Keeley, D. E.
Leckie, R. G. E.
Macauley, H. D.
Martin, E. N.
Neville, Everett Arthur
Ouimet, Georges
Rimmington, H. S.
Smith, B. O.
Stronach, R. S.
Thompson, Ross
Warren, George E.
Wickenden, A. A.
Wilson, W. deS.

Juniors

Bradley, Claude
DaCosta, W. R. C.
Garden, Herbert Mackie Gordon
Johnston, B. H.
Lewis, W. A.
Maxwell, R. J.
Merry, Frank S.
Moulton, Vincent C.
Theriault, A.
Willrich, Edgar Gebbard
Worthington, A. N.

Students

Barley, E. B.
Bruce, V. N.
Dewar, C. L.
Dobson, R. M.
Fleming, G. O.
Forbes, Karl
Giles, G. R.
Johnston, J. Gordon
Kingsmill, Walter J.
Maynes, C.
Maunder, W. F.
Mawdsley, J. B.
Meikle, M.
Nicholson, M. D.
Phillips, Jas. F.
Powell, Allan Trew
Shierholtz, O. J.
Swanson, C. O.
West, George Richard

Removals from the membership roll, for non-payment of dues are as follows: — five Members, nine Associate Members, two Juniors, and one Student.

Deceased Members

There have been reported during the year the deaths of twenty of *The Institute's* members. Of these, five were killed in action or died as the result of wounds or illness contracted while on active service during the war, authentic information of which has been received during the year.

Honorary Member	Hartley, Sir Charles Augustus, K.C.M.G.
Members	Borden, Henry P.
	Bush, Harry Dean
	Garden, Charles
	Hill, Arthur E. B.
	Lafleur, Eugene D.
	Smith, The Hon. George R.
	Wallis, Herbert
Associate Members	Galbraith, Robert Ayr
	Hallock, Byron
	Klingner, Capt. L. W., M.C.
	Loveland, Charles P.
	Powell, Major Robt. W.
	Timbrell, Alan
Junior	Jones, Sydney Stuart

Killed in action or died as the result of wounds and illness contracted during war service.

Associate Member	Robinson, Lieut. Thomas E.
Students	Bayne, Lieut. Charles MacV.
	Brown, William G.
	Gear, George
	Knight, Capt. A. G., D.S.O., M.C.

Total Membership

The membership of *The Institute* at present is as follows:—

Honorary Members	12
Members	1,080
Associate Members	2,382
Juniors	132
Students	949
Associates	41
	4,896
Elections — acceptances pending	231
	5,127

Respectfully submitted,
JOHN G. SULLIVAN, M.E.I.C., *President.*
FRASER S. KEITH, M.E.I.C., *Secretary.*

Publications Committee

The President and Council,

Your committee would recommend that the following papers published in *The Engineering Journal* from June 1921 to May 1922, inclusive, be preserved for the transactions of the Institute:

Paper by W. Nelson Smith, M.E.I.C., and Doctor I. W. Shipley, "Self-Corrosion of Cast Iron and Other Metals in Alkaline Soils".

Paper by P. E. Biggar, S.E.I.C., "The Aeroplane Engine".

Paper by G. M. Williams, A.M.E.I.C., "The Disintegration of Concrete in Alkali Soils"

Respectfully submitted,
K. B. THORNTON, M.E.I.C., *Chairman.*

Students' Prizes Committee

The President and Council,

Your committee charged with the duty of allocating Students' prizes recommends that four student prizes be awarded for papers presented to the Institute as follows:

To P. E. Biggar, S.E.I.C., for his paper "The Aeroplane Engine".

To Stephen Williams, S.E.I.C., for his paper "Feed Water Impurities"

To C. P. Mills, S.E.I.C., for his paper "Electrical Railway Problems"

To W. J. S. Dormer, S.E.I.C., for his paper "The Magog River"

Respectfully submitted,
K. B. THORNTON, M.E.I.C., *Chairman.*

Gzowski Medal Committee.

The President and Council,

Your committee recommends that no award be made of the Gzowski Medal for the year nineteen twenty-two. In considering the papers it was decided that the paper, "Self-Corrosion of Cast Iron and Other Metals in Alkaline Soils" by W. Nelson Smith, M.E.I.C., and Dr. I. W. Shipley, was of sufficient merit as to be given consideration in connection with the awarding of the Gzowski Medal. Your committee finds, however, that there is no provision in the rules for the Gzowski Medal for awarding the medal to a paper issued by joint authors where one of the authors is not a member of the Institute.

Respectfully submitted,
K. B. THORNTON, M.E.I.C., *Chairman.*

Finance Committee

The President and Council,

Following the precedent established a year ago your Finance Committee again prepared a budget for the present year's operations. This budget, which was accepted by the Council, showed a deficit on the year's operations, but owing to measures taken to reduce expenditure, it is very satisfactory to be able to report to the membership of *The Institute* an operating surplus, for the year nineteen twenty-two, of twenty-three hundred and twenty-four dollars and ten cents.

According to the budget the estimated revenue for the year was seventy-two thousand, two hundred and seventy-five dollars. It is interesting to note that the actual current revenue received from all sources was seventy-three thousand, eight hundred and thirty-six dollars and sixty-six cents being a remarkably close estimate.

The revenue from admissions was less than half that of a year ago, but was slightly over the estimate. *The Journal* revenue was lower than anticipated, but expenses were reduced accordingly, and *The Journal* showing approximately agrees with the estimate. It will

STATEMENT OF ASSETS AND LIABILITIES AS AT 31ST, DECEMBER 1922

ASSETS

PROPERTY ACCOUNT		$ 89,041.64
FURNITURE:		
Balance, as at 1st Jan. 1922	$ 3,855.39	
Additions during year	538.38	
	$ 4,393.77	
LESS 10% written off for depreciation	439.37	3,954.40
LIBRARY:		
Estimated value of books as at 1st Jan. 1922	5,697.00	
LESS 10% written off for depreciation	569.70	5,127.30
STATIONERY ON HAND, as per inventory		650.00
GOLD MEDAL		45.00
INVESTMENT:		
Canada Permanent Mortgage Corporation stock, 20 shares par value $10 each	215.00	
Montreal Light, Heat & Power Consolidated stock, 6 shares par value $100.00 each	120.50	335.50
ACCOUNTS RECEIVABLE:		
Journal	4,559.51	
Advances to branches	650.00	
Sundry	125.00	
	5,334.51	
LESS Reserved for doubtful accounts	500.00	4,834.51
ARREARS OF FEES — Estimated		2,500.00
CASH:		
Canadian Bank of Commerce, current account	712.36	
Petty cash on hand	100.00	
Canadian Bank of Commerce, savings bank account	41.64	854.00
UNEXPIRED INSURANCE		85.25
SPECIAL FUNDS, as per schedule No. 1 attached:		
Investments Victory Loan	10,536.71	
Cash in savings bank accounts	688.73	11,225.44
		$118,653.04

LIABILITIES

MORTGAGE ON PROPERTY:		
Royal Institute for the Advancement of Learning	$ 20,000.00	
Interest thereon accrued to date	233.33	20,233.33
ACCOUNTS PAYABLE:		
Sundry	2,078.86	
Advances to branches	672.17	2,751 03
SPECIAL FUNDS:		
As per schedule No. 1 attached		11,225.44
SURPLUS ACCOUNT:		
Balance as at 31st Dec. 1921	90,755.85	
DEDUCT:		
Appropriation for mortgage fund	$ 8,136.71	
Appropriation for doubtful accounts reserve	500.00	8,636.71
	82,119.14	
Add Surplus for year 1922	2,324.10	84,443.24
		$118,653.04

MONTREAL, 16TH JANUARY, 1923.
Verified, as per our report of this date.
(Signed) RIDDELL, STEAD, GRAHAM & HUTCHISON, C.A.
Auditors

be recalled that last year's Council recommended that the total amount received from entrance fees, namely nine thousand, six hundred and sixty-one dollars and fifty cents, be set aside as a capital fund to be used towards the reduction of the mortgage. At that time the entrance fees had been absorbed into current account and were not available, but your committee set aside from the total revenue received this year the sum of eight thousand dollars, with which under your instructions, Dominion Government Victory Bonds, nineteen thirty-four's, were purchased. These are in the keeping of the treasurer to go towards retiring the mortgage when due.

It might be pointed out that the proposal to change the rebates to branches will increase the total amount of rebates to the branches.

While the present year's operations show a surplus it is not sufficient to give *The Institute* the necessary funds to carry out proposals such as plenary meetings of Council, or extraordinary expenditure that might be desired.

Respectfully submitted,

ALEX. BERTRAM, M.E.I.C., *Treasurer.*

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED 31ST, DECEMBER 1922

REVENUE

SUBSCRIPTIONS:		
Arrears of fees	$ 3,573.95	
Current fees	26,052.86	
Advance fees	587.74	
Entrance fees	5,053.50	
		35,268.05
INTEREST:		
On overdue fees	278.86	
Bank interest	178.35	
		457.21
DIVIDENDS:		
Canada Permanent Mortgage Corporation stock	24.00	
Montreal Light, Heat & Power Company stock	30.00	
		54.00
JOURNAL:		
Revenue		35,155.87
YEAR BOOK, ADVERTISING		1,643.00
RENT OF HALL		483.00
CERTIFCATES		408.00
BADGES		66.27
EXAMINATION FEES		11.00
BAD DEBTS RECOVERED		256.01
SUNDRY REVENUE		31.25
		$ 73,836.66

EXPENDITURE

BUILDING EXPENSE:		
Interest on mortgage	$ 1,400.00	
Taxes	1,372.17	
Water rates	203.70	
Fuel	792.08	
Insurance	88.67	
Light and gas	386.38	
Caretaker's wages and service	1,252.60	
Repairs and expense	689.86	
		6,185.46
OFFICE EXPENSE:		
Salaries, secretary and office staff	13,562.59	
Office supplies and stationery	1,423.49	
Postage and telegrams	1,364.58	
Auditors' fees	250.00	
Telephone	264.93	
Messenger and express	67.75	
Miscellaneous expense	209.50	
Legal expense	40.00	
		17,182.84
PUBLICATIONS:		
Transactions	1,510.55	
Journal	31,686.35	
		36,196.90
GENERAL EXPENSE:		
Annual meeting expense	1,569.18	
Travelling expenses, secretary	1,115.00	
Branch stationery	227.21	
Gzowski Medal	128.75	
Students' prizes	50.00	
Library expenses and magazines	339.97	
10% written off furniture for depreciation	139.37	
10% written off books for depreciation	569.70	
Bank exchange and discounts	133.55	
Entertaining	30.00	
Committee expenses	1,166.41	
Bad debts written off during year	100.89	
		6,170.03
REBATES TO BRANCHES:		
As per schedule No. 2 attached		5,777.33
		$ 71,513.56
BALANCE being surplus of revenue over expenditure for the year ended 31st December, 1922		2,323.10
		$ 73,836.66

MONTREAL, 16TH JANUARY, 1923

Verified

(Signed) RIDDELL, STEAD, GRAHAM & HUTCHISON, C. A.

Auditors.

Library and House Committee

The President and Council,

During the past year your Library and House Committee has made a study of the library situation with a view to making the library of greater value to the members. A preliminary survey showed that there were many books required, as there have been no purchases of recent years, and additions of the more modern technical books have been few. Suggestions were asked from all members through *The Journal*, and individually from a large number of members, with the result that your committee compiled a list of ninety-three volumes which are being secured, the necessary funds to the amount of five hundred dollars having been voted by Council in the early part of the year.

It is a pleasure to announce that arrangements have been made with McGill University library for reciprocal privileges. Any member of *The Institute* is now entitled, upon presentation of his credentials, to the full benefit of the McGill University library, and in return the privileges of *The Engineering Institute* library have been extended to those entitled to use the McGill library.

The Engineering Index, provided through the columns of *The Journal*, is being used more and more by the members of *The Institute*, as it enables any member to receive the original or photostat copy of practically every technical article published. We are indebted for this service to the American Society of Mechanical Engineers and the Engineering Societies Library, New York.

During the year your committee exercised a general supervision over the Headquarters premises and recommended the retinting of the Headquarters' assembly hall ceiling, but found that the amount allocated by Council for that purpose was not sufficient to have the work properly executed. We recommend that this matter be taken up by the incoming Library and House Committee.

Acknowledgment, with thanks, is made of the following books and publications presented to the library during the past year:—

J. M. R. FAIRBAIRN, M.E.I.C., *Chairman.*

Publications Received

General Publications

Presented by U.S. Navy Department.
Activities of the Bureau of Yards and Docks, Navy Department, U.S.A. — World War.

Presented by Yves Lamontagne, A.M.E.I.C.
Aero Engines, by B. A. Burles.

Presented by Major Sidney Snell, M.C., R.E., A.M.E.I.C.
A Story of Railway Pioneers, by Major Sidney Snell, M.C., R.E., A.M.E.I.C.

Presented by the Board of Award, New York.
John Fritz Medal. (book)

Presented by J. W. Harris, M.E.I.C.
The Art of Rapid Computation and Science of Numbers, by J. W. Harris, M.E.I.C.

Presented by John Murphy, M.E.I.C.
Copy of paper entitled "Data Concerning Ice", by John Murphy, M.E.I.C., given before a meeting of the International Joint Commission at Montreal.

Presented by Walter Haddon.
Theory of Wave Transmission, by George Constantinesco.

Presented by D. Van Nostrand Company, New York.
Machinists' and Draftsmen's Handbook, by Peder Lobben. (3rd edition.)
Mechanical Laboratory Methods of Testing Machines and Instruments, by Julian C. Smallwood, M.E. (3rd Edition.)

Presented by U.P.C. Book Publishers, Inc., New York.
Practical Structural Design, by Ernest McCullough. (2nd Edition.)
The New Building Estimator's Handbook, by William Arthur. (1922 Edition.)
Electrical Equipment of the Motor Car, by D. P. Moreton and H. S. Hatch.
Blast Furnace and the Manufacture of Pig Iron, by R. Forsythe. (Deceased) Completely revised by Carl A. Meissner and J. A. Mohr.
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Bookkeeping and Business Management, by F. W. Risque.
Thirty Lessons in Advertising and Selling, by Guy Hubbart.

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Trading with Latin America, by Ernest B. Filsinger.
Trading with the Far East.

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Belt Conveyors and Belt Elevators, by Frederic V. Hetzel.

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Elements of Metallurgy — Phillips and Bauerman.
Trusses and Arches — Archer.
Tests.
Iron Highway Bridges — Bell.
Concrete Reinforcement — Pittsburg Steel Products Co.
Trautwine's Handbook.
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Presented by the Estate of the late Sir John Kennedy, Hon. E.I.C.

Montreal Harbour Documents. Five volumes. 1850-95.

Presented by T. J. McMinn, M.E.I.C.

Reports of the late John Smeaton, F.R.S. Vols. 1 and 2, 1837.

Presented by A. Durand Murray, A.M.E.I.C.

Indian Relics: — Two bone needles; one bone awl; two fragments of stone needles; one bone tusk awl; one quartz arrow point; three flint war arrow points; four flint hunting arrow points; one long flint arrow point; one small bone plug; four iron nails–French trading post; one native copper spear head; one fish spear; four large quartz spear points; one granite hammer; one Hudsons' Bay axe; one French trading axe; one pipe axe; two stone axes; four stone adze; three long stone adze points; three skin scrapers; one slate sloin axe; one splitting axe; one spear flint; one fragment of slate spear flint; sixteen clay pipe fragments.

Legislation and By-Laws Committee

The President and Council,

After having been in existence for many years, in 1921 the Legislation Committee of *The Institute* was merged with the By-Laws Committee of *The Institute* owing to the intense activity in favour of legislation for engineers throughout Canada. In 1921 legislation had been secured in every province except Saskatchewan and Ontario.

The main duty of the committee is to keep Council informed of the proposed changes in the professional acts in the various provinces, and to pass upon proposed amendments to the by-laws of *The Institute* and of its several branches.

Legislation

During 1922 there were two outstanding features in legislation for engineers in Canada.

The more notable feature is the passing of the Professional Engineers' Act of Ontario by the Legislature on June 5th, a full account of which will be found in the July issue of *The Engineering Journal* commencing on page 391.

The other feature is an amendment of the act governing the practice of the profession in Quebec. By this amendment all graduates of Ecole Polytechnique as well as all graduates of the Faculty of Applied Science of McGill University desiring to practice within the province are required to join the Corporation of Professional

Engineers of Quebec. It is also provided that the Council of the Corporation of Professional Engineers of Quebec may, at its discretion, admit any person residing in the province and holding a diploma in engineering or a corresponding degree in applied science from any university recognized by the Corporation, or any member of other professional engineering bodies of like importance.

Institute By-Laws

The proposed changes in the by-laws of *The Institute* as offered by the committee are based principally on the report of the Committee on Policy.

The first proposal is to widen the scope of activities of *The Institute*, by requiring it to promote the social and economic welfare of its members, as well as their professional interests. At present the stated objects of *The Institute* refer only to professional matters.

The clause under the heading of *Objects* and reading "to encourage original research" is proposed to be amplified by adding the words "and the study, development and conservation of the resources of the Dominion".

As a complete addition to the *Objects* as at present stated it is proposed to add collaboration with universities and other educational institutions in the advancement of engineering education and the promotion of intercourse between engineers and members of allied professions.

In order to avoid the confusion which formerly existed by the use of the word "associate" in its application to a distinct class of membership, it is proposed to substitute the word "affiliate".

The most important proposals now being made relate to membership in branches, to the election of councillors directly by the branches, and to the election of vice-presidents by zones. At present certain parts of the Dominion are outside the jurisdiction of the branches, and it is now proposed to allocate the whole of the Dominion for branch authority so that every member in the Dominion will become a member of a certain branch. By the new arrangement, every branch will have representation on the Council, branches with less than two hundred corporate members having one representative, branches with a membership ranging between two hundred and four hundred having two, and branches with more than four hundred corporate members having three representatives.

In order to make the proposed branch representation possible of accomplishment, it is necessary to change the length of tenure of office to one year in the case of one representative, and to two years in the case of two representatives, the tenure of office in the case of three representatives remaining at three years, as at present.

It is further proposed that larger rebates shall be made to the smaller branches and a reduction in rebates to the larger branches. In practice this proposal will probably not reduce the revenue of the larger branches, owing to the increase of their territory.

Several minor changes resulting from the discussions in the Council from time to time are also proposed. These are included in the suggestions to change the sections nos. 7, 8, 38, 57, 60, 66, and 67.

It is confidently hoped by your committee that the proposed changes will receive the affirmative vote of the membership, as they are believed to be for the benefit of the engineering profession of the Dominion.

Branch By-Laws

It has not been necessary to devote much time to the question of Branch By-Laws during the year. Your committee had thought of redrafting a set of model branch by-laws, but after consideration and discussion the idea was abandoned.

Respectfully submitted,

WALTER J. FRANCIS, M.E.I.C. *Chairman.*

Papers Committee

The President and Council,

On behalf of the Papers Committee, I take pleasure in submitting the following report for the year 1922.

The Papers Committee for 1922 was appointed at a meeting of Council held on February 21st, and consisted of the writer as chairman, together with the secretaries of the various branches of *The Institute*.

On receipt of notification of my appointment as chairman, a letter of acknowledgment was sent to the general secretary suggesting that a small money grant be set aside for expenses in connection with sending speakers to various branches, and to provide for the preparation and forwarding of meritorious papers to branches which might request such assistance. No definite grant was apparently made, and no notification of any action of Council has been received in this connection.

Early in March a letter was sent to each member of the committee requesting his co-operation in the work of the committee, and asking for the views of the various branch secretaries as to how the committee could best serve *The Institute*. Answers were received from nine of the twenty-two secretaries setting forth their views. Most of the letters contained constructive suggestions, the more notable of which were contained in the replies of Messrs. Cameron, Gnaedinger, McCannel and Buchan.

The general result of the canvass of the committee members seems to be that the smaller branches find it difficult to maintain the interest in the meetings and they desire help from the larger branches which may be able to send either speakers or papers to them.

Some correspondence was continued throughout the year between the various branches and a number of meritorious papers were received, some of which were passed on to the Publication Committee, and subsequently published in *The Journal*. Some of the branches requested definite assistance, and your committee co-operated with the general secretary and the staff at Headquarters in an endeavour to accede to the requests made.

Your committee believes that further good would result if Council would again follow out the suggestions made last year, and carry this still further by taking a more definite stand with regard to helping smaller branches keep up interest in the meetings by making provision for supplying speakers and papers on a systematic basis. I would suggest that a letter be sent to each branch asking for their definite programme for meetings for the coming year, and asking if they would like any specific assistance at any particular time. The larger branches

might also be definitely requested to be prepared to assist the smaller branches by an inter-change of speakers and papers.

As a constructive suggestion it might be well to repeat what has already been done by sending a special letter to each member of Council pointing out that it is the duty and privilege of each councillor to make a special effort to officially visit the branch in any city where such councillor might happen to be visiting, and to carry a message from Council and from his own district to the place where he may be speaking. Such a visit is of considerable help and has proven very enjoyable where the plan has been followed out. Your chairman visited two or three branches during the past year in this way and was well received.

Respectfully submitted,

FREDERICK B. BROWN, M.E.I.C., *Chairman.*

Committee on Deterioration of Concrete in Alkali Soils

The President and Council,

Inasmuch as the organization and work of this committee are somewhat different from that of the other committees of *The Institute*, it has been suggested that it might be well at this time to review briefly conditions that led up to the formation of the committee, the organization and workings of the same, as well as the objects and progress made on the actual research.

This committee has dual responsibilities. It is a committee of *The Institute* and as such is responsible to the parent body as other committees are, but it is also responsible directly for the expenditure of all funds and for obligations incurred. *The Institute* is not supporting the research financially and by action taken at the 1922 annual meeting made it quite clear that no financial responsibility would be assumed, this we believe to be a very proper attitude inasmuch as *The Institute* did not raise the funds but merely permitted the committee to solicit funds and administer the same. We are accordingly individually responsible for all obligations incurred and also directly to the bodies supporting the research for the wise and proper expenditures of all monies, and presumably on the degree of satisfaction which meets our annual reports to them future grants will depend.

History of Early Activities

The problem of the *decay of concrete in alkali soils*, I understand, was just brought formally to the attention of *The Institute* at the general professional meeting held at Saskatoon August 1918. Papers were read on the subject by Messrs. B. Stuart McKenzie, M.E.I.C., and A. G. Blackie of Manitoba, H. McI. Weir, M.E.I.C., of Saskatchewan, and A. S. Dawson, M.E.I.C., of Alberta. The papers of the Manitoba members reviewed the observations and experiments that had been made in Winnipeg by a committee of the local branch of *The Institute*. The paper by Mr. Dawson was also a report of the work of a committee of the Calgary Branch and described the investigational work that was being undertaken there. Mr. Weir's paper was an account of personal observations in Saskatoon. All of these papers were printed in full in the August and September 1918 issues of *The Journal*.

At the above mentioned meeting the following resolution was passed.

"Resolved that the Council be requested to appoint a Committee on the Action of the Alkali Salts on Concrete to carry out such experiments and investigations as they consider desirable, with power to collect funds in the name of the Committee to enable them to carry out the work."

It was understood that the nomination to the committee should be made by the three local branches interested, accordingly on October 22, 1918, Council appointed the following nominees: — *Manitoba:* B. S. McKenzie, M.E.I.C.; W. B. Chase; W. P. Brereton, M.E.I.C.; J. C. Holden, M.E.I.C. *Saskatchewan:* J. P. C. Macredie, M.E.I.C.; E. D. Martin; H. McI. Weir, M.E.I.C.; R. J. Leckie, A.M.E.I.C. *Alberta:* A. S. Dawson, M.E.I.C.; G. W. Craig, M.E.I.C.; F. W. Alexander, M.E.I.C.; H. Sidenius.

B. S. McKenzie, M.E.I.C., of Winnipeg, was named chairman. At the same time a committee of the Saskatchewan Branch was formed, and until the fall of 1920 the three branch committees undertook individually all of the actual investigation work and no organized joint action was taken.

The observations of the Winnipeg committee were continued and laboratory tests carried on under Mr. Blackie, Mr. Chase and others. The Saskatchewan committee undertook a program of field and laboratory tests under the writer and Dr. Thorvaldson and these have been continued since 1919. The experimental work of the Calgary committee, largely through the activities of A. S. Dawson, M.E.I.C., G. W. Craig, M.E.I.C., and F. C. Field, was continued and enlarged, and to-day is one of the most important sources of long term field tests, covering as they do a wide range of different mixes and various so called protective admixtures and coatings.

The work of the Calgary Branch was again reported by Mr. Dawson at the Banff professional meeting, August 1920, and printed in the October 1920 *Journal*. The experimental results obtained by these three committees together with the valuable conclusions from the investigations of the Bureau of Standards at Washington, and many other independent observations and experiments, were the basis of the conclusion reached by the Branch committees individually and collectively, that the best of concrete will undoubtedly be acted upon chemically and be deteriorated in time if subjected to a sufficiently strong alkali ground water.

The Joint Committee met before the above mentioned Banff meeting and it was unanimously decided that the problem should be attacked thoroughly and under a single organization, accordingly the following resolution was presented by B. Stuart McKenzie, M.E.I.C., and was passed unanimously by the meeting:

"Resolved that fifteen thousand dollars per annum for three years be secured for investigational purposes by specialists engaged to devote their entire time to the work. That the existing committee be authorized by Council to make definite application for necessary funds from all interested bodies. That the work be carried on under the supervision of the existing committee who will act in an advisory capacity. That Council be asked to ratify this manner of dealing with the problem."

Council subsequently granted the authorization asked for.

Organization of Present Committee

On January of the following year B. Stuart McKenzie, M.E.I.C., for private reasons found it impossible to continue his work as chairman, and the writer was appointed to succeed him. Negotiations were entered into with various parties interested, and the following subscriptions promised. The amounts promised were to be paid each year for three consecutive years, and at the present time two such annual payments have been received from each contributor.

Research Council	$5,000	a year	for	three years
Canada Cement Company	3,000	"	"	"
Province of Saskatchewan	3,000	"	"	"
Canadian Pacific Railway	1,000	"	"	"
Province of Alberta	1,000	"	"	"
City of Winnipeg	200	"	"	"
	$13,200			

I would like both personally and on behalf of the entire committee, to express our very great gratitude and appreciation for the wholehearted and sincere generosity of each and all of these contributors who have made and are making this research possible, their grants have at all times been without reservation and their purposes of the highest.

After the availability of funds had been assured a meeting of the committee was held in Saskatoon for the purpose of organizing and determining the general policies of the committee.

Financial Arrangements

It was decided to request the University of Saskatchewan to undertake the accounting. The bursar has accordingly opened a special account for our committee, all grants are deposited into this account and all disbursements made by the bursar on order only from the chairman of this committee or a member of the executive duly authorized. This account is audited by a provincial auditor according to the same regulations that ordinary university accounts are subjected to.

The regulations governing grants from the Research Council of Canada require that their grant be covered by original vouchers and receipts, for this purpose sufficient items have to be allocated each year to cover their grant.

Organization

The committee as originally constituted has been subjected to many changes at the request of the provincial sub-committee, and additions were made at the organization meeting to bring in as full members the following chemists who had been interested in the problem, — Dr. J. W. Shiply and A. G. Blackie of Manitoba, J. A. Kelso, A.M.E.I.C., and F. C. Field of Alberta. The committee has however remained practically unchanged since actual work started and is as follows:—

Alberta

Alex. Dawson, M.E.I.C.
Geo. W. Craig, M.E.I.C.
R. S. Stockton, M.E.I.C.
A. W. Haddow, A.M.E.I.C.
F. C. Field,
J. A. Kelso, A.M.E.I.C.

Manitoba

W. P. Brereton, M.E.I.C.
J. C. Holden, M.E.I.C.
J. N. Finlayson, M.E.I.C.
J. G. Sullivan, M.E.I.C.
J. W. Shipley,
A. G. Blackie.

Saskatchewan

W. McI. Weir, M.E.I.C.
E. A. Markham, A.M.E.I.C.
J. R. C. Macredie, M.E.I.C.
G. M. Williams, A.M.E.I.C.
C. J. Mackenzie, M.E.I.C., Chairman.

It was decided that the chairman of the committee, the secretary, and the chairmen of the provincial committees of Manitoba and Alberta should form the executive committee.

Scope of Investigation

It was the unanimous decision of our committee that our activities should be bent first towards the primary and fundamental problem of determining what chemical action takes place when concrete is acted upon by alkali waters, and if, or when this answer is available an attempt should then be made towards suggesting remedies.

It is desired to emphasize the objects we have in mind clearly as other investigations are being carried on by other parties with different objects in view and while we have no wish to insist that ours is the most valuable we do desire that interested parties should realize clearly that we are not duplicating work already done and that as far as we have been able to learn no other body or institution is at present working along the same lines as we are. I shall, therefore, state the problem as it appeared to us and endeavour to show just what work has been done and is being done by our committee and other parties.

Our unanimous agreement was that it had been proved beyond question that the best of concrete and even neat cement blocks would be acted upon chemically and deteriorated when subjected to sufficiently strong alkali ground water. Our conclusions, as previously stated, were based upon the observations and experiments of our three branch committees, the very conclusive field tests of the Bureau of Standards and numerous other observations by private and public parties.

We recognize that of course there are limiting and border conditions upon which information is desirable, as it is well known that in ground waters of light alkali concentration, concrete will stand up for many years and perhaps the best will be practically permanent, it is also generally recognized that a high grade concrete is more enduring than a poorer one, and that likely a highly impervious one more resistant than a permeable specimen. We also recognize that apparently contradicting and baffling results are observable under exposure conditions due to the fact that the concentration of ground waters varies widely within a very short distance horizontally and that it also varies widely at different seasons of the year and also as the level of the water table.

We have already gone on record as stating that provided the chemical research does not bring forth any definite remedies, that engineers will still have to develop the best practice in the light of the above facts. We further consider that the *hit or miss* trying of different compounds for admixture or surface application might bring forward a remedy, but we could not consider this as a legitimate method of attack for a scientific study, moreover the various commercial compounds have been proceeding along this line for several years and no proved remedy has been developed up to the present. We did consider it, however, quite proper for us to undertake a thorough test under field conditions of these various patented compounds and coatings and with this end in view we have undertaken besides our chemical work a very limited series of field tests which have been installed at the selected sites in each of the three prairie provinces.

In view of the above conclusion we felt that for our committee the proper and most profitable course was to institute a thorough chemical investigation and this we have undertaken, the general plan and progress of which will be mentioned later on.

Other Investigations

The Institution of Civil Engineers of Great Britain, supported by the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research is at present engaged upon an investigation of the deterioration of structures in sea water. Concrete is one of these materials being studied, and their problem is of course an allied one, but up to the present their reports as to concrete cover only observations made at different ports in the world.

The drainage investigations of the Bureau of Public Roads, U.S., under the direction of Mr. McCrory have been conducted several years. Mr. McCrory has been connected intimately in an advisory capacity with the very valuable work carried out by the Bureau of Standards under G. M. Williams, A.M.E.I.C., the results of which were published in Technology Papers Nos. 95 and 214. The work of Mr. McCrory and his associates has been directed chiefly at the specific problem of concrete drain tile in an attempt to define the practical limitations of various makes of pipe and under various conditions of exposure, this work is being followed with interest.

The latest large investigation to be launched is that of the American Portland Cement Association, the work is being carried out under the direction of Professor Duff Abrams, M.E.I.C., and his staff at the Lewis Institute. This investigation consists of the exposing at different sites in U.S. and Canada of a large number of different grades of concrete, of different strengths, mixes, etc., with various treatments. The investigation is notable for the large number of specimens placed, and should give some idea of the relative values of different grades of concrete under different conditions and their relative length of life. The specimens in Canada were placed in co-operation with our committee and will be examined every year.

Various other independent investigations are being carried out, but I think it will be clear from the above that each investigation has for its aim a quite different object, and, as mentioned before, while we are far from insisting that ours is the only attack desirable we do believe that we are justified in our contention that we are attacking the fundamental problem, and it is our sincere hope that with all the work being done from different angles that we may all feel that progress is being made in the very important and involved problem.

Papers were given at the August 1921 professional meeting at Saskatoon by Professor Williams of Saskatchewan, Professor Finlayson of Manitoba and Mr. Dawson of Calgary, and at the September 1922 meeting at Winnipeg by Dr. Thorvaldson in an endeavour to place on record the results of experimental work done both in Canada, United States and elsewhere, up to the time we started actual work. These papers were fully reported in *The Journal* of August and September 1921 and September and October 1922. An attempt has thus been made to give credit to all previous investigators and state definitely the sources of the results on which our policy has been founded.

Programme of Physical Tests

At the above mentioned organization meeting the decision to undertake only a limited programme of field tests was made and Professor G. M. Williams, A.M.E.I.C., was asked to undertake the actual supervision of making and installing the specimens, this was done during the summer of 1921 and these will be inspected at least yearly and other series added as seem desirable. Following is a description of the work done and the observations made to date.

After consultation with members of the committee and consideration of previous investigations the following general programme was decided upon.

(a) *Concrete Quality.*—Test specimens should be prepared of neat cements and concretes having a compressive strength at 28 days of 2,500 pounds and 1,200-1,500 pounds per square inch for each cement included in the tests.

(b) Exposure test specimens should be cylindrical in form 7 inches in diameter and 21 inches long. Other specimens 6-inch by 12-inch cylinders were to be made for compressive strength tests and slabs 2½ inches by 12 inches by 12 inches were to be moulded for permeability tests.

(c) In addition to neat cement and plain concrete specimens, concretes containing various integral compounds and treated with different bitumenous surface coatings were provided.

(d) Exposure sites were selected near Brooks, Alta., Grandora, Sask., and Winnipeg, Man., where the specimens would be totally or partially immersed in sulphate ground waters of high concentration.

Laboratory Preparation of Test Specimens

Test specimens were prepared in the concrete laboratory of the University of Saskatchewan using the materials and methods as outlined below. A complete list of concretes prepared will be found in appendix A,—table 1.

(a) *Cements.*—The cements used included "Canada" purchased from a contractor receiving fresh stock direct from the mill, "Super Cement" furnished by the Super Cement (America) Company, Ltd., Mount Dennis, Ont., and "Commercial" brand natural cement supplied by the Commercial Cement Company, Winnipeg.

(b) *Aggregates.*—Most of the specimens were prepared with Warman, Sask. aggregate which is generally used for concrete work in Saskatoon. This is a pit run gravel containing 60 to 90 per cent sand usually with about 90 per cent passing the ¾-inch screen. This material was washed and screened and combined in the concretes in the proportions of 45 per cent sand and 55 per cent gravel. Duplicate concretes were also prepared using aggregates from Carseland, Alberta and Winnipeg, Man. The former consisted of pit run gravel, and the latter a sand with crushed lime stone as a coarse aggregate.

c) *Integral Compounds and Coatings.*—The following integral compounds were used in different batches of concrete, as directed by the manufacturers of each:—Medusa, Trus-Con Paste, Toxement, Watorex, Lithil's "Alkagel".

Concrete from other batches were given surface treatments with the following materials:—Vulcan asphalt,

Barrett's tar, Vortex asphalt, Ironite, Calgary City asphalt, sodium silicate.

The integral materials and coatings were all applied to the same quality of concrete.

d) *Proportioning of Concrete.*—Three qualities were employed: (1) neat cement specimens made with cement and water without the addition of any form of aggregate, (2) a concrete testing about 2,500 pounds per square inch at 28 days, a quality generally superior to that usually employed in construction work, and (3) a concrete testing about 1,200 to 1,500 pounds per square inch at 28 days, equal or superior to most commercial concrete where rigid inspection is not employed in practice. Extensive laboratory tests previous to the beginning of this programme had shown that a sand gravel ratio of about 1–1 was advisable to secure best results with Warman materials. the common ratio 1–2 which results in a 1–1½–3, a 1–2–4, or 1–3–6 concrete does not give best results with this material resulting in a segregating mixture when sufficient mixing water is added to furnish a workable and placeable mix. A 45–50 volume ratio was selected. Since the Carseland sand was considerably finer than the Warman the usual 1–2 ratio was adhered to in the batches in which it was used. For the Winnipeg aggregates a sand, crushed stone ratio of 2–3 was employed.

For accuracy in preparing successive batches all qualities of cement, aggregate and water were weighed, the weight being dependent upon the previously determined weights per cubic foot. To establish the proportions of cement required to result in concretes having the desired compressive strength tests were made to determine the strength-cement content relation.

Each batch of concrete prepared was large enough to provide six (in most cases eight) cylinders 7 inches by 21 inches, three compression test cylinders 6 inches by 12 inches and two permeability slabs 2½ inches by 12 inches by 12 inches. All specimens moulded from a single batch were given a separate batch number which serves to identify them at all time. The moulding of at least six exposure test specimens insures that two can be installed at each site with all as nearly equal in quality as it is possible to prepare them. Brass plates stamped with the batch number and embedded in the top of each test specimen will permit identification as long as the specimen exists.

(e) *Mixing.*—Since a suitable machine mixer could not be obtained all batches were mixed by hand in the following manner:—The concrete floor was first sprinkled to reduce absorption of the weighed mixing water. The proper quantities of coarse aggregate, fine aggregate and cement were spread in consecutive thin layers and the whole mass shoveled through until the uniform color. The dry mixture was then formed into a crater and the mixing water slowly added and dry material from the sides thrown in. After adding sufficient mixing water to result in a fairly plastic consistency the mass was shoveled through three times. During the shoveling process a third man raked the mass with an ordinary garden rake. The mass was turned a minimum of three times with as many additional workings as was required to result in a homogeneous, uniform appearance.

Consistencies were determined and controlled by means of the flow table. As much mixing water was used for each batch as would result in the desired flow. No pre-determined quantity of water was employed but the amount used was noted in every case. A flowability of 180 was selected for use with all concretes. This is a plastic, mushy, consistency well suited to mass work, or portions of a structure which can be well tamped, spaded and vibrated, but does not contain the excess of water which is required when concrete is chuted. The consistency employed is one which should result in the lowest permeability and give a concrete of the highest quality for the cement content used.

(f) *Moulding.*—All cylinder test specimens were moulded in sheet metal forms with bottoms. Concrete was placed in approximately six inch layers and each thoroughly tamped in succession. The compacting was aided by taping the sides of the form. The form was heaped up at the last filling and allowed to stand for about thirty minutes after which the excess material was cut away, the brass identification plate placed in position and the surface troweled smooth. The top was then covered with a metal plate to prevent evaporation. Permeability slabs were moulded on edge so that the 12-inch by 12-inch faces were free from troweling, which greatly affected the permeability.

(g) *Curing.*—After 24 hours in the forms the specimens were removed and placed in wet sand in tar paper enclosures and sprinkled daily for a period of 27 days. Comparative tests made during this period indicated this method of curing to be fully as effective as curing in water.

Selection of Exposure Sites

The sites for exposure tests of specimens were selected with the following factors in view: — (1) fairly high concentrations of salt in the ground water, (2) a high water table so that the lower ends of the specimens might be immersed a great portion of the time with the upper ends projecting above the ground surface, and (3) convenience in visiting the site for later inspections.

In Alberta a site was selected near Cassils adjacent to the small lot which had been used for several years by the Calgary Branch of *The Institute* in conducting a series of field tests. Sewer pipes have been sunk at the four corners and at the center which will serve as wells for obtaining water samples and noting the height of the water table.

In Saskatchewan, a sulphate lake near Grandora, fourteen miles west of Saskatoon was selected for the tests. The salt concentration is approximately 1¾ per cent mainly sodium sulphate.

The site chosen near Winnipeg is along the line of the aqueduct of the Greater Winnipeg Water District near mile 15.2. At the time of selection the ground water level was about eight feet below the ground surface, necessitating the excavation of a pit about fifty feet square to that depth.

Preliminary analyses of waters from these three sites indicated that our requirements as to high sulphate concentrations will be fulfilled in each case.

Shipment of Test Specimens

To avoid damage in shipment the specimens were individually wrapped in heavy building paper and crated.

Installation of Test Specimens

Specimens were placed in duplicate at each site, each batch of concrete made being sufficiently large to permit

of six or more being moulded. Previous tests have shown that salt concentrations in the ground water may vary greatly only a few feet apart, so that care was taken to separate the duplicate specimens as far as possible. The specimens were embedded with about 6 inches projecting above the ground surface. Shipments were made and all installations completed in September and October before the freeze up took place.

Much credit is due the committee members at Calgary and Winnipeg for their assistance in selecting the sites and for supervising the placing of the test specimens. At Cassils, Alta., the work has been cared for by members of the staff of the Department of Natural Resources, Canadian Pacific Railway, stationed at the headquarters at Brooks, while at Winnipeg members of the engineering staff of the G.W.W.D., have been of great assistance both in connection with the selection of the exposure site as well as placing of the specimens.

Chemical Analyses

In order that the exposure conditions can be observed and recorded, a systematic system of sampling the ground waters has been adopted. At Winnipeg water samples are collected by the Engineering Department of the G.W.W.D., and the analyses are made under Mr. Blackie's supervision. Water samples from Cassils are collected monthly by the department of Natural Resources, C.P.R., and sent to Saskatoon in shipping cases where they together with samples from Grandora Lake are analyzed under Dr. Thorvaldson's supervision.

Inspection of Test Specimens

Caredul inspection of test specimens should be made at least twice yearly, in the spring and in the fall. While the specimens are cylindrical in shape which would permit of testing them in compression, it is very unlikely that such a procedure will be required. Any deterioration which may take place will be very apparent and visual inspection will prove to be of far more value than strength tests.

Co-operation with other Investigators

The Super Cement (America) Company Ltd., has furnished two lots of 2-inch by 4-inch cylinders made of 1–3 mortar by weight for exposure. The first group was installed in the fall of 1921 with our own test specimens, while the second which was received later will be sent out in the near future.

The Portland Cement Association through its Lewis Institute laboratory in charge of Professor Abrams, M.E.I.C., commenced an extensive field investigation in 1921. They have installed their largest groups of blocks in Colorado and North Dakota but have also made shipment of three similar sets to be installed along with our own blocks at the three sites. These specimens arrived late in the fall of 1921 and installation was completed at Winnipeg and Cassils, but at Grandora the freeze up took place the night before all could be placed. The rest were placed in position this spring. A complete list which will permit identification of these specimens will be found in appendix A, table 4.

Result of Exposure Tests

Since all test specimens were installed late in the Fall of 1921 it cannot be expected that the results of exposure to alkali waters will be marked at this early date.

However, Professor Finlayson, M.E.I.C.,reports, May 1922, that one of the Utica natural cement specimens installed at Winnipeg appears to be disintegrated, the depth of water in the pit preventing a thorough inspection at the present time.

At Grandora in May 1922, all specimens made of natural cement, both Utica and Commercial are completely disintegrated. This applies both to our own specimens and those furnished by Professor Abrams. Those blocks from Lewis Institute made of mixtures of Portland and Natural cements do not appear to be affected.

Gunite blocks Nos. 8 and 9 both showed signs of disintegration when inspected in May 1922.

In December, 1921, Mr. Dawson reported that cylinder 5–62 made at Saskatoon, containing sodium silicate was scaling off at the ground surface, but with no apparent swelling; also that Lewis Institute block 75–B was disintegrating. The latter is a Utica natural cement concrete block.

The foregoing is not intended to fully describe the present condition of all the test specimens since data is at hand covering the present condition of the Grandora specimens only.

Appendix "A"

List of Test Specimens Installed in 1921

Following are given lists of test specimens made and installed in 1921. In the first group table 1, are included those test pieces manufactured at Saskatoon, together with other necessary details which will give an idea of their physical properties. The identification numbers are stamped in a brass plate which is embedded in their tops. The batch number which is the number to the right in the upper line is all that is necessary to completely identify a specimen. For convenience in referring to different specimens moulded from the same batch of concrete each was given a different number which appears alone in the *lower* line. For example a plate is marked as follows:— $\frac{S\text{–}1\text{–}S\text{–}20.}{6}$ The first letter indicates the place of moulding, Saskatoon for all 7-inch by 21-inch cylinder specimens installed in 1921. The figure 1 indicates that Canada Portland Cement was used. Super Cement is designated by 2, and Commercial cement by 3. The third letter indicates the aggregate used, S represents Warman, C for Carseland, and W for Winnipeg. The second number represents the batch number and is alone sufficient to distinguish a test piece from any other batch. The figure 20 corresponds to batch 20 in the table. The lower line figure 6, permits the cylinder to be distinguished from the other seven of the same batch. In general those carrying 1 and 2 were sent to Cassils, 3 and 4 to Grandora, and 5 and 6 to Winnipeg.

As indicated in the tabulation, table 1, the concretes prepared at Saskatoon had a flowability of about 180, the different batches varying slightly. In general for comparison of the compressive strengths of concretes, consideration must be given to cement content or richness and flowability. In this group flowabilities are practically the same and the cement contents in pounds of cement per cubic yard of wet concrete permit a comparison of the compressive strengths which were obtained from tests of 6-inch by 12-inch cylinders at 28 days of age

It should be emphasized that the higher strengths obtained in compression for Super Cement do not necessarily indicate superiority over ordinary Portland cement in any other respect. This material was made in the cast using raw materials from other sources than those used in manufacturing the Canada Portland and **the strength differences here found are only normal differences often found when comparing two Portland cements from different mills.** The effect of the special treatment given Super Cement in its manufacturing process can only be determined by comparing it with cement produced in the same mill with the same raw materials with tannin omitted from the retarder.

Integral waterproofing compounds and bitumenous coatings were in all cases used and applied as recommended by the manufacturer whenever furnished. All specimens had been cured for a period of more than 28 days before shipments were made.

TABLE 1

List of Specimens Moulded at Saskatoon — 1921

From each batch indicated two specimens were installed at Cassils, Grandora and Winnipeg. All concretes had a flowability of 180 approximately.

7-inch by 21-inch cylinders

Batch number	Cement	Aggregate	Proportions by volume	Special treatment	Lb. cement per cu. yd. concrete	Comp. strength 28 days
1	Canada	none	neat	none	2760	5988
2	Super	"	"	"	2760	8695
3	Commercial	"	"	"	2320	1495
4	Canada	Carseland	1-1-2	"	738	2100
5	Super	"	1-1-2	"	753	3120
6	Canada	Winnipeg	1-1.28-1.84	"	778	2515
7	Super	Winnipeg	1-1.28-1.84	"	788	3505
20	Canada	Warman	1-1.36-1.66	"	783	2520
21	Super	"	1-1.36-1.66	"	783	3540
22	Commercial	"	1-1.36-1.66	"	750	615
60	Canada	"	1-2.3-2.8	"	515	1260
61	Super	"	1-2.3-2.8	"	515	1885
62	Canada	"	1-2.3-2.8	5% Sodium silicate sol.	500	680
63	"	"	1-2.3-2.8	Medusa	500	1270
64	"	"	1-2.3-2.8	Trus-Con. Paste	500	1320
65	"	"	1-2.3-2.8	Toxement	495	1030
66	"	"	1-2.3-2.8	Waterex	490	1195
69	"	"	1-2.3-2.8	Alkagel	475	590
72	"	"	1-2.3-2.8	Vulcan asphalt	516	153
73	"	"	1-2.3-2.8	Barrett tar	517	1395
74	"	"	1-2.3-2.8	Ironite	514	1565
76	"	"	1-2.3-2.8	Calgary asphalt	508	1341
77	"	"	1-2.3-2.8	Sod. sil. coating	507	1162
78	"	"	1-2.3-2.8	Vortex Bit. coating	509	1290
81	"	Carseland	1-1.67-3.33	none	493	1802
82	Super	"	1-1.67-3.33	"	497	2291
83	Canada	Winnipeg	1-2.16-3.10	"	527	1850
84	Super	"	1-2.16-3.10	"	532	—

TABLE 2

List of Gunite Specimens Made at Brooks, Alta.

Prepared by Department of Natural Resources, C. P. Ry.

Slab No.	Proportion Cement	Sand	How made	Installed at
"	1	2	shot up	Cassils
"	1	2½	" down	"
"	1	3	" "	"
"	1	3	" up	Grandora
"	1	3	" down	"
10	1	3	" "	Winnipeg
11	1	2	" up	"

Dimesinons of Blocks:—5 . . . . . 21 inches x 8 inches x 3½ inches.
6, 7, 9 and 10 . 24 inches x 10 inches x 4½ inches.
8 and 11 21 inches x 8 inches x 3½ inches.

How made:— "Shot up" indicates mould was suspended overhead.
How Cured: — Immersed in water 28 days before shipment.

TABLE 3

List of 2 x 4 Cylinders Furnished by Super Cement (America) Ltd.

48 small cylinders as follows:—
Proportions — 1 cement — 3 commercial sand by weight
Mixing water — 13½ per cent by weight
Flowability — 125
Cured — In damp sand for more than a period of 7 weeks.

These cylinders are each marked with a brass tag, a third of the lot being installed at each of the sites, Cassils, Grandora and Winnipeg.

TABLE 4

List of Specimens Made at Lewis Institute, Chicago

These test specimens are 10-inch by 24-inch cylinders, each one mixed and moulded separately, but made in duplicate, two of each reference number being sent to each site, marked A and B.

Aggregate — Sand and gravel from Jamesville, Wis. Cement — As indicated in tabulation.

Ref. No.	Proportions by volume Cement	Aggregate	Relative Consistency	Cement used
1	1	5	.90	Mixture of 4 brands Portland cement
2	1	5	1.00	"
3	1	5	1.10	"
4	1	5	1.25	"
5	1	5	1.50	"
6	1	4	.90	"
7	1	4	1.00	"
8	1	4	1.10	"
9	1	4	1.25	"
10	1	4	1.50	"
11	1	3	.90	"
12	1	3	1.00	"
13	1	3	1.10	"
14	1	3	1.25	"
15	1	3	1.50	"
16	1	2	.90	"
17	1	2	1.00	"
18	1	2	1.10	"
19	1	2	1.25	"
20	1	2	1.50	"
21	1	1	.90	"
22	1	1	1.00	"
23	1	1	1.10	"
24	1	1	1.25	"
25	1	1	1.50	"
26	1	5	.85	"
27	1	4	.85	"
28	1	3	.85	"
29	1	2	.85	"
30	1	1	.85	"
63	1	4	1.00	Universal
67	1	4	1.00	Northwestern States
71	1	4	1.00	Lehigh
75	1	4	1.00	Utica Natural
79	1	4	1.00	25% Portland 75% Utica
83	1	4	1.00	50% " 50% "
87	1	4	1.00	75% " 25% "
91	1	4	1.00	"Commercial" Natural
95	1	4	1.00	25% Portland 75% Commercial
99	1	4	1.00	50% " 50% "
103	1	4	1.00	75% " 25% "

TABLE 5

Sulphate Content of Ground Waters to which Test Blocks Have Been Exposed

Analyses made in Fall of 1921

	Sulphates part per million
Winnipeg — Samples taken at corners of 50-foot x 50-foot plot —	
N. E. corner	17,570
N. W. "	16,710
S. W. "	3,200
Grandora — lake water	8,531
Cassils — Soil water well E	10,948

Chemical Research

It was early recognized that the selection of a suitable and qualified man to act as director of the chemical research was one of our most important and difficult problems. A thorough search was made for such a man and in September 1922, Dr. Thorvaldson, head of the Chemistry Department at the University of Saskatchewan, was asked to undertake the work. For the first year arrangements were made with the governors of the university whereby Dr. Thorvaldson was to be granted leave of absence from teaching duties in order to devote his entire time to the organization of this work, the committee undertaking to make up the balance of his salary. At the end of the year Dr. Thorvaldson resumed part of his teaching duties, and offered his services, free of charge, to the committee to continue as director of the chemical research. The committee thoroughly appreciates the generosity of Dr. Thorvaldson and consider themselves most fortunate in being able to retain his services as director, a post which he has filled with great credit and ability.

It will be realized that it is impossible to report more than generally upon a chemical research that is not complete, but the following will serve to give some idea of the general method of attack and the progress made.

The first chemical work on the problem was concerned with a study of the composition of the ground waters of the areas where failures of concrete foundations were general, etc. This work is still being carried on in connection with the field investigation, especially with reference to seasonal variations, etc. Some chemical work has also been done on the nature of the integral and waterproofing compounds used in the field work. The more important part of the chemical work deals with a study of the changes which take place in cement and concrete during disintegration by the action of sulphate solutions. In this work the problem is being attacked from two sides. First, by studying the action of the various salts, present in ground waters in the so-called alkali districts, on hydrated cement. Second, by a separate study of the action of these solutions on all the substances present in cement systems, or disintegrated cements. This includes the preparation, in pure state, of all the substances which may be present in such systems and a study of their solubilities in, and reactions with, the various salt solutions.

In the first part of this work several types of cement have been used. The work so far done or in progress includes a number of series of experiments where intimate contact is effected between cement or concrete and the various solutions, and the changes taking place both in the liquid and solid phase are followed as far as possible by chemical methods. Other series deal more directly with the effect of variation of the hydrogen ion concentration. Still others deal with physical changes occurring in set mortars and application of these to the elucidation of celloidal changes during the action of "alkali" solutions. Other series deal with the action of deteriorated concrete on undamaged concrete.

As to the second method of attack the chemical behaviour (with alkali solutions) of the simpler substances, present in concrete and disintegrated concrete, has already been studied. The preparation of the more complex compounds, which is a matter of considerable difficulty, is at present in progress.

In all this work the microscopic methods of the petrographer are used as well as the usual chemical methods for the identification of substances and determination of the composition of the solid phase.

It is hoped that these investigations will lead to an understanding of the reactions involved in the deterioration of concrete, and that this will serve as a guide in the search for a successful remedy.

Financial Statement

The following summary of expenditures and receipts as to December 1st, 1922, is given, a detailed itemized statement of expenditures is being sent to the financial supporters in addition.

Expenditures to Dec. 1st, 1922

General	Committee meetings travelling expenses	$ 1,628.66	
	Misc. telegrams, office expenses	219.12	$ 1,847.78
Physical Tests	Travelling allowances and expenses	$ 1,123.66	
	Materials and special equipment	1,696.11	
	Freight and cartage	303.61	$ 3,123.38
Chemical Research	Travelling expenses	$ 278.45	
	Salaries	7,034.54	
	Materials and equipment	3,922.73	$11,235.72
Grand total			$16,206.88

Receipts to Dec. 1st, 1922

Council Scientific and Industrial Research	$10,000.00	
Canada Cement Company	6,000.00	
Saskatchewan	6,000.00	
Alberta	2,000.00	
Canadian Pacific Railway	2,000.00	
City of Winnipeg	400.00	$26,400.00
Balance unexpended December 1st, 1922		$10,193.12

From the above it will be seen that there is a balance on hand of approximately $10,000. The probable expenditure for field tests will be smaller in the future, as will also be the general expenses as there will not be the necessity for a more than one general committee meeting a year, now that the general organizational work is complete, these two items should not exceed together $1,500 per year. The expenditure on the chemical work as at present organized is approximately $800 a month and it does not seem probable that this figure will be exceeded. It will be seen, therefore, that with the $10,000 balance and the third instalment of $13,200 we will have sufficient funds to carry on for at least two more years. As we have already been actively at work for well over a year it is obvious that the three year program which we originally embarked upon will be possible and we have every reason to feel confident that the results will fully repay both ourselves and the contributors for the time, money and energy expended.

All of which is respectfully submitted,

C. J. MACKENZIE, M.E.I.C.,

Chairman of the Committee on Deterioration of Concrete in Alkali Soils.

Board of Examiners and Education Committee

The President and Council,

On behalf of the Board of Examiners and Education I beg to submit the following report for the year 1922. Eight candidates presented themselves for examination at the usual periods in Spring and Autumn. Three of these were examined under schedule "B" only, and five under schedule "C" as well as schedule "B". The following table shows the results.

Schedule	Number examined	Passed	Failed
B	8	5	3
C hydraulic engineering	1	1	0
C railway engineering	2	1	1
C structural engineering	1	0	1
C highway engineering	1	1	0
Total	13	8	5

Respectfully submitted,

H. M. MacKay, M.E.I.C., *Chairman.*

Committee on Classification and Remuneration

The report of the Committee on Classification and Remuneration was published in the November 1922 issue of *The Journal*, page 541.

Nominating Committee — 1923

The following nominations have been made by the various branches, have been noted by Council, and are herewith presented to be announced at the annual meeting in accordance with the by-laws.

Montreal Branch	R. Bickerdike, M.E.I.C. J. A. Lalonde, A.M.E.I.C.
Sault Ste. Marie Branch	J. W. LeB. Ross, M.E.I.C.
Lethbridge Branch	G. N. Houston, M.E.I.C.
Toronto Branch	E. G. Hewson, M.E.I.C.
Calgary Branch	B. L. Thorne, M.E.I.C.
Winnipeg Branch	J. G. Legrand, M.E.I.C.
Saskatchewan Branch	A. C. Garner, M.E.I.C.
Cape Breton Branch	Horace Longley, M.E.I.C.
Border Cities Branch	H. Thorne, M.E.I.C.
Victoria Branch	E. E. Brydone-Jack, M.E.I.C.
Peterborough Branch	P. P. Westbye, M.E.I.C.
Niagara Peninsula Branch	F. S. Lazier, M.E.I.C.
Halifax Branch	K. H. Smith, M.E.I.C.
St. John Branch	A. R. Crookshank, M.E.I.C.
Moncton Branch	F. B. Tapley, M.E.I.C.
Ottawa Branch	G. Gordon Gale, M.E.I.C.
Hamilton Branch	C. H. Marrs, M.E.I.C.
London Branch	H. A. Brazier, M.E.I.C.
Quebec Branch	L. A. Dubreuil, A.M.E.I.C.
Kingston Branch	L. M. Arkley, M.E.I.C.
Lakehead Branch	F. Y. Harcourt, M.E.I.C.
Edmonton Branch	C. A. Robb, A.M.E.I.C.
Vancouver Branch	James Muirhead, M.E.I.C.

Publicity Committee

The President and Council,

On behalf of the Publicity Committee, I have the honour to submit the following report:

In considering the question of greater publicity for the engineering profession your committee is of the opinion that *The Institute* should both as a matter of general policy and through the activities of its branches strive constantly for a greater recognition by the public of the debt it owes the engineering profession. In this connection the following suggestions are offered, to be put into effect by a committee or committees under Council.

1.—In the preparation of biographical sketches of the pioneer engineers of Canada, already approved by Council, the authors keep constantly in the foreground the vital importance of the results of the work done by these men towards the development of Canada.

2.—Articles on the engineer's place in industrial and material progress, based on engineering works accomplished, making the importance of the engineer a prominent feature.

3.—By encouraging the members to make use of their *Institute* title on every possible occasion, and to insist that it appear after their names in all published articles and in letters to the press, and encourage its use wherever the name of a corporate member appears in print.

4.—In securing a proper valuation of the everyday practical work of the engineer in bettering the economic and physical conditions of life.

Suggestions to be carried out by the branches.

1.—A committee in every branch whose function shall be to make certain that the local press is supplied with an account of every meeting and who shall provide the press with a popular abstract of all papers read, and a summary of all addresses delivered.

2.—The holding of meetings to which the public is invited, the subject being such as to inspire those present with a better appreciation of the engineers' value.

3.—Taking an active constructive part in helping to solve the problems of the community in which the branch is located.

4.—Having as a definite object of the branch to become a leading influence in its municipality's progress.

5.—By encouraging and assisting the members to accept and secure offices in the public bodies of the branch's community.

6.—Providing speakers, as opportunity offers to present before local organizations, such as Rotary and Kiwanis Clubs, addresses on engineering subjects, the interest in which could be used to greater advantage; these addresses to emphasize the practical side of engineering, and the necessity of the employment of only recognized engineers.

7.—A constant striving for recognition of the word ENGINEER as being applicable to professional engineers only and that engine operators or drivers be known as enginemen.

It is believed by your committee that the adoption of a definite policy embodying the above suggestions would strengthen the engineering profession and give the individual members increased standing and prestige.

Respectfully submitted,

C. P. Edwards, A.M.E.I.C. *Chairman.*

Members of the Committee

Chairman — C. P. Edwards, A.M.E.I.C.
K. M. Cameron, M.E.I.C.
G. Gordon Gale, M.E.I.C.
C. H. Atwood, M.E.I.C.
H. G. Acres, M.E.I.C.

Committee on Biographies

The President and Council,

This committee has been given the task of preparing biographies of those engineers who have filled a prominent place in the carrying through of Canada's greater engineering undertakings and who were Canadians by birth or through more or less permanent citizenship. For obvious reasons, it is felt that memoirs should be limited to those of deceased engineers. They should not, however, be confined to members of the Canadian Society of Civil Engineers and its successor, *The Engineering Institute of Canada*. In this way the committee believes that much valuable material relating to the days of New France and subsequently, as well as to more recent times, can be brought to light and recorded. Up to the present, biographies of the following have been promised:— Thos. C. Keefer, Sir Sandford Fleming, Marcus Smith, John Page, Walter Shanly, Simon J. Dawson, Hamilton Kilally, F. E. Busteed.

The committee is extremely anxious that anyone familiar with the career of a deceased engineer and who is willing to undertake the preparation of a biography, will communicate with any one of its members. The co-operation of *Institute* members in this is earnestly solicited.

Respectfully submitted,

PETER GILLESPIE, M.E.I.C., *Chairman.*

Members of the Committee

Col. W. P. Anderson, M.E.I.C., Ottawa; M. J. Butler, M.E.I.C., Oakville; Willis Chipman, M.E.I.C., Toronto; Col. John S. Dennis, M.E.I.C., Montreal; A. R. Decary, M.E.I.C., Quebec; C. E. W. Dodwell, Hon.M.E.I.C.,Halifax; A. B. Lambe, A.M.E.I.C., Ottawa; J. G. Sullivan, M.E.I.C., Winnipeg; H. K. Wicksteed, M.E.I.C., Toronto; Peter Gillespie, M.E.I.C., Toronto, Chairman.

Committee on Policy

The report of the Committee on Policy was published in the June 1922 issue of *The Journal*, page 329.

Canadian Engineering Standards Committee

The President and Council,

On behalf of the members nominated by Council, of the Main Committee of the Canadian Engineering Standards Association, I beg to submit the following report:

General

The Engineering Institute of Canada's representatives on the above committee are now: Walter J. Francis, M.E.I.C., *one year*, Sir Alexander Bertram, M.E.I.C., *two years*, and W. H. Winterrowd, A.M.E.I.C., *three years*. H. H. Vaughan, M.E.I.C., is chairman of the association, and a very large number of members of the Main Committee and of the various working committees are members of *The Engineering Institute of Canada*. The number of members of the association as of October 1, 1922, is 285, this being, therefore, the approximate number of members of the various working committees.

During the past year the work of the association has undergone considerable development, there being at the present time thirteen sectional committees which have oversight of the work on various divisions of engineering activity, and twenty-five sub-committees and panels in whose hands the actual technical work of formulating specifications and standards has been placed.

Publications

A list of publications of the association up to date is as follows:—

No.	1-1922	Standard Specification for Steel Railway Bridges.
No.	1A-1922	Separate reprint of Material Specifications, Steel Railway Bridges.
No.	2-1920	Standard Requirements for Distribution Type Transformers.
No.	3-1921	Standard Specifications for Telegraph and Telephone Wire.
No.	4-1921	Standard Specification for Wire Rope for Mining, Dredging, and Steam Shovel Work.
No.	5-1922	Standard Specification for Portland Cement.
No.	6-1922	Standard Specification for Steel Highway Bridges.
No.	7-1922	Standard Specification for Flexible Steel Wire Rope and Strand for Aircraft Purposes.

The following publications are in preparation and will shortly be issued:—

Standard Specification for Incandescent Lamps.
Standard Specification for Watthour Meters.
Standard Specification for Wood Poles for Transmission Lines.
Standard Specification for Reinforcing Materials for Concrete.
Standard Specification for Commercial Bar Steel.

Concrete and Reinforced Concrete

One of the most important pieces of work now in hand is that of the Sub-Committee on Concrete and Reinforced Concrete, which is preparing a specification for those materials, the work being undertaken at the instance of *The Engineering Institute*. The sub-committee has divided the subject for consideration by panels dealing respectively with waterproofing and protective treatment; surface finish; forms and placing; materials, proportioning and mixing; design and details of construction, and form of specification.

The task of this sub-committee is a heavy one, on account of the large extent of ground to be covered. It is considered advisable to work as far as possible along lines parallel with those adopted in the United States, where a similar specification is under preparation. It is not anticipated that the sub-committee will be able to report at any early date, but its various panels are actively at work. In regard to some of the points under consideration a considerable amount of experimental work will be needed before definite conclusions can be arrived at.

Road Materials

Another interesting development is that of the Sectional Committee on Road Materials and Construction, the formation of which has been undertaken with a view of obtaining interprovincial agreement, especially as regards nomenclature, definitions, and tests for road materials which will be generally acceptable. It is probable that a number of working sub-committees will have to be organized, each dealing with a sub-division of this work. The work of this committee is being

carried out in conjunction with that of *The Institute's* Committee on Roads and Pavements.

Wire Strand

A draft specification for this material has been prepared, covering three grades and four sizes in each grade, and this specification has been sent out in tentative form for criticism by a large number of firms and organizations interested in the purchase of wire strand. The questionnaire sent out with this draft has been returned in a large number of cases, and replies are being tabulated for consideration by the sub-committee at a meeting which it is hoped to hold shortly.

Flexible Wire Rope and Strand for Aircraft Purposes

A panel of the Sectional Committee on Aircraft Parts has drawn up a specification for this material, at the request of the Air Board, officers of that body desiring a specification which follows generally the requirements of the British Air Ministry but contains such modifications as will encourage the use of material of Canadian manufacture. The resulting specification has been duly submitted for criticism, and has been approved for publication.

Incandescent Lamps

A draft specification prepared by a small panel and embodying the results of over two years' work was considered by the sub-committee at a meeting in June, received various amendments, and was approved, subject to the inclusion of certain additional information to be furnished by the manufacturers. This specification is now ready for submission for final approval by the sub-committee by letter ballot. Its preparation was originally undertaken at the suggestion of officers of one of the large government departments and it is intended to give, in as simple a form as possible, the information needed by a purchaser of tungsten lamps regarding the standard practice in manufacturing these articles and the accepted methods of test. The testing of incandescent lamps as to efficiency is an extremely difficult and technical business. Photometric tests of the kind required for this purpose can in fact only be carried out in an elaborately equipped photometric laboratory and by a specially trained staff. Facilities for this purpose already exist at one or two places in Canada and it is hoped that the publication of the specification in question will benefit the consumer and the manufacturer by leading to a more general interest and a better understanding regarding the subject.

Watthour Meters

The last meeting of the sub-committee on this subject was held in July and a draft of its report received general approval, subject to some modifications which are now being worked out, and which will be considered at a further meeting to be held shortly. The committee is receiving the very active support of the Canadian Electrical Association and the Canadian manufacturers of these instruments, and expects to secure agreement which will eliminate certain existing diversities of practice between the various makes of watthour meters as regards methods of testing for acceptance, arrangement of working parts, dials, location of connecting wires, etc. This will result in benefit to the user without sacrificing the manufacturers' individuality and special methods of construction. The work of the committee is being carried on in close consultation with the Electrical Inspection Branch, Department of Trade and Commerce.

Wood Poles for Transmission Lines

The work on this subject has progressed satisfactorily and draft specifications have been prepared, were considered at a meeting held in September, and are being modified in accordance with the directions of that meeting.

Rating and Testing of Electrical Machinery

The present Canadian practice in rating the power or capacity of electrical machinery, such as motors, generators, transformers, etc., is generally in accordance with that accepted in the United States. The rules of the American Institute of Electrical Engineers and other American technical bodies, have, however, never received official acceptance in Canada, and a large committee, under the auspices of the C.E.S.A., has been formed and divided into panels, each dealing with one section of the subject. Their purpose is to examine into the standardization rules in use in the United States and Great Britain, and draw up a report which will indicate the practice to be regarded as standard under Canadian conditions.

The work of this sub-committee has hardly yet progressed beyond the organization stage, but the subject was generally surveyed at a meeting held in June and various types of electrical machinery were classed as:—

(1) Large motors, generators, and rotating machines operating under controllable conditions as regards ventilation, etc.

(2) Industrial sizes of motors and generators operating as a rule under unfavourable conditions in manufacturing establishments and elsewhere.

(3) Transformers of various types.

A panel has been organized to deal with rules affecting each of these classes.

Canadian Electrical Code

It has not yet been possible to organize definitely the sub-committee for this subject on account of the difficulty in getting into touch with the very numerous interests affected. The Honourable J. A. Robb, Minister of Trade and Commerce, as a result of the memorandum forwarded to him as directed at the seventh meeting of the Main Committee, has addressed a request to each of the provincial governments, inviting them to nominate members to attend a conference on the subject, and the date of October 2nd, was provisionally set for this. Replies, however, were not received from all of the provincial governments by that date and the conference has had to be postponed. The governments of Ontario, Quebec and Nova Scotia have signified their intention of taking part; those of New Brunswick, Saskatchewan, Alberta, and British Columbia do not propose to be represented, and no replies have yet been received from Manitoba and Prince Edward Island. As a very large proportion of the electrical development of the Dominion takes place in the provinces which have replied, it is felt that the conference, even although some of the provinces are not represented, cannot fail to be productive of beneficial results, and it is hoped that it will take place in the near future.

Gasoline and Lubricating Oil

At a meeting of the committee on this subject held in March, it was decided that for the present the prepara-

tion of definite specifications for gasoline for automotive purposes was undesirable, but that a booklet or statement should be prepared for the information of motorists. This document is to give such technical data and information regarding gasoline and lubricating oil as will tend to minimize the troubles complained of by consumers, provided that they take advantage of the recommendations given. This pamphlet is in preparation, and data are being furnished by the oil companies and others for incorporation in it.

Co-operation with Other Standardizing Bodies

During the year the association has been in active co-operation with the American Engineering Standards Committee in regard to a number of active subjects, and in several cases arrangements have been made for the interchange of delegates at the meetings of the various working committees. This is of special importance owing to the very close industrial relationship existing between Canada and the United States. The results of this arrangement and of the close consultation which is taking place with the British Engineering Standards Association have been very satisfactory.

Relations with The Engineering Institute

The Main Committee of the association has expressed its high appreciation of the assistance and financial help received from *The Engineering Institute of Canada*. Without the active assistance of members of *The Institute* the association's progress would undoubtedly have been much slower than has been the case.

In closing we wish to pay tribute to the splendid work done by Captain R. J. Durley, M.E.I.C., secretary of the Standards Committee, also a member of *The Institute*, who has on all occasions been most courteous and has conducted the work of the committee in a manner that meets with the heartiest approval of your committee.

On behalf of the committee,

ALEX. BERTRAM, M.E.I.C.
Canadian Engineering Standard Committee.

Canadian National Committee of International Electro-Technical Commission

The President and Council,

Early in the year 1922 your committee received reports of the International Conference on High Tension Transmission and the texts of the resolutions adopted at its closing session.

During the year a comprehensive questionnaire has been prepared in order to obtain full information for the work to be done as the result of the above mentioned conference.

A great deal of progress was achieved during the year in the matter of the rating of electrical machinery, to allow of a specification requiring an overload to be brought within the scope of the rating rules.

The matter of the International adoption of electrical symbols has been almost completed, the report of the British Engineering Standards Association, approved by the British National Committee of the International Electro-Technical Commission being practically the complete list of symbols proposed.

Respectfully submitted,

L. A. HERDT, M.E.I.C., *President,*
Canadian National Committee., I.E.C.

Committee on Uniform Steam Boiler Specifications

The President and Council,

On behalf of the committee I beg to report as follows on the progress made in having uniform boiler regulations adopted by the different provinces of the Dominion. Since our last report, the governments of the provinces of British Columbia and Ontario have adopted the uniform boiler regulations as approved by your committee.

As the matter stands at present, the provinces of Alberta, British Columbia, Manitoba, Ontario and Saskatchewan, now have the same regulations for the construction and inspection of steam boilers.

The eastern provinces, Nova Scotia, New Brunswick, and Prince Edward Island have not as yet adopted the uniform rules, but D. W. Robb, M.E.I.C., a member of your committee, is keeping in close touch with the situation there, and I believe that we are justified in expecting these provinces to follow the lead of the western provinces in a short time.

It has been suggested that as far as the province of Quebec is concerned, the matter might be turned over to the Association of Professional Engineers for the Province of Quebec, the executive of this association would be in closer touch with legislation in Quebec, than the members of your committee, and we recommend that this be done.

The regulations that are being adopted by the different provinces are those known as the Canadian Interprovincial Regulations for the Construction and Inspection of Boilers and Machinery.

These regulations were formulated at a conference of delegates from the different provinces, held in Winnipeg in 1918, they were submitted to your committee for criticism and as they were in substantial accord with the draft that we were prepared to recommend, we approved them.

Respectfully submitted,

L. M. ARKLEY, M.E.I.C. *Chairman.*

Ontario Provincial Division

The President and Council,

On behalf of the Ontario Provincial Division, and in pursuance of *Institute* By-law No. 63, the undersigned beg to submit the following report for the calendar year 1922, namely:—

Membership

The membership of the Division consists, as specified in the by-laws of *The Institute*, of all the *The Institute* members resident in the province of Ontario, the total being approximately 1,836 divided about as follows, namely:—

Corporate branch members	1,088
Non-Corporate branch members	473
Corporate non-resident members	160
Non-Corporate non-resident members	115
	1,836

Executive Committee

The Executive Committee of the Division, in accordance with the Division by-laws, is constituted as follows, namely:

The vice-presidents resident in Ontario	2
The Ontario councillors	9
The honorary councillors resident in Ontario	1

One representative from each branch, 9 branches at beginning of year, now	10
One representative of each 25 non-resident corporate members	6
The immediate past-chairman of the Division	1
The immediate past-sec.-treas. of the Division	1
	30

The detail of the personnel of the Committee is contained in each month's issue of *The Journal.*

The Executive Committee has not held any meetings during the year, conducting all its business by correspondence or by telegraph and telephone. Besides this the various questions before the Division were discussed by different members of the executive whenever they happened to see each other, the Division being fortunate in having on its committee a good many members who not only were constantly travelling and thus frequently meeting one another, but who also never missed an opportunity thus afforded of discussing any questions current at the time.

Professional Engineering Act

As in 1921, the main and important question with which the Division has been concerned during the year 1922 was that of a Professional Engineering Act for the province of Ontario. To handle this question, as you are already aware, the Division joined late in 1919 with the Association of Ontario Land Surveyors, the Canadian Institute of Mining and Metallurgy, the Canadian Society of Chemical Industry, the Ontario Association of Architects, (later on the Architects withdrew), the Toronto section of the American Institute of Electrical Engineers, and the Ontario section of the American Society of Mechanical Engineers, to form a joint organization, which was called the Advisory Conference Committee.

As already reported to you, this Advisory Conference Committee succeeded in getting a Professional Engineering Act passed by the Legislature of the province of Ontario at its last session. The Act, which is known as No. 67, 3rd Session, 15th Legislature, was introduced on April 6th, 1921, had its second reading on April 20th of that year, was passed by the House on June 5th of this year, received Royal Assent on the 13th of the same month, and came into operation on that day. It marks a very decided advance in the annals of professional engineering in Canada, and is one more forward step in the effort to put that profession on the same well-defined and legal basis as the sister professions of theology, medicine, and law. Besides this it will of course be of value to the community also, in fact as at first drafted it would have afforded just as complete protection to the public as do the corresponding Acts relating to the sister professions, but before it was finally passed the wording was changed. The main difference is the elimination of the clause which specified that none but registered men, which means qualified men, might practise professional engineering, but even in its amended form the Act will be of value to the public if those depending upon professional engineering advice make a point of seeing that it emanates from a registered man. But the unregistered man is still allowed to practise, he may be qualified, but he may not be, so the Act does not protect the community to the extent that it otherwise might, nevertheless, it is a marked step forward.

In its work of obtaining the above legislation the Advisory Conference Committee was most ably assisted by the executive of the Toronto Branch, which formed itself into a local committee and placed itself at the disposal of the Advisory Conference Committee. The thanks of all concerned are due to the executive and members of that branch for the excellent work they did.

Financial Statement

Regarding finances: As previously reported to you, the Association of Professional Engineers created by the Professional Engineering Act referred to above has assumed as part of its organization expenses the outlays incurred in connection with the passage of said Act, and in accordance therewith there has been returned to the Division, through the Advisory Conference Committee, the sums that we had from time to time forwarded to the latter. This has enabled us in turn to refund to *The Institute* the advance of $400.00 made to us, in which connection we would take this opportunity of again expressing our sincere thanks to Council for its help in the matter. Our financial statement for the year is as follows:—

Revenue		
Balance as at January 1st, 1922	$333.79	
Advisory Conference Committee, return of advances	250.00	$583.79
Expenditure		
Engineering Institute of Canada, return of advance	$400.00	
Postage	24.30	
Stenography	16.60	
Telephones and telegraphs	27.15	
Printing	3.00	
Total	$471.05	
Balance, cash in hand	$112.74	$583.79
Assets		
Cash in hand, as above		$112.74
Liabilities		
Sundries, estimated	$ 25.00	
Surplus, estimated	87.74	$112.74

In conclusion, we cannot refrain from again emphasizing the exceedingly great value of such a body as the above Advisory Conference Committee, and this from two distinct view points:—

(a) It has proved itself to be by far the best possible means of handling any matter, such as the above engineering legislation question, which affects a number of professional organizations.

(b) It has shown itself to be a most effective means of bringing the member organizations together in a way that gives each and all of them a most complete understanding and appreciation of the aims and methods and views of each of the others. We commend it as most excellent procedure under all such conditions as faced the professional engineers of Ontario in 1919.

On behalf of the Division,

W. H. MAGWOOD, M.E.I.C., *Chairman.*
C. R. YOUNG, M.E.I.C., *Vice-Chairman.*
A. B. LAMBE, A.M.E.I.C., *Secretary-Treasurer.*

Branch Reports

Border Cities Branch

The President and Council,

The Executive of the Border Cities Branch beg to submit the following annual report for the year ending December 31st, 1922.

Report of Chairman

The growth of the branch during the year has been in keeping with the general development of the Border Cities district. Membership has increased from fifty-six to seventy-seven members of all grades, a gain of thirty-seven per cent. The policy of holding dinner-meetings has been continued throughout the year and is productive of a spirit of good fellowship among the members who attend. Several changes were made in branch by-laws during the year, to secure uniformity with other branches, where possible. The interest shown by the younger members in branch activities augurs well for its future growth and usefulness.

Report of Membership Committee

The membership of the branch shows a net gain of twenty-one during the year, classified as follows: Members two, Associate Members nine, Juniors three, Students six, Associate one. We record with regret the loss of two members through resignation. It is unfortunate that while they are still engaged in engineering pursuits that the advantages of participating in meetings and associating with other engineers does not appeal to them.

A detailed statement of membership changes follow herewith:—

Members added through transfer	2
Transferred from Junior to Associate Member	4
New Associate Members	7
New Juniors	5
New Students	6
Associate of The Institute	1
Resignations	2

	1921	1922
Members	13	15
Associate Members	29	38
Juniors	9	12
Students	5	11
Associate	–	1
	56	77

Our records do not indicate that any member was removed by death during the year.

Meetings

Regular meetings 8; average attendance 24.
Executive meetings 18; average attendance 5.

January —"The Manufacture of T.N.T.", W. H. Baltzell, M.E.I.C.
"The Evolution of Matter in the light of Modern Science", D. A. Molitor, M.E.I.C.

February —"The Placing of Concrete under Varying Conditions'., L. M. Allen, A.M.E.I.C.

April —"Roads", A. J. M. Bowman, A.M.E.I.C.
"Inconsistencies in Specifications on the same work in different localities", E. F. Considine, M.E.I.C.
"Radio", Alex May.
"The Hudson Bay Railway", J. S. Nelles, A.M.E.I.C.

May —"Concrete", Col. Boyden.

October —"Transmission Towers", C. E. Goodrich, M.E.I.C.

November —"Reminiscences of a City Engineer", M. E. Brian, A.M.E.I.C.

Report of Advertising Committee

This committee has undertaken an active campaign to augment the revenues both of *The Journal* and of the branch by bringing the advantages of *The Journal* to the attention of those in this district who should be interested and who would be directly benefitted. This has been quite successful and we can confidently look forward to seeing the firms of the Border Cities well represented in the columns of *The Journal* in 1923.

The following committees were active during the year:—

Papers and Entertainment,—W. J. Fletcher, A.M.E.I.C., chairman; O. J. Hein, A.M.E.I.C.; E. J. McIntire, A.M.E.I.C.
Membership,—J. E. Porter, A.M.E.I.C., chairman; D. A. Molitor, M.E.I.C., M. E. Brian, A.M.E.I.C.
Advertising,—L. E. Collins, Jr.E.I.C.
Nominating Committee,—H. Thorne, M.E.I.C.
Ontario Provincial Division,—J. J. Newman, M.E.I.C.

Financial Statement

January 1st — December 31st, 1922

Receipts

Balance in bank		$126.31
Rebates from Headquarters	$118.38	
branch news	52.94	
advertising	1.50	172.82
Rebate from Montreal Branch re branch secretaries meeting		63.40
Bank interest		4.25
		$366.78

Expenditure

Notices and printing	$ 23.52
Postage and miscellaneous	9.48
Entertainment	23.90
Expenses of secretary to Montreal	76.40
Rental Collegiate auditorium	15.00
Typing	13.00
Balance on hand	205.48
	$366.78

Respectfully submitted,

GEO. F. PORTER, M.E.I.C., *Chairman*
J. CLARK KEITH, A.M.E.I.C., *Secretary-Treasurer*

Calgary Branch

The President and Council,

On behalf of the Executive Committee of the Calgary Branch we beg to submit the following report for the year ending December 31, 1922:—

At the annual meeting on March 11th, 1922, the following officers were elected:—*Chairman*, P. J. Jennings, M.E.I.C.; *Secretary*, J. A. Spreckley, A.M.E.I.C.; *Treasurer*, G. P. F. Boese, A.M.E.I.C.; *Executive*, V. M. Meek, A.M.E.I.C., F. E. Emery, A.M.E.I.C., F. K. Beach, A.M.E.I.C.

Ex-officio members of the executive: P. Turner Bone, M.E.I.C., G. W. Craig, M.E.I.C., B. L. Thorne, M.E.I.C.

Auditors: W. J. Gale, A.M.E.I.C., A. Fraser, A.M.E.I.C.

After two years as secretary-treasurer, A. L. Ford, M.E.I.C., resigned from this position on the completion of the branch year in March 1922, and at a general meeting on April 28th, 1922, he was presented with a wrist watch, suitably engraved, in recognition of his services to the branch.

Meetings

The executive held fourteen meetings, at which the regular business of the branch was transacted, with an average attendance of six.

Thirteen general meetings were held at which the average attendance was forty. The following is a list of these meetings:—

Jan. 6—**"Recent Developments in Sanitary Engineering"**, Professor C. J. MacKenzie, M.C., B.E., M.C.E., M.E.I.C., Saskatoon.

Jan. 27—**"A New Development in Electrical Oscillations"**, R. W. Boyle, M.Sc., Ph.D., F.R.S.C., Dean of the Faculty of Applied Science, Edmonton.

Feb. 24—**"Actuarial Factors in the Design of Irrigation Structures"**, Lt.-Col. H. B. Muckleston, M.E.I.C., read by G. P. F. Boese, A.M.E.I.C.

Mar. 11—Annual meeting and luncheon.

Apr. 28—**"Irrigation Experiment at Brooks, Alberta"**, W. H. Snelson, A.M.E.I.C.

June 5—**"Scientific Methods of Making Concrete"**, Professor Duff A. Abrams, M.E.I.C.

June 23—Luncheon and address on the Report of the Policy Committee, Fraser S. Keith, M.E.I.C., general secretary.

July 10—Dinner and address, Brig.-Gen. C. H. Mitchell, C.M.G., D.S.O., M.E.I.C., vice-president E.I.C.

Oct. 9—**"Concrete Highway Investigations and Specifications"**, Col. H. C. Boyden, B.S., M. Am. Soc. C.E.

Nov. 3—**"Irrigation Practice in India"**, A. N. McI. Robertson, B.A., B.E., executive engineer of the Punjab Irrigation Department.

Nov. 7—**"Proportional Representation"**, P. Turner Bone, M.E.I.C.

Dec. 1—Visit to the new Institute of Technology and Art at Crescent Heights, Calgary, with address by J. H. Ross, A.M.E.I.C., acting principal.

Dec. 29—Annual dinner and entertainment, with an attendance of seventy.

The branch is indebted to the several speakers for contributing to the success of the programme and to the Programme Committee for the excellent entertainment provided and to the Press of Calgary for its co-operation.

Membership

The membership of the branch compares with the end of last year as follows:—

	Jan. 1st, 1922	Dec. 31st, 1922
Members	24	22
Associate Members	62	67
Juniors	6	7
Students	4	5
Associates	2	1
Affiliates of the branch	8	7
Totals	106	109

The conditions of residence may be described as follows:—City of Calgary 62; Winter in Calgary and Summer in the field 33; resident outside 25-mile limit 14.

Financial Statement

Assets December 31st, 1922

Cash in bank		$ 269.08
Market value of securities		811.10
Fees collectible from Affiliates		24.00
Rebate due from Headquarters		24.39
		$1,128.57

Liabilities December 31st, 1922

Expense a/c secretary	$10.86	
Stenographer's account	4.75	
Expense a/c treasurer	2.75	
		$ 18.36
Surplus at Dec. 31, 1922		$1,110.21
Surplus at Dec. 31, 1921		1,047.89
Increase in value of assets		$ 62.32

Revenue

Rebates	$195.32	
Branch news	80.99	
Affiliates	27.00	
Interest on bonds and savings	49.55	
		$352.86

Expenditures

Speakers, meeting expenses, etc.	$132.00	
Stenographer's services	43.82	
Miscellaneous expenses	121.70	
		$297.52
Increase in revenue over expenditure		$ 55.34
Bank balance at Dec. 31st, 1922		$269.08
Bank balance at Dec. 31st, 1921		$238.13
		$ 30.95
Amount of rebates and branch news due from Headquarters		$ 24.39
		$ 55.34

Audited and found correct.
WILLIAM J. GALE, A.M.E.I.C.
ARTHUR FRASER, A.M.E.I.C.
Jan. 4th, 1923.

G. P. F. BOESE, A.M.E.I.C., *Treasurer.*

We have had frequent opportunities of welcoming outside members to our meetings and the branch executive are glad to note the proposed amendment to *The Institute* bye-laws to include branch non-residents as members of a branch.

During the summer the branch had visits from General C. H. Mitchell, M.E.I.C., J. B. Challies, M.E.I.C., and Fraser S. Keith, M.E.I.C., and the members very much appreciate these opportunities of hearing first hand information as to the activities at Headquarters.

The branch was represented at the Vancouver and Winnipeg professional meetings and also at the convention of the Western Canada Irrigation Association in Maple Creek, Saskatchewan, and Brooks, Alberta.

Respectfully submitted,

P. J. JENNINGS, M.E.I.C., *Chairman.*

J. ALFRED SPRECKLEY, A.M.E.I.C., *Secretary-Treasurer.*

Cape Breton Branch

The President and Council,

The Executive Committee begs to submit herewith their report covering the activities of the branch since the last annual meeting on May 9th.

Membership

The branch has suffered through transfer to other districts of several of its members. These have been balanced, however, by new members, so that the present total of forty-two is one ahead of the total at the last annual meeting. There are in addition six applications pending.

There is no reason why every engineer in the locality should not belong to *The Institute.* It is to his advantage to do so, and *The Institute* gains, through power of numbers, if in no other way. The various classes of membership are so graded that most men engaged in professional engineering work can be enrolled in one or other of them, and it is hoped that each member will do what is possible to reach any engineers in the district who are not attached to *The Institute,* and to show them the advantages they are missing.

Finances

The small balance of $6.36 at the last annual meeting has been increased to $79.02 to-day. While it is not the object of the branch to accumulate large funds, your executive feels that it is wisdom to have a certain amount in reserve, upon which to draw in case of emergency. The response to local dues has been fair, but there is still $86.00 outstanding on this account, and it would materially assist matters if members would keep up to date.

Financial Statement

Balance on hand at last annual meeting held May 9th, 1922:—		
Bank	$ 5.04	
Cash	1.32	
	—	$ 6.36
Receipts		
Rebates from Headquarters	$ 17.11	
	42.17	
	19.38	
		$108.96
Local dues May 1st quarter	$ 16.00	
Aug. 1st quarter	83.55	
Nov. 1st quarter	46.00	
		145.55
Interest on bank a/c	0.21	
Balance from visit to Louisbourg	0.20	
		0.41
Total		$261.28
Expenditures		
Rent—May 1st quarter	$ 45.00	
Aug. 1st quarter	45.00	
Nov. 1st quarter	45.00	
Chairs per a/c from Wrights	11.88	
Balance of Glace Bay meeting accounts	22.50	
Printing	4.80	
Postage	5.50	
Telegraph	1.13	
Telephone	0.35	
Stationery	0.80	
Deficit from visit to H.M.S. Raleigh	0.30	
Total		$182.26
Balance on hand, Dec. 11th—cash	15.70	
bank	63.32	
		$ 79.02

In order to supplement the Mining Society's library, to increase the usefulness of the branch to its members, and to provide additional inducement towards more frequent use of the rooms, it is hoped to subscribe to various technical magazines, such as might appeal to members employed in other directions than mining. It might also be possible to add to the library volumes along civil and mechanical lines. This is not possible, however, unless local dues are paid promptly, and some surplus thus accumulated.

Meetings

Six meetings in all have been held since the last annual report, as follows:—

June 20—Visit to H.M.S. Raleigh at Sydney Harbour.
Aug. 2—Summer outing to Louisburg and Sangaree.
Sept. 12—"**Blast Furnace Construction**", K. H. Marsh, M.E.I.C.
Oct. 10—"**Present Day Practice in Concrete Construction**", K. G. Cameron, A.M.E.I.C., and S. C. Mifflen, A.M.E.I.C.
Oct. 31—Special meeting and dinner at Glace Bay on the occasion of the visit of Fraser S. Keith, M.E.I.C.
Nov. 14—"**Submarine Mining**", F. W. Gray, A.M.E.I.C.

The attendance at these meetings has, on the whole, been good, but it might have been better, — it might be 100 per cent, — it should at least be 75 per cent. Notices are mailed to each member in ample time. If a member is sufficiently conversant with the subject to discuss it, he ought to be there, to help with the discussion, — if not, then he ought to be there to learn something more about it. Preparations for meetings and general business entail a considerable amount of work for your executive committee, — only those who handle it know how much,— and the only return they can get for their labours is good attendance and interest. It is hoped therefore, that every member will make up his mind to attend every meeting. Every member should realize that the greater individual effort he makes, the greater will be his individual return from *Institute* affairs.

Respectfully submitted,

K. H. MARSH, M.E.I.C., *Chairman.*

K. G. CAMERON, A.M.E.I.C., *Secretary-Treasurer.*

Edmonton Branch

The President and Council,

The 1922 annual report covering the activities of the Edmonton Branch is submitted herewith.

Membership

The branch membership is as follows:—

Members	[illegible]
Associate Members	[illegible]
Juniors	[illegible]
Student	[illegible]
Total	[illegible]

The 1922 executive adopted the following plan in regard to meetings. At each meeting three fifteen-minute papers on subjects of local interest were arranged, each paper being followed by a fifteen-minute discussion. This plan has worked out very successfully and has greatly increased our attendance, as with three papers on diversified subjects there was always something that would be of particular interest to each member.

Meetings

Seven general meetings were held in Edmonton Board of Trade rooms, and in all twelve papers.

The following is a resume of meetings:—

Date	*Subject*	*Speaker*	*Attendance*
Jan. 18—	"City Engineers Department"	A. W. Haddow, A.M.E.I.C.	30
	"The work of the Lignite Utilization Board of Canada"	E. Stansfield, M.E.I.C.	
	"The Jasper Highway"	D. Donaldson	
Feb. 16—	"Drainage Problems"	G. McLeod, A.M.E.I.C.	35
	"Edmonton to North Battleford and Onoway to Whitecourt Lines of C.N.R."	Kells Hall, A.M.E.I.C.	
	"Bituminous Sands of Northern Alberta"	Dr. K. A. Clark.	
Mar. 15—	"Railway Maintenance"	W. E. Roe, A.M.E.I.C.	30
	"Local Concrete Materials"	Clyde Sutherland, A.M.E.I.C.	
	"Engineering Education"	Dean Boyle, University of Alberta.	
Apr. 19—	"Local Items of Municipal Engineering Introducing Economics"	R. J. Gibb, M.E.I.C.	25
	"Earth Road Building in Alberta"	J. D. Robertson, A.M.E.I.C.	
May 23—	Election of 1922-23 officers.		
Oct. 6—	"Concrete Highway Investigation and Specification"	Lt.-Col. Boyden	25
Nov. 15—	"Railway Organization"	R. W. Ross, A.M.E.I.C.	50
	"Telephony"	R. B. Baxter, Supt. Alta. Govt. Telephones	
	"Possibilities of Smelting Iron Ores from the vicinity of Lake Athabasca"	A. E. Cameron.	

Our average attendance at meetings when papers were read was over thirty-two. Further activities of the branch during 1922 included:—

(a) The adoption of a resolution supporting the Honorary Advisory Council for Scientific and Industrial Research in their appeal to the Dominion Government for the establishment of a suitable bureau of standards and research.

(b) The appointing of a committee from the branch to study and examine "Local Concrete Materials" with the idea of arriving at combinations that would be safer and more economical than others.

(c) The sending out of a circular letter to all local employers in engineering work, urging that science students be given the preference when assistance was required for such work.

Financial Statement

Balance forward from 1921		$ 69.87
Receipts		
Rebates from membership fees	$ 89.25	
Receipts from branch news	22.10	111.35
		$181.22
Expenditures		
Total disbursements 1922		$ 59.91
Balance on hand Jan. 1st, 1923		121.31
		$181.22

Respectfully submitted,

Col. J. G. REID, M.E.I.C., *Chairman.*

R. H. DOUGLAS, A.M.E.I.C., *Secretary-Treasurer.*

Halifax Branch

The President and Council,

On behalf of the Executive Committee of the Halifax Branch we beg to submit the following report for the calendar year 1922:—

Executive Committee

As the branch year formerly ended in May, the activities of the branch during the calendar year have been carried on under two separate executive committees, the elective personnel of which were:—

May 1921—May 1922	May 1922—Dec. 1922
C. E. W. Dodwell, Hon.M.E.I.C. Chairman	F. R. Faulkner, M.E.I.C.
	Vice-Chairman. I. P. Macnab, M.E.I.C.
O. S. Cox, A.M.E.I.C. Sec.-Treas	O. S. Cox, A.M.E.I.C.
F. R. Faulkner, M.E.I.C.	H. W. L. Doane, A.M.E.I.C.
W. P. Morrison, M.E.I.C.	J. B. Hayes, A.M.E.I.C.
L. H. Wheaton, A.M.E.I.C.	K. H. Smith, M.E.I.C.
H. W. L. Doane, A.M.E.I.C.	A. F. Dyer, A.M.E.I.C.
J. B. Hayes, A.M.E.I.C.	C. A. Fowler, A.M.E.I.C.
K. H. Smith, M.E.I.C.	

In addition to these the local member of Council and the immediate past-chairman of the branch were ex-officio members of the committee.

The Executive Committee have held nine meetings during the year at which in addition to arranging for the details of branch meetings, making recommendations to Council regarding applicants for admission to *The Institute*, and dealing with various routine business, a number of matters have been taken up dealing with the general welfare of the branch. Among these have been the adoption of several suggestions made by the meeting of secretaries at Montreal in January, including the appointment of a vice-chairman and a revision of the by-laws to make the branch this year correspond with the calendar year.

Membership

During the year there has been a slight increase in total membership:—

	1921	1922
Honorary Members	—	1
Members	25	26
Associate Members	45	46
Juniors	15	16
Students	10	16
Branch Affiliates	5	5
	100	110

Perhaps the greatest gain as shown by the above list is that of an Honorary Member. Upon one of our oldest and most prominent members, C. E. W. Dodwell, Council has bestowed this signal honour. Mr. Dodwell, who is well known to *The Institute* membership at large, is a past-chairman of the branch and has been a member of *The Institute* ever since its incorporation, and the branch greatly appreciates the honour of having his services on behalf of the profession recognized in this fitting manner.

Meetings

During the year there have been nine meetings of the branch, as follows:—

Jan. 17—"**Some Problems encountered in Local Building Construction**", C. St. J. Wilson, A.M.E.I.C.; attendance 46.
Feb. 16—"**A Lump of Coal**", K. L. Dawson, A.M.E.I.C.; attendance 30.
Mar. 29—"**Engineering underground in France**", W. G. Hardy, A.M.E.I.C.; attendance 35.
Apt. 26—"**Some Problems met with in Surveying**", H. B. Pickings, A.M.E.I.C.; attendance 15.
May 10—"**Recent Developments in Concrete**", Col. H. C. Boyden.
May 20—Annual meeting of the branch.
June 22—"**Valuations**", Edward L. Moreland; attendance 100, (including guests).
Nov. 3—"**Engineering from the Legal Standpoint**", F. H. Bell, K.C.; attendance 32.
Dec. 19—Annual meeting of the branch; attendance 51.

Financial Statement

Balance Jan. 1st, 1922		$238.82
Revenue		
Headquarters rebates on dues and branch news	$205.37	
Dues from Branch Affiliates	8.00	
Bank interest	4.46	$217.83
		$456.65
Expenditures		
Clerical help	$ 63.00	
Printing	19.50	
Postage and post cards	22.10	
Expressage	3.20	
Telegram	.50	
Expenses of meetings	28.80	
Honorarium to secretary	50.00	
Expenses of secretaries' meeting at Montreal	45.00	$232.10
Balance Jan. 1st, 1923		$224.55

Respectfully submitted,

F. R. FAULKNER, M.E.I.C., *Chairman.*
O. S. COX, A.M.E.I.C., *Secretary-Treasurer.*

Hamilton Branch

The President and Council,

The Hamilton Branch begs to report the following meetings during the year:—

Meetings

Jan. 13—"**Detroit-Windsor Bridge**", Prof. C. R. Young, M.E.I.C. This was a most interesting address, illustrated with lantern slides Attendance 125.
Jan. 27—"**St. Lawrence River Development**", T.H. Hogg, M.E.I.C. of the Hydro-Electric Power Commission of Ontario. This was a very valuable address. Attendance 100.
Feb. 16—"**Standardization in Engineering**", R. J. Durley, M.E.I.C. Attendance 40.
Mar. 3—"**Construction Work**", F. H. Farmer, M.E.I.C. Illustrated with lantern slides. Attendance 100.
Mar. 24—"**220,000-volt Transmission and Equipment**", F. H. Peters, of Pittsburgh. The Toronto section of the A.I.E.E., was largely represented at this meeting, which was held in the Westinghouse auditorium, followed by refreshments served by the Canadian Westinghouse Company Attendance 200.
May 16—The branch held a joint dinner with the Hamilton Chapter of the Ontario Association of Architects. Attendance 30.
May 22—Annual meeting—Reports presented for the end of the branch year, at a luncheon at which only 14 attended.
Sept 15—Annual banquet at the Royal Connaught hotel opened the season. Hon. F. C. Biggs, minister of public works and highways of Ontario, was guest of honour, and gave an address on "**Highways**". Attendance 81.
Nov. 1—Joint meeting with the Hamilton Chapter of the Ontario Association of Architects. Address by Brig.-Gen. C. H. Mitchell, C.B., C.M.G., M.E.I.C. on "**Italy**". Attendance 120.
Dec. 14—"**Proposed Operation of Electric Railways by the Hydro-Electric Power Commission of Ontario**", Frederick A. Gaby, M.E.I.C. Attendance 150.

Membership

	Dec. 31, 1921	Dec. 31, 1922
Members	18	22
Associate Members	55	57
Juniors	11	10
Students	29	27
Affiliates	55	48
	168	164

Financial Statement

Receipts	
Brought forward	$260.48
Journal subscriptions	26.00
Rebates	167.75
Branch news	59.18
Affiliate fees	144.00
	$657.41
Expenses	
Miscellaneous	$ 79.66
Printing and postage	101.73
Rent halls	45.00
Annual dinner	48.00
Stenographer	50.00
Journal subscriptions	26.00
Balance	307.02
	$657.41

Respectfully submitted,

F. W. PAULIN, M.E.I.C. *Chairman.*
W. F. MCLAREN, M.E.I.C. *Secretary-Treasurer.*

Kingston Branch

The President and Council,

On behalf of the Executive Committee, we beg to submit the following report of the activities of the Kingston Branch from January 1st, 1922, to December 31st, 1922.

Meetings were held on the second and fourth Tuesdays of the first three and last three months of the year. The attendance at all meetings has been of a high average and the interest shown by all members especially the Student and Junior members has given the Executive a valuable assistance.

Meetings

Eleven meetings were held during the year, as follows:—

Jan. 10—"**The Work of the Staff College**", Colonel T. Anderson, A.M.E.I.C., of the Royal Military College, Kingston.
Jan. 24—"**The Chippawa Power Development**", A. D. Blanchard, M.E.I.C.
Feb. 14—"**Aerial Surveying**". The discussion was introduced by Col. Schmdlin, R.M.C., Kingston.
Feb. 24—"**Development of the St. Lawrence for Deep Water Navigation and for Power**", J. M. Campbell, M.E.I.C.
Mar. 14—Students' Night. Three papers, for which cash prizes were given, were read.
First, "The Design of a High Speed Steel Plant", A. A. Paoli, A.M.E.I.C.
Second, "The Modern Conception of Electricity", Bruce Saunders, S.E.I.C., and "The Construction of a **Concrete Arch Bridge**", H. Myers, Jr. E.I.C. More papers were submitted, but only the above three were read. The meeting was a brilliant success.

Mar. 28—The annual dinner.
Oct. 10—Business meeting, election of officers and executive for the following year.
Oct. 25—Installation of officers. Address by Professor A. Macphail, M.E.I.C., entitled "**Observations and Reflections**".
Nov. 14—"**Evolution of Prices and Wages**",G.Monture,B.Sc.,S.E.I.C.
Nov. 25—"**Weather Forecasting**", Dr. A. L. Clark, Hon. M.E.I.C.
Dec. 14—"**Releasing of the S.S. Rapids Prince from the Rocks in the Lachine Rapids**", Capt. Donnelly.

Membership

The approximate membership of the branch is as follows:—

Honorary Members	1
Members	10
Associate Members	21
Juniors	7
Students	90
Affiliates	3
	132

As this report covers the activities of two executives the personnel of both executives are given below.

1921–1922.		1922–23.
W. P. Wilgar, M.E.I.C.	Chairman	L. M. Arkley, M.E.I.C.
L. M. Arkley, M.E.I.C.	Vice-Chairman	T. McGinniss, A.M.E.I.C.
L. T. Rutledge, M.E.I.C.	Sec.-Treasurer	L. T. Rutledge, M.E.I.C.
J. M. Campbell, M.E.I.C.	Executive	T. Anderson, A.M.E.I.C.
A. Macphail, M.E.I.C.		L. Malcolm, M.E.I.C.
D. J. Emrey, A.M.E.I.C.		G. J. Smith, A.M.E.I.C.

Financial Statement

The following is a financial statement for the year 1922:—

Revenue

Jan. 1	Cash on hand	$106.24
Jan. 15	Fees from Affiliates	10.00
Mar. 31	Dinner collections	33.00
May 2	Rebate on fees from Headquarters	64.50
	Receipts for branch news	11.67
June 30	Bank interest	.94
Aug. 15	Rebate on fees	21.00
	Receipts for branch news	10.00
Nov. 25	Rebate on fees	5.75
Dec. 31	Accounts receivable from headquarters as per advise	12.81
		$275.91

Expenditures

Jan. 1 to Dec. 31,	Total disbursements	$182.19
Dec. 31	Credit Balance	$ 93.72

Respectfully submitted,

L. M. ARKLEY, M.E.I.C., *Chairman*,
L. T. RUTLEDGE, M.E.I.C., *Secretary-Treasurer*.

Lethbridge Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the following report for the calendar year 1922. This report covers part of two branch years, and the activities of two executives.

The members of both are given below:

1921-22.		1922-23.
S. G. Porter, M.E.I.C.	Chairman	C. M. Arnold, M.E.I.C.
C. M. Arnold, M.E.I.C	Sec.-Treas	G. S. Brown, A.M.E.I.C.
G. N. Houston, M.E.I.C.		S. G. Porter, M.E.I.C.
C. D. MacKintosh, M.E.I.C.		C. D. MacKintosh, M.E.I.C
H. W. Meech, A.M.E.I.C.		H. W. Meech, A.M.E.I.C.
		H. G. Cochrane, A.M.E.I.C.

Membership

In January, 1922, the membership of the branch was as follows: fifteen corporate members, three non-corporate members. During the year, by the efforts of the Membership Committee, the branch has been increased by forty-six members and affiliates. The membership at December, 1922, is as follows:—

Members	9
Associate Members	21
Juniors	3
Students	3
Associate	1
Affiliates	27
Total	64

Meetings.

During the year the branch has held nine executive and ten general meetings. The attendance at the latter has averaged seventy-five per cent of the membership. The following addresses were given:—

Jan. 14.—"**Actuarial Factors in the Design of Irrigation Structures,**" Major H. B. Muckleston, M.E.I.C., chief engineer, Lethbridge Northern Irrigation District.
Jan. 28.—"**The Manufacture of Smokeless Powder and the Construction of the Plant at Nitro, W.Va.,**" illustrated by lantern slides — G. N. Houston, M.E.I.C., secretary, Irrigation Council, Alberta.
Feb. 11.—"**The Evolution of Transportation,**" C. D. MacKintosh, M.E.I.C., superintendent C.P.R., Lethbridge Division.
Feb. 25.—"**Town Planning,**" H. W. Meech, A.M.E.I.C., commissioner of public works, Lethbridge, Alta.
Mar. 11.—"**General Railway Maintenance,**" H. R. Miles, M.E.I.C., divisional engineer, C.P.R., Lethbridge Division.
Mar. 18.—"**Modern Telephone Engineering,**" John Dow, A.M.E.I.C., telephone plant chief, Lethbridge. (Previous to the meeting the branch members were conducted through the Lethbridge new automatic telephone plant.)
June 24.—"**Institute Affairs,**" Fraser S. Keith, M.E.I.C., general secretary, E.I.C.
Oct. 7.—"**Concrete Highway Investigations and Specifications**" (illustrated), — Col. H. C. Boyden, Portland Cement Association, Chicago, Ill., U.S.A.
Nov. 10.—"**Irrigation in India,**" A. M. Robertson, executive engineer, of the Punjab, India.
Nov. 25.—"**Irrigation in Mesopotamia,**" G. B. Hull, A.M.E.I.C., late district engineer, Euphrates Division.

Financial Statement
March 11th, 1922, to December 31st, 1922

Assets, March 11, 1922

Cash in bank	$125.93
Affiliates dues unpaid	5.00
Rebate due from Headquarters on sundry members:	40.50
Rebate due from Headquarters on sundry members (Approval of application pending).	37.00
Total	$208.43

Liabilities, March 11, 1922

Advance from Headquarters	$ 50.00
Members fees collected on account:	45.00
Net funds	113.43
Total	$208.43

Revenue, March 11, 1922

Cash in bank	$125.93
Rebates Jan., Feb. and Mar.	24.00
" Apl., May and June	22.75
" July, Aug. and Sept.	7.75
Branch news	6.96
Sundries	4.00
	$191.39

Expenditure, March 11, 1922

To Headquarters from suspense account	$ 41.00
Printing and advertising	23.02
Books and stationery	18.65
Sundries	24.90
Balance cash in bank	83.82
	$191.39

Assets, December 31, 1922

Cash in bank	$ 83.82
Rebates due for Oct., Nov. and Dec.	12.50
Branch news	4.31
	$100.63

Liabilities, December 31, 1922

To Headquarters	$ 50.00
Cash in bank	50.63
	$100.63

Respectfully submitted,

C. M. ARNOLD, M.E.I.C., *Chairman.*
G. S. BROWN, A.M.E.I.C., *Secretary-Treasurer.*

London Branch

The President and Council,

The Executive of the London Branch beg to submit the following report for the current year ending December 31st, 1922.

Although this branch has been organized for only a year, there has been a great interest shown as is evident from the large turnouts at the meetings. The attendance has been large in spite of the fact that at least a third of the members do not reside in the city, but in St. Thomas, Woodstock, St. Marys and the urban districts.

Membership

During the past year the membership of the branch has increased from 44 to 60, with a gain of 22 members, 6 members having left the district or *The Institute*. The following is a report of the Membership Committee:—

	Members	Associate Members	Juniors	Students	Total
Removed from branch membership	2	3	—	—	5
Moved within branch jurisdiction	—	5	4	2	11
Admission to Institute membership	5	4	2	—	11

Transfers to higher grades: to Member 4; to Associate Member 3; total 7.

Removed from Institute membership by Council 1

Applications under consideration of Council for admission to Institute and this branch 3

	1921	1922
Members	7	13
Associate Members	23	24
Juniors	5	10
Students	9	13
Total	44	60

Net gain in membership 16, or 36 per cent.

Meetings

Regular meetings held	9
Special meetings held	2
Executive meetings held	6

Financial Statement

The following is the financial statement:—

Balance bank	$ 46.61
Rebate from Headquarters:—	
Membership fund	79.25
Branch news	23.90
Rebate of dinner, Jan. 20th	7.40
Balance from dinner	8.60
Interest at bank	.70
Donations	4.00
Total receipts	$170.46
Notices and printing	$ 37.59
Telegrams and telephone	2.89
Postage	3.99
Expenses for speakers	30.70
Cigars	7.50
Special meeting, Oct. 26th	4.50
Stationery	14.72
Sundries	6.10
Balance on hand in bank	62.47
Total expenditures	$170.46

Respectfully submitted,

H. A. BRAZIER, M.E.I.C., *Chairman.*
F. JAS. BRIDGES, A.M.E.I.C., *Secretary-Treasurer.*

Montreal Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the following report. The administration of the branch has been under the direction of the following members — elected and ex-officio:—

	Elected Members	Ex-Officio Members
Chairman	J. A. Duchastel, M.E.I.C.	Frederick B. Brown, M.E.I.C.
Vice-Chairman	J. T. Farmer, M.E.I.C.	J. M. R. Fairbairn, M.E.I.C.
Sec.-Treasurer	J. L. Busfield, M.E.I.C., E. A. Ryan, A.M.E.I.C.	Walter J. Francis, M.E.I.C.
	A. E. Dubuc, M.E.I.C.	George R. Macleod, M.E.I.C.
	C. M. McKergow, M.E.I.C.	R. A. Ross, M.E.I.C.
	S. F. Rutherford, A.M.E.I.C.	F. P. Shearwood, M.E.I.C.
	R. Bickerdike, M.E.I.C.	Julian C. Smith, M.E.I.C.
	C. J. Desbaillets, M.E.I.C.	Arthur Surveyer, M.E.I.C.
	P. B. Motley, M.E.I.C.	K. B. Thornton, M.E.I.C.
	J. H. Hunter, A.M.E.I.C.	

Owing to pressure of business, with consequent long absences from the city, Mr. Busfield felt obliged to resign his office in August. The present secretary-treasurer, E. A. Ryan, A.M.E.I.C., was appointed his successor in September.

The Executive Committee held a total of twelve meetings during the year, and in addition to the transaction of routine business, it has dealt with a number of important matters of which the following is a resumé:—

Arranging for and carrying out of a meeting of the secretaries of branches east of the Great Lakes, to discuss interrelations between the various branches and with Headquarters. Preparation of report and recommendation to Headquarters.

Arranging for and carrying out of annual and professional meeting in Montreal owing to inability of Winnipeg Branch to undertake it, as scheduled.

Inauguration of monthly noon-hour luncheons at which prominent citizens and members of other professions gave short talks, upon invitation.

Formation of a committee composed of members of the Montreal Branch of *The Engineering Institute of Canada* who are members of the American Society of Mechanical Engineers, and also a special committee representing the Montreal Branch to co-operate with the former in arranging for accommodations, meetings, etc., in connection with the convention of the American Society of Mechanical Engineers which is to be held in Montreal on the 28th to 31st of May, 1923.

Study of change in *Institute* by-laws concerning rebates to branches and recommendation to Council.

Membership

There has been a small increase in membership during the year. The listing in the various grades is as follows:—

Honorary Members	2
Members	185
Associate Members	350
Juniors	68
Students	300
Associates	6
Branch Affiliates	15
Total	926

A number of members have asked for and been granted transfer to higher grades.

Papers and Meetings

A number of papers of outstanding merit, of which a list follows, have been delivered before the branch during the year:—

Date	*Subject*	*Author*	*Attendance*
Jan. 5	"The Complexities of a Modern Telephone Plant"	N. M. Lash	96
Jan. 12	"Fonctions Administratives d'un Gérant Municipal"	Henri Ortiz	13
Jan. 19	"Administration of the Explosives Act in Canada"	Lt.-Col. G. Ogilvie	65
Jan. 19	"The Electric Steam Generator"	F. T. Kaelin, M.E.I.C.	65
Jan. 26	"Queenston-Chippawa Power Development"	H. G. Acres, M.E.I.C.	300
Feb. 2	"Automotive and General Lubrication"	W. C. Common	65
Feb 9	"The Principles of Water Softening"	C. E. Hogarth, A.M.E.I.C.	78
Feb. 16	"Somes Notes on South American Railways"	H. K. Wickstead, M.E.I.C.	91
Feb. 23	"Accident Prevention in Industrial Plants"	W. G. H. Cam, A.M.E.I.C.	87
Mar. 2	"Inductive Interference"	Prof. C. V. Christie, A.M.E.I.C.	89
Mar. 9	"The Ruins of Babylon". (Illustrated)	Robt. A. MacLean, B.A., Ph.D., F.R.G.S.	127
Mar. 16	"Scientific Research in Canada"	Col. F. M. Gaudet, C.M.G., M.E I.C.	95
Mar. 23	"The New Low Level Pumping Station for the City of Montreal"	C. J. Desbaillets, M.E.I.C.	107
Mar. 30	"Electrons and Atoms"	W. B. Cartmel, M.E.I.C.	95
Apr. 6	"Undersea Coal Mining in Cape Breton"	F. W. Gray, A.M.E.I.C.	89
Apr. 13	"Carrier Current Telephony"	H. J. Vennes	55
Apr. 20	"A Railway Refrigerator Car"	W. H. Winterrowd, A.M.E.I.C.	50
Apr. 27	"Recent Developments in Concrete"	Lt.-Col. H. C. Boyden	140
Oct. 5	Conducted Tour of the Port of Montreal		124
Oct. 12	"Commercial Aviation"	Lt. L. D. Palmer, D.S.C.	52
Oct. 19	"Power Factor"	W. G. H. Cam, A.M.E.I.C., A.M.I.E.E.	64
Oct. 26	"Paint and its Use in the Protection of Steel"	John Grieve, A.M.E.I.C.	69
Nov. 2	"Railway Valuations in the United States"	W. S. McCulloch, A.M. Inst. C.E.	97
Nov. 9	"The Port of Montreal". (NOTE—Deferred paper of Oct. 5.)	T. W. Harvie, A.M.E.I.C.	102
Nov. 16	"A New Principle of Relay Protection"	P. Ackerman, A.M.E.I.C.	62
Nov. 23	"The Cost of Industrial Power"	J. A. Burnett, M.E.I.C.	81
Nov 30	"Bottle Manufacture"	E. T. Harbert, S.E.I.C.	79
Dec. 7	"The Design and Economics of City Refuse Destructors"	F. A. Combe, M.E.I.C.	115
Dec. 14	"Research and Industry"	E. B. Craft	142
Dec. 21	Annual Meeting		

These papers covered not only technical subjects, but also administration, historical, national and civic ones and their relation to the engineering profession. An innovation was made in the successful carrying out of an "evening" when the address was given in French by a member of that tongue and on which occasion the chair was occupied by a former chairman of the branch — J. H. Hunter, A.M.E.I.C. All of the discussion, etc., was conducted in French — in which many of the English speaking members joined. It is the intention to afford, in the future, added facilities for the reading of papers in French for the benefit of those of our members who speak that language.

An outstanding event was the visit of inspection to the Port of Montreal conducted by the chief engineer, T. W. Harvie, A.M.E.I.C., one of our members, and several of his assistants. Through the courtesy of the manager of the port, M. P. Fennell and the harbour commissioners, all arrangements for transportation, etc., were made. This trip will be long remembered by those who took it, on account of an accident that occurred during the afternoon when a heavy fog caused the captain of the carrying tug "Sir Hugh Allan", to lose his bearings with the result that it ran aground about three miles down the river. The party was stranded for about three hours and was taken off by another vessel of the port and landed without mishap at about 8 p.m., at the Imperial Oil Company's storage yard. It was necessary to cancel the paper scheduled for that evening by Mr. Harvie on this account.

The committees in charge of arrangements for the holding of meetings and procuring of papers was composed of the following:—Chairman, H. W. Fairlie, A.M.E.I.C.; vice-chairman, J. A. Lalonde, A.M.E.I.C.; civil section, A. J. Kelly, A.M.E.I.C., O. O. Lefebvre, M.E.I.C.; electrical section, P. S. Gregory, A.M.E.I.C., C. V. Christie, A.M.E.I.C.; mechanical section, F. A. Combe, M.E.I.C., J. S. Cameron, A.M.E.I.C.; industrial section, A. C. Tagge, M.E.I.C., G. P. Cole, M.E.I.C.; railway section, A. Crumpton, M.E.I.C., J. E. Armstrong, A.M.E.I.C.; marine section, I. J. Tait, A.M.E.I.C., W. I. Hay.

Financial Statement

Notwithstanding what might be termed extraordinary expenditures, for equipment and the financing of the branch secretaries' meetings, the branch finished the year with a substantial cash balance on hand. The Executive Committee was obliged, at the beginning of the year, to appeal to the members of the branch for a voluntary subscription to help carry on over the period when no rebates were forthcoming from Headquarters and a hearty response was made. The statement for the year 1922 follows:—

Revenue

Cash in bank — Jan. 1st, 1922	$ 56.59
Branch news	68.48
Commission on advertising	11.50
Special subscriptions	647.00
Affiliate dues	78.25
Rebates — Nov. and Dec. (1921)	133.13
" Jan., Feb., Mar. (1922)	866.75
" Apr., May, June	265.25
" July, Aug., Sept., Oct.	270.38
Annual professional meeting, — receipts,—sale of tickets	752.00
donation from Headquarters	997.81
Monthly luncheons — receipts from sale of tickets	61.00
Branch secretaries' meeting, — contribution various branches	51.50
Interest on savings deposits	9.14
	$4,268.78

Expenditures

Post card notices	$642.71
Other printing, multigraphing, stamps	269.22
Secretary's honorarium	300.00
Clerical assistance	105.00
Telephone and telegraph	54.76
Stationery	11.97
Moving pictures and lantern slides	57.47
Miscellaneous expenses re weekly meetings: chairs, cartage, signs, gratuities, etc.	103.35
Piano	257.00
Monthly luncheons	63.75
Annual professional meeting, — hotel, refreshments, printing, entertainment, etc.	1,794.81
Branch secretaries' meeting	428.80
Subscriptions to Journal for Affiliates	30.34
	$3,719.18
Cash in bank, — savings a/c	509.14
Cash in bank, — current a/c	40.46
	$4,268.78

Outstanding bills receivable:—		
Rebates for November and December	$138.75	
Commissions on advertising	22.50	
	$161.25	
Outstanding bills payable	Nil	

Respectfully submitted,

J. A. DUCHASTEL, M.E.I.C., *Chairman.*

E. A. RYAN, A.M.E.I.C., *Secretary-Treasurer.*

Moncton Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the third annual report of the Moncton Branch.

Meetings

The Executive Committee held seven meetings during year 1922. There were thirteen meetings of the branch held, seven of which were our popular supper-meetings, and the large attendance shows the active interest our members take in the welfare of the branch and of *The Institute*. Two of these meetings were held at Mount Allison University, Sackville, N.B., and it is the intention to hold at least two at the university during the year 1923.

The membership has increased from fifty-nine to eighty-eight during 1922, a net gain of twenty nine. We have at present:—

Members	12
Associate Members	26
Juniors	8
Students	39
Affiliates	3
Total	88

The annual meeting of the branch was held on May 11th, and after the reports were read, the following officers were elected for 1922-23:—

Chairman	F. B. Tapley, M.E.I.C.
Vice-Chairman	F. B. Fripp, A.M.E.I.C.
Secretary-Treasurer	M. J. Murphy, A.M.E.I.C.
Executive Committee:	G. C. Torrens, A.M.E.I.C., C. S. G. Rogers, A.M.E.I.C., A. S. Gunn, A.M.E.I.C., J. G. Dryden, A.M.E.I.C., Prof. H. W. McKiel, A.M.E.I.C., K. Gordon, A.M.E.I.C.
Ex-officio members of Executive Committee:	A. F. Stewart, M.E.I.C., J D. McBeath, M.E.I.C.

Financial Statement

The financial statement for the year ending December 31st, 1922, is as follows:—

Revenue

Balance from 1921	$145.84
Rebates on dues and branch news	136.92
Surplus from suppers	8.00
Branch Affiliate fees	7.50
Bank interest	3.64
	$301.90
Rebate due from Headquarters	9.20
Total	$311.10

Expenditures

Postage	$ 8.44
Expenses of meetings	32.00
Printing	12.10
Telegrams and telephone	1.61
Purchase of Baloptican lantern	60.00
Incidental expenses	5.35
Total	$179.50
Balance including rebates due from Headquarters	$131.60

Respectfully submitted,

F. B. TAPLEY, M.E.I.C., *Chairman*

M. J. MURPHY, A.M.E.I.C., *Secretary-Treasurer.*

Niagara Peninsula Branch

The President and Council,

The executive of the Niagara Peninsula Branch beg to submit the following annual report for the year ending December 31st, 1922.

Meetings

The policy of holding dinner-meetings introduced by previous executives has been followed with gratifying success. The average attendance has been forty-five.

The following meetings have all been reported at length in *The Journal:*—

Jan. 14—"Rural Power Distribution in Ontario from the Hydro Lines", J. W. Purcell, A.M.E.I.C., at St. Catharines.
Feb. 15—"Town Planning", H. L. Seymour, A.M.E.I.C., at Niagara Falls.
Mar. 15—"Operation and Maintenance of Generating Stations and Distributing Systems", H. C. Don Carlos, at St. Catharines.
May 17—"Recent Developments in Concrete", Lt.-Col. H. C. Boyden of the Portland Cement Association, at Thorold.
Oct. 20—"Roads", Capt. T. S. Scott, M.E.I.C., at St. Catharines.
Nov. 24—"Reminiscences of the Near East", D. A. Andrus, at Niagara Falls.
Dec. 19—Business meeting, at Thorold.

Trips and Social Functions

May 5—Dance and annual meeting, held at St. Catharines.
Aug. 16—Picnic, at Niagara-on-the-Lake.
Nov. 24—Trip over power tunnel, at Niagara Falls Power Company, Niagara Falls, N.Y., and Chippewa intake of Ontario Hydro-Electric Commission, Chippewa, Ont.

In addition to the above the members of the branch availed themselves of the invitation of the American Institute of Electrical Engineers in convention at Niagara Falls on June 28-30, and attended the technical sessions.

Membership

Notwithstanding the loss of many members leaving the district on the completion of the Chippewa project, the list shows a net gain of twenty-three. The following is a comparison with the previous annual report.

	1921	1922	Gain
Members	19	24	5
Associate Members	75	87	12
Juniors	22	22	—
Students	14	14	—
Associates	1	1	—
Branch Affiliates	2	8	6
	133	156	23

Financial Statement

The following is an abstract of the treasurer's report:—

Balance on hand Jan. 1st, 1922	$413.61	
Revenue	294.58	
Disbursements		$517.91
Balance on hand, Dec. 31st, 1922		190.28
	$708.19	$708.19

Respectfully submitted,

H. LAZIER, M.E.I.C., *Chairman.*

R. W. DOWNIE, A.M.E.I.C., *Secretary-Treasurer.*

Ottawa Branch

The President and Council,

On behalf of the Managing Committee of the Ottawa Branch, we beg to submit the following report for the calendar year 1922.

During the year there have arisen several matters of importance affecting the membership of the Ottawa Branch, and as usual the members of the branch have played a prominent and useful part in the furtherance of the interests of the profession.

The Ontario Legislature has placed on the statute books an Act respecting professional engineers. It is considered that a decided advance has been made towards securing the ultimate desires of the membership in this direction and it is of great importance that the measure as passed be fully supported.

The Committee on Policy of *The Institute*, under the chairmanship of J. B. Challies, M.E.I.C., and of which A. B. Lambe, A.M.E.I.C., is secretary, performed a noteworthy task in a manner deserving of the greatest praise. The result is embodied in the proposed changes in the constitution of *The Institute* which will be considered at the forthcoming annual meeting in Montreal.

The question of remuneration is always an active one and the report of *The Institute's* committee has been before the membership for some time. The Managing Committee appointed a committee to study the report, and its approval is recommended.

The Ottawa Branch has consistently supported the efforts of its Managing Committee along the line of dignified but aggressive publicity. The Council of *The Institute*, appreciative of these efforts sanctioned the appointment of a committee on publicity, under the chairmanship of past-chairman C. P. Edwards, A.M.E.I.C., and the report of that committee will be presented at the annual meeting in Montreal.

Realizing that the greater part of the membership in the Ottawa Branch is in the employment of the Federal Government, the Managing Committee has continued harmonious relations with the Professional Institute, and feels that the selection of Geo. A. Mountain, M.E.I.C., past-president of *The Engineering Institute* as president of the Professional Institute assures the continued activities of the latter body along well managed lines.

During the year the branch was happy in welcoming as an Honorary Member, Dr. E. G. Deville, Hon.M.E.I.C., director general of surveys, and the Council of *The Institute* deserves the congratulations of the branch on this noteworthy step.

The second annual "Engineers' Ball" received such unanimous endorsation by the membership of the branch and their friends as to assure the success of future events of this nature; in conjunction with the successful smoker the Managing Committee realizes the value of such social events in promoting the welfare of the membership, and trusts these may become established events with the branch.

The giving of popular lectures as instituted in Ottawa by the branch has been well received. The annual popular lecture was this year given by H. G. Acres, M.E.I.C., vice-president of *The Institute*, and it is felt that this too has become an established institution in Ottawa. The programme was varied, both semi-technical or popular lectures, and evening discussions of a technical nature being held.

During the year the Managing Committee held sixteen meetings. In addition the branch had seven evening meetings and eight luncheons. The Managing Committee continued the policy of bearing twenty-five per cent of the cost of the luncheons out of branch funds, as well as part of the cost of the annual smoker. In spite of the fact that the luncheons have been so well attended

the balance shows the usual surplus. It is felt that the outstanding attendance at the luncheons has shown how the membership has heartily endorsed this feature. It is therefore felt that the luncheon policy of the branch has been well established and that the benefit derived has well justified the additional outlay.

The growth in membership, undoubtedly due to the work your energetic Membership Committee and the magnificent foundation laid in past years, is perhaps the best barometer of the standing of the engineering profession in Ottawa.

Proceedings and Publicity

During the year the following meetings of the branch were held:—

Jan. 12—Annual meeting — Daffodil Tea Room.

Jan. 26—Annual ball under the distinguished patronage of Their Excellencies the Governor General and Lady Byng; at the Chateau Laurier.

Feb. 9—**"Jutland"**, Commander W. H. Eves, R.N.; luncheon meeting at Chateau Laurier.

Feb. 15—Complimentary luncheon at Chateau Laurier to A. St• Laurent, M.E.I.C., on his appointment as chief engineer of the Department of Public Works, Ottawa.

Feb. 16—**"Our Public Highways"**, George Hogarth, O.L.S., M.E.I.C., chief engineer, Department of Highways, province of Ontario — evening lecture at Victoria Memorial Museum.

Feb. 23—**"Hydrometric Studies — Their Place in the Development of our Rivers and Streams"**, S. B. Johnson, M.E.I.C., senior assistant engineer, Department of Public Works; D. W. McLachlan, M.E.I.C., engineer in charge of Hudson Bay Terminal and St. Lawrence Waterways, Department of Railways and Canals; C. G. Cline, A.M.E.I.C., Dominion Water Power Branch, Department of Interior and S. G. Dawson, A.M.E.I.C., Reclamation Service, Department of Interior — evening discussion at University Club.

Mar. 4—Special excursion to the mine, mill and smelter of the Kingdon Mining and Smelting Company, Galetta, Ont. This outing was at the invitation of the Canadian Institute of Mining and Metallurgy.

Mar. 6—Some Engineering Stories by past-chairmen of the Ottawa Branch, E.I.C. — luncheon meeting at Chateau Laurier.

Mar. 30—**"Principles and Practices of Valuation of Public Utilities"**, R. A. C. Henry, M.E.I.C., engineer in charge of G.T.R. Arbitration, Department of Railways and Canals; A. A. Dion, M.E.I.C., general manager, Ottawa Gas and Electric Company; A. Ferguson, M.E.I.C., assistant engineer, Department of Railways and Canals; F. D. Burpee, ASSOCIATE E.I.C., general manager, Ottawa Electric Railway; G. A. Mountain, M.E.I.C., chief engineer, Board of Railway Commissioners; John Murphy, M.E.I.C., electrical engineer, Department of Railways and Canals; N. Cauchon, A.M.E.I.C.; and C. J. Tulley — evening discussion at University Club.

Apr. 6—**"Engineering in relation to Agriculture"**, Dr. J. G Rutherford, C.M.G., Board of Railway Commissioners — luncheon meeting at Chateau Laurier.

Apr. 20—**"Hydro-Electric Power Development in Ontario"**, H. G. Acres, M.E.I.C., vice-president of The Engineering Institute of Canada — The annual popular lecture given under the auspices of the Ottawa Branch — evening meeting at Victoria Memorial Museum.

May 1—"Recent Developments in Concrete", Lt.-Col. H. C. Boyden, B.S., M.A.S.C.E. — evening lecture at University Club.

Oct. 12—**"The Automatic Control of Fire"**, J. Grove Smith, B.A., B.Sc., A.R.C.S., F.R.S.C., Dominion Fire Commissioner — luncheon meeting at Chateau Laurier.

Oct. 31—Complimentary luncheon at Chateau Laurier to Dr. E. Deville, Hon.E.I.C., on his election as an Honorary Member of The Engineering Institute of Canada.

Nov. 15—**"The Great Lakes — St. Lawrence Scheme"**, Hon. J. A. O. Preus, governor of the State of Minnesota, U.S.A. — luncheon meeting at Chateau Laurier.

Nov. 29—**"The Engineering Institute"**, Fraser S. Keith, M.E.I.C., general secretary of The Engineering Institute of Canada — luncheon meeting at Chateau Laurier.

Dec. 7—**"The Fuel Situation in Canada"**, B. F. Haanel, M.E.I.C., Department of Mines; Gordon Gale, M.E.I.C., general manager, Hull Electric Company; and G. A. Mountain, M.E.I.C., chief engineer, Board of Railway Commissioners — evening meeting at Victoria Memorial Museum.

Dec. 14—Annual Smoker in Palm Room of Chateau Laurier — two hours of solid fun followed by buffet supper.

The committee adhered to the precedent established last year with a view to arousing public interest in the profession and the local press was utilized as much as possible for publicity purposes.

The evening lectures met with a large measure of appreciation and popular themes along educational lines were generally employed by the lecturers. The average attendance was approximately four hundred and these figures amply testify to the sustained interest shown in the course. Local papers rendered maximum support by advance notices, adequate report of meetings and by editorial comment. The space given by the press during the year aggregated thirty-eight columns of twenty-two inches each.

The luncheons have gained in popularity and when the address has been of international interest, the main dining room of the Chateau Laurier has been filled.

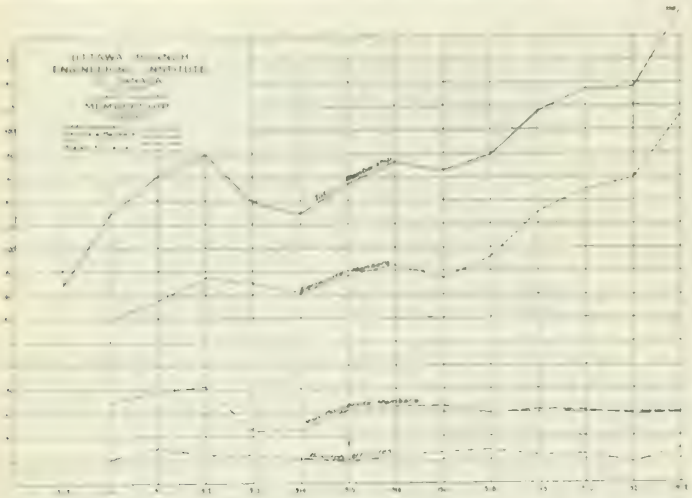
In conformity with the policy of the branch to invite to its meetings and luncheons, prominent men interested in the subjects to be presented, we have been honoured by the presence of the following distinguished gentlemen:— Rt. Hon. W. L. Mackenzie King, Rt. Hon. Arthur Meighen, Hon. E. C. Drury, Hon. John Bracken, Hon. C. A. Dunning, Hon. H. Greenfield, Hon. John Oliver, Hon. F. B. Carvel, Hon. Charles Stewart, Hon. J. H. King, Hon. G. P. Graham, Mayor F. H. Plant, H. P. Hill, M.L.A., Admiral Sir Charles Kingsmill, Major-General Sir Eugene Fiset, J. B. Hunter, Dr. Charles Camsell, Dr. J. H. Grisdale, G. J. Desbarats, M.E.I.C., Roy A. Gibson, Clarence Jameson, C. A. Magrath, M.E.I.C., G. P. Mackenzie and many others.

Membership

During the year the Committee on Membership held eleven meetings and dealt with eighty-six applications as follows:—

New Members	14
Associate Members	39
Juniors	2
Associates	2
Branch Affiliates	10
	67
Transfer to full Membership	9
Transfer to Associate Membership	7
Transfer to Junior	3
	19

During the year the total membership of the branch increased from 339 to 398, and the corporate membership from 257 to 311. The growth in the membership from 1909 to date is shown graphically on the accompanying chart.



The branch regrets to report the loss by death during the year of two members, E. D. Lafleur, and H. P. Borden, and of two Associate Members, A. Timbrell and Major R. W. Powell.

The following table shows in detail the comparative figures of the branch membership for the years: 1920, 1921 and 1922:—

	1920	1921	1922
Honorary Members	1	1	2
Members	90	89	100
Associate Members	158	168	211
Juniors	32	35	32
Students	24	25	19
Associates	2	2	6
Branch Affiliates	24	19	28
Total	334	339	398

Rooms and Library

As the policy of the Ottawa Branch remains unchanged as regards rooms, the branch is still without permanent quarters. Part of the furniture owned by the branch is still on loan to the Minto Skating Club and the remainder is stored in an unoccupied office.

The library is situated on the third floor of the Journal Building and has been used to a considerable extent by the members during the past year. The exchange of information, referred to in the report for 1921, between the libraries comprising the Library Association of Ottawa, has been continued, and to some extent systematized. This should prove of great value to enquirers by directing them to the most promising sources of information. During the year accessions have been received from Col. Duncan MacPherson, M.E.I.C., G. W. Volchman, M.E.I.C. K. M. Cameron, M.E.I.C., and Headquarters.

The British Commonwealth Publishers, Limited, a company which specializes in English periodicals, has offered to place a credit of $5.00 towards the purchase of books for the library for each $100.00 business received from the Ottawa members.

Advertising in The Journal

Commissions due to Ottawa Branch for advertising secured in *The Journal* during 1922 amounted to $91.03, which is practically equal to the rebates received from 46 Associate Members. During the year the committee secured contracts which will bring in commissions amounting to $137.50. During 1922 the advertising from the Ottawa Branch has averaged $1\frac{5}{6}$ pages per month.

Finances

The financial position of the branch continues to be highly satisfactory as may be seen by reference to the attached statements of assets and liabilities and of receipts and expenditures. The branch closes the year with a balance of $399.48 in the bank, $3.10 in cash on hand, and $1,000.00 in Victory bonds, a total balance on hand of $1,402.58. The accompanying chart shows graphically the financial standing of the branch from 1910 to the present date.

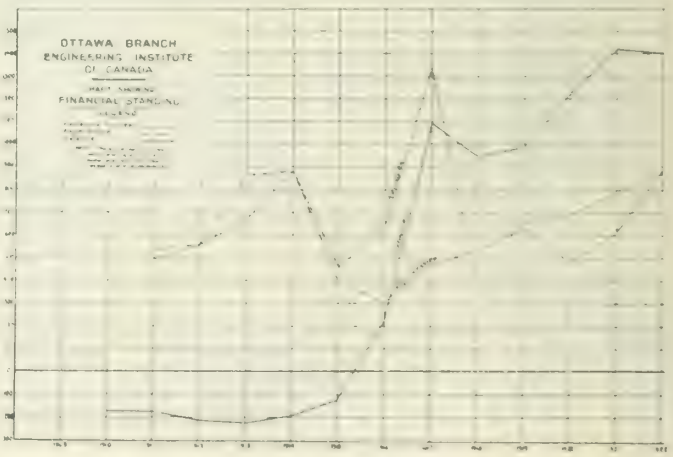
In addition to the balance mentioned above the branch has assets of $56.75 in rebates due from Headquarters for membership fees, $91.03 due from Headquarters for advertising in *The Journal*, and $10.00 for branch news, $176.00 in furniture, equipment, etc., and $27.50 in interest due from Victory bonds. The income for the last two years is: for 1921, $793.94; and for 1922, $875.42; the expenditure, for 1921, $603.66, and for 1922, $890.78. The branch now has an annual income of $55.00 from its Victory bonds.

While the balance sheet shows very substantial increases over last year due to growth in membership and greater branch activities, the statement of assets and liabilities shows we have been successful in adding to our assets by $119.20, the branch having now working capital and equipment amounting to $1,763.86.

Financial Statement

Receipts

Balance in Royal Bank Jan. 1st, 1922	$614.12
Cash on hand	3.66
Rebates from Headquarters for Nov. and Dec. 1921	50.88
Rebates from Headquarters for quarter ending Mar. 31st, 1922	354.00
Rebates from Headquarters for quarter ending June 30th, 1922	155.00
Rebates from Headquarters for July to Oct. 1922	102.50
Rebates from Headquarters for branch news — Jan. to April 1922	40.00
Rebates from Headquarters for branch news — May, June, and July 1922	24.73
Rebates from Headquarters for branch news — Aug., Oct., and Nov. 1922	17.22
Branch Affiliate fees	68.00
Refund from Ball Committee	15.00
Surplus from ball	26.81
Proceeds from sale of luncheon tickets	264.00
Proceeds from sale of tickets for smoker	137.70
Ontario Provincial Division	9.00
Interest on Victory bonds	22.00
Bank interest	5.28
	$1,909.90



Expenditures

Chateau Laurier for luncheons	$555.25
University Club — 3 meetings	21.00
Journal Dailies — advertising	47.60
Citizen Newspapers — advertising	33.40
Ottawa Electric Ry. Co. — advertising	10.00
Printing — ballots, cards, etc.	48.54
J. T. Pattison — printing of year book	60.00
Crabtree Co. — for half-tones	21.77
Daffodil Tea Rooms — annual meeting	46.00
Scrims — for flowers	37.00
Pittaway-Jarvis — framing pictures	19.70
Express	5.94
K. M. Cameron — expense re ball	15.00
Expenses of smoker	254.75
Wiggins & Co. — purchase of Victory bonds	202.50
Insurance	2.00
Subscription to Engineering News Record	8.00
Subscription to Engineering Journal for Rideau and University Clubs	6.00
Sundries — lantern operator, gratuities, etc	38.15
Petty cash expenditures — postage, etc.	74.72
Balance in bank — Dec. 31st, 1922	399.48
Balance cash on hand	3.10
	$1,909.90

Assets

Furniture (cost $200.00)	$ 80.00
Library:—	
Book cases (cost $72.50)	50.00
Bound magazines nominal	1.00
Books	25.00
Victory bons interest due	27.50
Rebates due from Headquarters on 1922 fees	56.75
Rebates due from Headquarters for branch news	10.00
Rebates due from Headquarters for advertising	91.03
Stationery and equipment	20.00
Victory bonds due December 1st, 1937	500.00
Victory bonds due November 1st, 1934	500.00
Cash in bank	399.48
Cash on hand	3.10
	$1,763.86

Liabilities

Surplus	$1,763.86
	$1,763.86

Officers for 1923

The annual meeting of the branch will be held in Ottawa on January 11th, when the officers and members of the Managing Committee will be elected for the year 1923.

Respectfully submitted,

K. M. CAMERON, M.E.I.C., *Chairman.*

F. C. C. LYNCH, Associate E.I.C.,

Secretary-Treasurer.

Peterborough Branch

The President and Council,

On behalf of the Executive Committee we submit hereunder the annual report of the Peterborough Branch for the calendar year of 1922:—

Membership

The membership of the branch is as follows:—

Members	16
Associate Members	27
Juniors	5
Associates	2
Affiliates	25
Total	75

Meetings

Fifteen meetings were held during the year, a list of which follows:—

Jan. 9—**"Some Experiences of a Consulting Engineer"**, Dr. T. Kennard Thomson, M.E.I.C., of New York City; illustrated with lantern slides.

Jan. 26—**"Silent Knight Engine"**, J. R. Marlow, general sales manager of Willys-Overland Company, Toronto; illustrated with lantern slides and moving pictures.

Feb. 9—**"Concrete Highway Construction"**, H. S. Van Scoyoc, M.E.I.C. of the Canada Cement Company, Limited, Montreal and formerly chief engineer of the Toronto-Hamilton Highway.

Feb. 23—The meeting was addressed by Thomas Gibson, deputy minister of mines for the province of Ontario, and Dalman Neeley, secretary of the Mine Owners' Association of Northern Ontario, on the mining industry in the province.

Mar. 9—**"Chippawa-Queenston Development"**, A. C. D. Blanchard, M.E.I.C., field engineer for the Hydro-Electric Power Commission of Ontario; illustrated with motion pictures and lantern slides.

Mar. 23—**"High Frequency Wireless Telephone Apparatus"**, A. S. Runciman, A.M.E.I.C., telephone engineer for the Shawinigan Water and Power Company; illustrated with lantern slides.

Apr. 8—**"The Wireless Telephone"**, Dr. Chas. A. Culver, of the Canadian Independent Telephone Company of Canada.

Apr. 13—**"History of Electrical Development in Peterborough"**, H. O. Fisk, M.E.I.C., manager of the Peterborough Utilities Commission; illustrated with lantern slides.

Apr. 24—**"Recent Developments in Concrete"**, Col. H. C. Boyden of the Portland Cement Association.

Apr. 27—Meeting was addressed by Col. F. M. Gaudet, C.M.G., M.E.I.C., technical research officer of the Research Council of Canada, on the need of establishing a scientific and industrial research laboratory in Canada.

May 11—Annual meeting of the branch and election of officers.

Oct. 12—**"The Progress of Highway Construction in Ontario"**, George Hogarth, M.E.I.C., chief engineer of the Department of Highways for the province of Ontario; illustrated with moving pictures and lantern slides.

Oct. 26—**"Vacuum Tubes for Radio Work"**, G. M. Middleton, E.E., Member A.I.E.E. of Toronto; illustrated with moving pictures.

Nov. 14—Annual banquet. Speakers: Brig.-Gen. C. H. Mitchell, M.E.I.C., Dr. R. A. Ross, M.E.I.C., Prof. Peter Gillespie, M.E.I.C., Alex. J. Grant, M.E.I.C., J. H. Hunter, A.M.E.I.C., and General Secretary Fraser S. Keith, M.E.I.C.

Dec. 14—Discussion of the Association of Professional Engineers of Ontario.

The attendance at these meetings averaged over 60.

On June 3rd, a visit of inspection was made by a party of about forty-five engineers to the new generating station of the Central Ontario System of the Hydro-Electric Power Commission of Ontario at Ranney Falls, near Campbellford.

Financial Statement

Receipts

Balance in bank, Jan. 1, 1922	$ 14.47
Rebates and branch news	159.36
Affiliate fees	48.00
Receipts annual dinner	167.50
Culver lecture	71.30
Subscription to m.p. machine fund	98.00
Middleton lecture	39.90
Bank interest	0.30
	$598.83

Expenditures

Rent	$ 50.00
Lantern service and parts	23.00
Affiliate subscriptions to Journal	24.00
Annual dinner expenses	120.75
M.p. machine (balance of account)	115.00
Printing	71.73
Y.W.C.A. (donation)	40.00
Speaker and meeting expenses	37.03
Lunch	10.30
McLaren (present)	14.00
N.O. relief fund	37.15
Postage, war tax, etc.	9.65
Balance in bank	46.22
	$598.83

Respectfully submitted,

P. P. WESTBYE, M.E.I.C., *Chairman.*
R. C. FLITTON, A.M.E.I.C., *Secretary.*

Quebec Branch

The President and Council,

On behalf of the Executive Committee, we beg to submit the annual report of the Quebec Branch for 1922.

During the past year, the Executive Committee has met at very frequent intervals; the various committees of the branch have discharged their respective duties successfully; the members, at large, have showed much interest in *The Institute's* affairs and have widely attended the twelve general meetings that were held.

Our meetings were organized in the way of luncheons alternating with smokers. Newspapermen, industrials and businessmen were invited to all of our general meetings, which resulted in giving *The Institute* and the profession some good publicity. The local press also kindly published extensive reports of our lectures and discussions. In keeping with the spirit of entente cordiale which exists in the city of Quebec between the French and English speaking people, the papers presented to our branch were read in French and in English, alternately as much as possible. Attached to this report, we beg to submit a list of the lectures and addresses given before our members.

Papers and Addresses

"La construction des navires à Québec, au siècle dernier", O. H. Côté, A.M.E.I.C.
"Aircraft and the possibilities of its use by Engineers", R. H. Nisbet.
"Scope of the Engineer in Forest Industries", S. L. deCarteret, A.M.E.I.C.
"Marchés et devis", T. E. Rousseau, A.M.E.I.C.
"Our Society Affairs", F. S. Keith, M.E.I.C., general secretary
"Gérance municipale", Henri Ortiz.
"Formation de techniciens par l'enseignement technique industriel", J. A. Buteau, A.M.E.I.C.
"Coal tar Industry", Arthur Fournier, A.M.E.I.C.
"Le barrage 'Gouin'," O. O. Lefebvre, M.E.I.C.
"Joffre Terminals, Levis division, C.N.R.", J. E. Gibault, A.M.E.I.C.
"La voirie dans la province de Québec", Alex. Fraser, A.M.E.I.C.
"The practical side of Scientific Concrete", Col. H. C. Boyden.
"Le régime des Eaux", A. B. Normandin, A.M.E.I.C.
"Constructions électriques aériennes", Alex. Larivière, A.M.E.I.C.
"Ice, Anchor Ice and Frazil", John Murphy, M.E.I.C.

At the end of this year, our branch numbers fifteen Members, sixty-two Associate Members, seven Juniors, fifteen Students and one Associate, or a total membership of one hundred.

The financial statement for the year 1922 follows:—

Revenues

Cash in bank, December 27th, 1921	$377.82	
Rebates from Headquarters	249.25	$627.07

Expenditures

Printing, stamps, etc.	$ 53.97	
General meetings	123.12	
Miscellaneous	204.13	$381.22
Balance on hand, January 1st, 1923		$245.85

Respectfully submitted,

A. R. DECARY, M.E.I.C., *Chairman.*
HECTOR CIMON, A.M.E.I.C., *Secretary-Treasurer.*

Au Président et au Conseil,

Il nous fait plaisir de vous soumettre, ci-après, le rapport annuel de la Section de Québec pour l'année 1922.

Le Conseil s'est réuni très fréquemment durant l'année écoulée; les divers comités se sont acquittés de leurs tâches respectives avec succès; les membres de notre section, en général, se sont montrés intéressés aux choses de l'*Institut* et ont assisté très nombreux aux douze assemblées générales qui furent tenues.

Nos réunions furent organisées sous forme de déjeuners-causeries alternant avec des soirées-boucane. Des journalistes et des industriels et hommes d'affaires furent invités à toutes les assemblées générales, et il en est résulté une bonne publicité pour l'*Institut* et la profession. La presse locale, d'ailleurs, s'est plu à publier d'amples comptes rendus de nos causeries et discussions. Conformément à l'esprit d'entente cordiale qui existe dans la ville de Québec entre les éléments français et anglais, les travaux présentés devant notre section furent lus en français et en anglais, alternativement autant que possible.

Annexée à ce rapport, nous vous soumettons une liste des causeries données à nos membres.

A la fin de cette année, notre section compte quinze membres, soixante-deux membres-associés, sept juniors, quinze étudiants et un associé, soit un total de cent.

Suit le bilan de nos opérations financières pour 1922:—

Recettes

Caisse au 27 décembre 1921	$377.82	
Remises du Bureau Chef	249.25	$627.07

Dépenses

Impressions, timbres, etc.	$ 53.97	
Frais d'assemblées générales	123.12	
Divers	204.13	$381.22
Solde au 1er janvier 1923		$245 85

Respectueusement soumis,

A. R. DÉCARY, M.E.I.C., *Président.*
HECTOR CIMON, A.M.E.I.C., *Secrétaire.*

Saskatchewan Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the following report for the calendar year 1922. We would point out that as our branch year ends on February 28th, the period covered by this report refers to a portion of two branch years, the activities of which were controlled by different executives.

While our membership report as set out below does not show an increase in number, we are pleased to report the addition of fourteen (14) new members and several applications pending, also seven (7) transfers to a higher grade. The total membership has remained stationary due to the removal of fourteen members to points outside the branch jurisdiction.

The Papers and Library Committee, appointed in March last, under the chairmanship of Lt.-Col. A. C. Garner, M.E.I.C., has been quite active. Sub-committees were appointed with the following convenors: (a) papers,—Lt.-Col. A. C. Garner, M.E.I.C.; (b) publicity,—D. W. Houston, A.M.E.I.C.; (c) recreation and entertainment,—H. N. Macpherson, A.M.E.I.C. These sub-committees have done excellent work in connection with the meetings and have been of great assistance not only in enhancing the social atmosphere of the meeting, but also in making valuable suggestions from time to time regarding ways and means of making the meetings attractive.

Our assets are less by approximately two hundred dollars than at December 31st, 1921, but it is significant to note that no special branch assessment was made during 1922, it being the first year for some time to be financed without a branch assessment to augment the rebates secured from Headquarters. The financial statement for 1922 is set out below.

The annual summer meeting was held in Moose Jaw on July 14th, and was well attended by the outside members, who were well repaid by the hospitable way in which they were entertained by the Moose Jaw members.

Meetings

During the year 1922 the executive held ten meetings at which the routine business was attended to. Fourteen (14) regular and special meetings have been held, the majority of which were preceeded by a dinner, the particulars of which are as follows:—

Jan. 12—"**Some Phases of Waterworks Practice**", J. W. D. Farrell, A.M.E.I.C., assistant superintendent, waterworks, Regina.

Jan. 27—Annual dance, City Hall, Regina.

Feb. 10—"**Notes on Railway Water Supply**", P. C. Perry, A.M.E.I.C., Divisional engineer, C.N.R., Regina.
"**Notes on Natural Waters of Saskatchewan for Boiler, Feed and other Purposes**", R. N. Blackburn, M.E.I.C., chief steam and boiler inspector, Saskatchewan Government.

Feb. 23—"**Synopsis of the Federal and Provincial Drainage Acts**", M. B. Weekes, M.E.I.C., director of surveys, Provincial Government.
"**Some Notes on Drainage**", H. G. Phillips, A.M.E.I.C., of Smith and Phillips, Regina.

Mar. 7—Annual meeting. Annual reports; election of officers; banquet and theatre party.

Mar. 27—"**Location and Construction of Roads by Municipalities**", C. H. Biddell, A.M.E.I.C., Provincial Department of Highways, Regina.
"**The Design and Construction of a Humus Tank**", W. E. Longworthy, A.M.E.I.C., city engineer's office, Regina.
"**Keeping Accounts**", D. H. Lunam, Poole Construction Company, Regina.
"**Estimating for Construction Work**", H. N. Macpherson, A.M.E.I.C., contractor, Regina.
"**Notes on Electrolysis Mitigation**", T. McGuinness, A.M.E.I.C., assistant superintendent, street railway, Regina.
"**Some Notes on Reinforced Concrete for Building Construction**", J. H. Puntin, A.M.E.I.C., architect, Regina.

Apr. 18—"**Saskatchewan and its Natural Resources**", Lt.-Col. A. C. Garner, M.E.I.C., chief surveyor, Land Titles office, Regina.

May 4—"**Provincial Highways Problems**", Hon. S. J. Latta, Ex-Minister of Highways, Saskatchewan.

July 14—Summer meeting, Moose Jaw, Sask.
"**Some Fallacies in Concrete Proportioning Methods**", Prof. G. M. Williams, A.M.E.I.C., University of Sask., Saskatoon.

Oct. 4—"**Highways Investigation and Specifications**", Lt.-Col. H. C. Boyden, Portland Cement Association, Chicago.

Oct. 12—"**Notes on Irrigation**", A. J. McPherson, A.M.E.I.C., consulting engineer, Regina.

Nov 9—"**Specification the Essence of Contract**", G. F. Blair, K.C., city solicitor, city of Regina.

Nov. 22—"**The Clay Products of Saskatchewan**", Prof. W. G. Worcester, University of Saskatchewan, Saskatoon.

Dec. 14—"**Town Planning in Relation to the Engineering Profession**", W. A. Begg, A.M.E.I.C., provincial director of town planning, Regina.

Membership

	Membership Jan. 1, 1922	New members	Withdrawals	Membership Dec. 31, 1922
Members	21	3	1	23
Associate Members	85	8	6	87
Junior Members	11	3	4	10
Student Members	11	—	2	9
Associates	2	—	—	2
Branch Affiliates	6	—	1	5
	136	14	14	136

Financial Statement 1922

Revenue

Bank balance Dec. 21st, 1921	$215.86
Branch dues	169.00
Rebate from Headquarters (Jan. to Sept.)	208.60
Meetings	431.60
Sundries	51.52
	$1,076.58

Expenditure

Rebate to Headquarters	$ 22.60
Meetings	671.22
Sundries	134.28
Honorarium to secretary-treasurer	150.00
Bank balance Dec. 31st, 1922	98.48
	$1,076.58

Assets

Cash in bank Dec. 31st, 1922	$ 98.48
Outstanding branch dues	164.00
Outstanding rebates from Headquarters	186.50
Furniture and library	50.00
	$498.98

Liabilities

Dues paid in advance	$ 5.00
Accounts payable	100.00
Surplus	393.98
	$498.98

Respectfully submitted,

J. R. C. MACREDIE, M.E.I.C., *Chairman.*

D. A. R. MCCANNEL, A.M.E.I.C., *Secretary-Treasurer.*

Lakehead Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the report of the Lakehead Branch. This branch was authorized in August 1922, and this report therefore covers the period from that date to December 31st, 1922.

Membership

At the time of authorization there were twenty-one members of all classes resident in this district, divided as follows:—Members four, Associate Members thirteen, Juniors two, and Students two. The petition to Council had sixteen out of the seventeen corporate members signatures on it. Since organization, our membership has increased by two Members, two Associate Members, one Associate Member who has applied to be transferred from another branch to the Lakehead Branch, and there are three applications pending.

Meetings

Including the organization meeting, which was held in Port Arthur, September 12th, 1922, the branch has held four meetings. One was a business meeting at which the branch by-laws were discussed and passed, and at the other two professional papers were read by G. H. Burbidge, M.E.I.C., and H. S. Hancock, A.M.E.I.C.

At the organization meeting, there were some thirty members of the engineering profession present. Fraser S. Keith, M.E.I.C., of Montreal, general secretary, and R. L. Dobbin, M.E.I.C., of Peterborough, member of Council were present and both addressed the meeting. At this meeting all the officers were elected to hold office till the annual meeting of the branch, which will be held in May. To the Executive Committee was left the appointing of the committees on By-laws, Membership, and Programme.

Financial Report

Revenue

Advance from Headquarters	$ 50.00
Rebates from Headquarters	5.75
Branch news	7.22
Interest on bank account	.12
	$ 63.09

Expenditure

Postage	$ 4.00
Advertising	1.90
Stationery and printing	11.96
Exchange on Headquarters cheque	.15
Rebates due from Headquarters	5.75
Balance on hand in bank	39.33
	$ 63.09

Respectfully submitted,

GEO. H. BURBIDGE, M.E.I.C., *Chairman.*

GEO. P. BROPHY, A.M.E.I.C., *Secretary-Treasurer.*

Sault Ste. Marie Branch

The President and Council,

The past year has not been as successful as it would otherwise have been, owing to the closing of the plant of the Algoma Steel Corporation in the Spring. This resulted in several members, who were very active in the branch, leaving the city and their loss has been severely felt from every point of view. In April the branch secretary, F. T. Gnaedinger, Jr.E.I.C., left for Montreal and resigned office after twelve months of most efficient work. During that period the affairs of the branch improved in every way due to his untiring efforts. Upon his resignation the writer was elected to fill the post until the next election

Branch Activities

The year's activities include some important work. In March the branch by-laws were altered to make them conform more closely with those of the other branches. The annual meeting was altered from May to December and a resolution passed enabling the members holding office at that date to carry on until the end of 1922.

The "Town Planning Committee" of the branch, working with a similar committee from the Sault Ste. Marie Young Men's Civic Club, did some excellent work in explaining the necessity for a permanent committee, appointed under the existing legislation, to the citizens and city council. Unfortunately the matter had finally to be left in abeyance.

Some very effective work was done by members of the branch in interviewing members of the Provincial Legislature regarding the Professional Engineers Act, which has at last been passed though in a very mutilated form.

Meetings

During the year the following papers were presented at branch meetings:—

Jan. 26—"Fuel Testing for School Heating in the Sault", L. H. Derrer, S.E.I.C.
Mar. 2—"Industrial Plants and their Location", F. T. Gnaedinger, Jr.E.I.C.
Mar. 30—"Projected Improvements of the St. Lawrence River", J. W. LeB Ross, M.E.I.C.
Apr. 27—"Some Fuel Problems of the Steel Plant" E. Litz, M.E.I.C.
May 25—"Composium on Dock and Pier Construction":
Sault Ste. Marie Ship Canal Piers, J. W. LeB Ross, M.E.I.C.
Algoma Steel Coal Dock, W. S. Wilson, A.M.E I.C.
Algoma Central Coal Dock, C. H. E. Rounthwaite, A.M.E.I.C.
Algoma Steel Ore Dock, B. E. Barnhill, M.E.I.C.
Nov. 30—"The Great Pyramids of Egypt", C. H. Speer, M.E.I.C.
Dec. 22—"Low Grade Iron Ores of Algoma", J. D. Jones, M.E.I.C.

Membership

The branch membership has suffered somewhat during the year due the cause mentioned above. The standing at December 31st, 1922, as compared with a year ago, is as follows:—

	1921	1922
Members	10	12
Associate Members	13	6
Juniors	2	3
Students	4	2
Affiliates	–	1
	29	24

Financial Statement

The financial position of the branch is sound although due to its comparatively small membership its bank account is not large. The financial statement is as follows:—

Receipts

Balance on hand Jan. 1st, 1922	$ 33.87
Rebates from Headquarters	57.25
Affiliates dues	23.00
Receipts from Journal	21.11
Subscriptions to Journal	4.00
	$139.23

Disbursements

Meetings and general expenses		$ 39.12
Subscriptions to Journal		4.00
		$ 43.12
Balance on hand, December 31st, 1922		$ 96 11
Assets		
Cash on hand	$ 4.00	
In current account, Royal Bank	92.11	$ 96.11

Respectfully submitted,

K. G. ROSS, A.M.E.I.C., *Chairman.*

GEO. H. KOHL. A.M.E.I.C., *Secretary-Treasurer.*

St. John Branch

The President and Council,

The Executive of the St. John Branch of *The Engineering Institute of Canada* asks leave to present its fifth annual report for the year ending December 31st, 1922.

There have been nine meetings of the Executive when the general business of the branch has been transacted. Eight regular meetings of the branch have been held at which papers of interest were read and discussed. Two special dinner meetings were held in addition to the regular gatherings.

The branch had the pleasure of a visit from the general secretary, in November, which has had beneficial results. The branch meetings have attracted a large number of the members and they are all taking an interest in *The Institute* affairs. The activities of the branch have received considerable publicity. The various committees have carried out their duties in a painstaking manner which has greatly assisted the Executive in its work.

Membership

The branch membership at the close of 1922 is as follows:—

Grade	Resident	Non-resident	Total
Members	14	4	18
Associate Members	28	3	31
Juniors	11	0	11
Associates	1	0	1
Students	3	1	4
Affiliates	3	1	4
Total end of year 1922			69
Total end of year 1921			72
Net loss			3

Financial Statement

Receipts

Balance from 1921	$198.70
Rebates and dues from Headquarters	106.26
Branch news	51.68
Dues and subscriptions from Affiliates	14.84
Entertainment receipts	59.00
Total	$430.48

Expenditures

Postage	$ 15.27
Stationary and printing	50.75
Dinners and entertainment	129.20
Hall and meeting expenses	43.00
Secretaries' meeting	25.00
Journal subscriptions (Affiliates)	2.84
Sundries	13.00
Total	$279.06
Balance on hand	$151.42

Respectfully submitted,

A. G. TAPLEY, A.M.E.I.C., *Chairman.*

HARRY F. BENNETT, A.M.E.I.C., *Secretary-Treasurer.*

Toronto Branch

The President and Council,

On behalf of the Executive Committee I beg to submit the following report of the activities of the Toronto Branch for the calendar year 1922. This period, on account of the branch elections being held in March, has been covered by two separate executive committees, the personnel of which are as follows:

	January to March 1922	March to December 1922
G. T. Clark, A.M.E.I.C.	Chairman	Wm. Storrie, M.E.I.C
Wm. Storrie, M.E.I.C.	Vice-Chairman	E. G. Hewson, M.E.I.C.
F. B. Geodike, A.M.E.I.C.	Secretary-Treas.	F. B. Geodike, A.M.E.I.C. O. M. Falls, A.M.E.I.C.
Peter Gillespie, M.E.I.C.	Committeemen	Peter Gillespie, M.E.I.C.
H. L. Lamb, M.E.I.C.		N. D. Wilson, A.M.E.I.C.
G. G. Powell, M.E.I.C.		G. G. Powell, M.E.I.C.
M. V. Sauer, M.E.I.C.		M. V. Sauer, M.E.I.C.
J. M. Oxley, M.E.I.C.		W. A. Duff, M.E.I.C.
R. C. Muir, M.E.I.C.		R. C. Muir, M.E.I.C.

In addition to the foregoing the local members of Council and the immediate past-chairman of the branch were ex-officio members of the committee.

The Executive Committee has held twenty-one meetings at various intervals throughout the year and in addition to discussing and making arrangements for routine branch matters, such as weekly meetings, recommendations to Council regarding applicants for admission to *The Institute* and appointment of various committees, has devoted its attention to many matters involving the welfare of the members of the Toronto Branch.

The policy of the executive this session has been to encourage the discussion of subjects of a business character and their efforts along this line have been rewarded by greatly increased attendance at the regular weekly meetings.

Meetings

The following meetings were held:—

Jan. 12—Address by Hon. F. C. Biggs, minister of public works and highways, and Geo. Hogarth, M.E.I.C., chief engineer, Department of Highways.

Jan. 19—Discussion of constitution and by-laws led by J. M. Oxley, M.E.I.C.

Jan. 26—**"Incineration"**, R. R. Knight, M.E.I.C.

Feb. 2—**"Hunter Street Bridge"** (Ashburnham), Frank Barber, M.E.I.C.

Feb. 9—**"Fertilizers"**, H. G. Bell.

Feb. 16—**"High Carbon Rail Steel"**, J. B. Carswell, A.M.E.I.C.

Mar. 2—**"Rise and Fall in Prices"**, H. A. Goldman, A.M.E.I.C.

Mar. 9—**"Some Legal Aspects of Engineering Problems"**, Alfred Bicknell.

Mar. 16—Annual Meeting.

Oct. 12—Opening Meeting — Chairman's Inaugural Address, Wm. Storrie, M.E.I.C.

Oct. 19—**"Manufacture of Tin Plates and Plant Operation"**, S. R. Cound.

Oct. 22—**"Town Planning Legislation"**, N. D. Wilson, A.M.E.I.C., W. S. B. Armstrong, and R. Redman.

Nov. 2—**"The Use of Light Alloys in Structural Engineering Practice"**, Prof. O. W. Ellis, A.M.E.I.C.

Nov. 9—Student's Night. Addresses by F. A. Ellis, S.E.I.C., D. B. Strudley, S.E.I.C., and H. F. Robertson, S.E.I.C.

Nov. 16—**"Inspection of Ferrous Material"**, Prof. E. A. Allcut.

Nov. 23—Discussion of committee's report on **Policy**, by R. O. Wynne-Roberts, M.E.I.C., Brig.-Gen. C. H. Mitchell, M.E.I.C., and A. M. Reid, S.E.I.C.

Nov. 30—**"The Local Improvement Act"**, R. C. Harris.

Dec. 7—**"The Purification of Public Water Supplies"**, Norman J. Howard.

Dec. 14—Discussion of committee's report on **Classification and Remuneration**, led by A. H. Harkness, M.E.I.C.

Membership

The membership of the branch has shown a healthy increase during the year as indicated by the following figures:—

	1921	*1922*
Members	115	118
Associate Members	251	273
Associates	6	6
Juniors	4	41
Students	103	213
Affiliates		10
	190	661

Financial Statement

Revenue

Cash on hand	$ 890.07
Rebates and branch news	1,094.22
Commision on advertising in Journal	9.50
Interest	32.70
Affiliates' dues	60.00
Sundry items	101.25
	$2,187.74

Expenditures

Advertising, printing, etc	$269.36
Secretary's honorarium	200.00
Engineer's Club, book cases	199.00
Headquarters, general subscriptions for Affiliates	9.32
Annual meeting expenses	185.00
Lantern	65.00
Library Committee	125.00
Lantern rent	15.00
Stationery and insurance	33.96
Stenographic services	33.00
Sundry expenses	58.70
Balance on hand	994.40
	$2,187.74

Respectfully submitted,

WM. STORRIE, M.E.I.C. *Chairman.*

O. M. FALLS, A.M.E.I.C. *Secretary-Treasurer.*

Vancouver Branch

The President and Council,

I have the honour to report on the affairs of the Vancouver Branch, for the year 1922, as follows:—

General Meetings

The attendance at the general meetings of the branch, with the exception of the one held on June 2nd, averaged about thirty, as compared with forty-five during 1921.

In order to stimulate greater interest, the Executive Committee inaugurated a change of policy whereby speakers outside of the engineering profession would be invited to address the branch on topics associated with engineering, but not necessarily technical. The first of these speakers, Dr. R. H. Mullin, director of laboratories at the Vancouver General Hospital, addressed the branch on "Sanitary Water Supply" on November 10th. An invitation was also extended to His Honour Judge Howay, New Westminster, to give a lecture on "The Royal Engineers", but a definite date could not be arranged, owing to the speaker's other engagements. It is regrettable that the attendance at Dr. Mullin's lecture was disappointingly small, in consequence of which, it would be most desirable to have the branch pass a resolution for or against this policy.

Very energetic measures must be taken to improve the attendance at our general meetings. We have the use of a commodious new auditorium which has a ground floor location, better ventilation, better acoustics and increased seating capacity, at a rental of five dollars per meeting as compared with two dollars and fifty cents for the old auditorium. It belongs to the Vancouver Board of Trade, and is located in the Board's new building at 300 Pender Street, West. The improvements are certainly worth the difference in rental, but it is obvious that the increased expense can only be justified by a substantial increase in attendance.

A very desirable improvement, which might easily be secured in the new auditorium, would be a permanent screen, for use with the lantern. The old arrangement required to be set up prior to, and dismantled after each meeting, — a labour which, heretofore, has fallen on the branch secretary. The old screen is not suited to the new auditorium, it having been lashed to a temporary frame, for our November meeting, after considerable trouble. The secretary of the Board of Trade apparently realizes that a permanent screen would be an asset to the auditorium. In view of this, it might be to the advantage of the branch, if the incoming Executive Committee would take up the question with him, at an early date. A permanent screen would be an undeniable boon to the person who accepts the responsibility of making the necessary preparations for lantern lectures.

The general meetings of the branch during 1922, numbered eight, as follows:—

Feb. 2—**"Review of events leading up to the action 'Creer vs. Vancouver and District Joint Sewerage and Drainage Board'"**, A. D. Creer, M.E.I.C.

Feb. 11—Afternoon visit to the new unit at the Keefer Street plant of the Vancouver Gas Company.

Mar. 16—**"Construction of the Greater Winnipeg Water District Aqueduct"**, Wm. Smaill, M.E.I.C.

May 9—**"History and Development of the Gas Industry"**, John Keillor, engineer, Vancouver Gas Co. This was a joint meeting with the Canadian Pacific Section of the Society of Chemical Industry.

June 2—**"Scientific Methods of Making Concrete"**, Prof. Duff A. Abrams, M.E.I.C., Lewis Institute, Chicago. The members of seven other local technical bodies were invited to attend.

Sept. 23—Visit to Sumas Reclamation Project. This visit involved the whole day and entailed a journey to Chilliwack on a B.C. Electric special train. The branch was entertained by the Hon. E. D. Barrow, on behalf of the Provincial Department of Agriculture.

Nov. 10—**"Sanitary Water Supply"**, Dr. R. H. Mullin, director of laboratories, Vancouver General Hospital.

Dec. 19—Annual General Meeting.

British Columbia Professional Meeting

The Vancouver Branch had the honour of staging the first professional meeting of *The Institute* held in British Columbia, on Friday and Saturday, June 16th, and 17th.

Through the co-operation of the Victoria Branch and the officials of the Canadian Good Roads Association, coupled with ideal weather, the venture was a most successful one. The meeting was attended by many of the prominent members of *The Institute* from the prairie and eastern provinces. A full account of the proceedings may be found in the August (1922) number of *The Engineering Journal.*

Executive Committee

The Executive Committee held twelve business meetings during the year, at which a number of matters of special importance were dealt with, including the proposal to absorb the members of the B.C. Technical Association, the proposal to revive the B.C. Provincial Division, the proposal of the Victoria Branch to form standing joint committees for B.C., the B.C. professional meeting, action in reference to the Second Narrows bridge contract, town-planning, joint library, and other matters.

In conjunction with the council of the Association of Professional Engineers of B.C., a complimentary dinner was tendered to Arthur St. Laurent, M.E.I.C., chief engineer of the Dominion Department of Public Works, at the University Club on September 13th.

On December 4th, Major-Gen. R. G. Edwards Leckie, A.M.E.I.C., tendered his resignation from the Executive Committee, his normal term of office expiring at the end of 1923. The extra vacancy thus created, has been allowed for by adding two more names to the ballot paper drawn up by the branch Nominating Committee, the candidate polling the lowest vote of the four elected, to retire at the end of 1923.

Major G. A. Walkem, M.E.I.C., represented the branch at the western professional meeting held in Winnipeg during September.

General Review of 1922 Business

British Columbia Technical Association:—The proposal to absorb this body by granting a $3.00 rebate on the entrance fee, to all members who would apply and be regularly admitted to *The Institute* as corporate members, was rejected by the B.C.T.A. on January 19th. Subsequently, an open general meeting of engineers passed a resolution in favour of eliminating the B.C.T.A. on account of the multiplicity of dues to other organizations. The B.C.T.A., however, decided to carry on, in spite of this resolution.

British Columbia Provincial Division:—An effort to revive the B.C. Provincial Division was made, in order to provide a means of carrying on the functions of the B.C.T.A., by placing *The Institute* in a position favourable to supplementing the activities of the Association of Professional Engineers of B.C., in matters relating to welfare, remuneration, etc. The question finally came up for discussion at the B.C. professional meeting on June 17th, where a resolution in favour of dropping the question indefinitely was passed by a large majority, in view of the recommendations of *The Institute* Committee on Policy.

Standing Joint Committees for British Columbia: - A resolution of the Victoria Branch, in favour of the appointment of standing joint committees to deal with matters of welfare, etc., with a view to obtaining united action on the part of all branches in the province, as well as non-resident members, was considered by the Executive Committee, and finally referred to the resident councillors for their opinion. They advised the adoption of the resolution, and suggested that the Victoria Branch should name the committees. This will be a matter for the incoming Executive Committee to complete.

British Columbia Professional Meeting:—This matter was the cause of considerable effort on the part of the Executive Committee and the various sub-committees on papers, entertainment, finance and advertising. The branch is especially indebted to Major G. A. Walkem, M.E.I.C., and Messrs. J. N. Anderson, A.M.E.I.C., T. W. Fairhurst, A.M.E.I.C., and J. F. Frew, for their very devoted and successful efforts in the matter of securing special advertising for the August number of *The Journal*, from which the branch received $225.00. All correspondence and other records in connection with this matter have been carefully filed, for reference on a future occasion.

Second Narrows Bridge:—It seems reasonable to infer that the activities of the Executive Committee in July and August of this year, resulted in the appointment of A. D. Swan, M.E.I.C., by the Burrard Inlet Tunnel and Bridge Company, as consulting engineer on the proposed Second Narrows bridge. The committee, by means of a carefully prepared questionaire, submitted to that company on August 1st, elicited the fact that no independent qualified engineer had been retained to examine the proposed plans and contract of the McClintock, Marshall Construction Company. Shortly after the receipt of the B.I.T. & B. Co.'s reply, the appointment of Mr. Swan was announced.

Branch Dues:—A resolution of the Executive Committee, in favour of suspending the collection of branch dues, was endorsed by the general meeting held on March 16th. Excluding the special revenue and expenses of the B.C. professional meeting, the ordinary activities of the branch have been conducted with a shrinkage in cash balance of approximately $90.00, or 60 cents per member.

Institute Nominating Committee:—James Muirhead, M.E.I.C., was appointed by the Executive Committee on January 4th, to represent the Vancouver Branch during 1922.

Institute Papers Committee:—The secretary-treasurer was appointed by the Council on February 21st, to represent the Vancouver Branch on this committee. Efforts are being made to inaugurate an exchange of meritorious papers among the various branches. The representative of the Vancouver Branch has already made application for papers to supplement the resources of the Vancouver Branch during 1923.

Town-Planning Committee:—A committee composed of C. Brakenridge, M.E.I.C., W. H. Powell, M.E.I.C., W. B. Young, A.M.E.I.C., and W. B. Greig, A.M.E.I.C., was appointed by the general meeting of March 16th, to foster town-planning in British Columbia on behalf of *The Institute*. Messrs. C. Brakenridge, M.E.I.C., and W. B. Young, A.M.E.I.C., subsequently represented *The Institute* on the civic Town-Planning Committee, under the chairmanship of Alderman T. H. Tracy, M.E.I.C. Mr. Brakenridge was appointed chairman of a special sub-committee to draft a provincial town-planning Act, which has since passed the committee stage in the B.C. Legislature, and will be dealt with by the House at the next session.

Joint Library Committee:—Acting upon the decision of the various bodies interested in the library at 930 Birks Building, to form a Joint Library Committee, the Executive Committee, on October 6th, appointed E. A. Wheatley, A.M.E.I.C., secretary of the Professional Engin-

eers of B.C., to represent the Vancouver Branch on this committee. The delay in making the appointment was owing to the difficulty experienced in securing a volunteer for this duty. As the branch is the principal body at present interested in the library, the branch will undoubtedly gain many advantages from this arrangement. A report is shortly expected from the committee, embodying an estimate to cover the branch's quota of new books, periodicals, bookcases, etc., which will be submitted to the incoming Executive Committee. It is most desirable that Mr. Wheatley's appointment be confirmed for the year 1923, not only because his constant presence in the office adjoining the library will enable him to discharge the duties of librarian, but because the branch may rest assured that his work will be most thoroughly performed.

Membership Committee:—A special committee, composed of Wm. Smaill, M.E.I.C., and A. C. Eddy, M.E.I.C., was appointed to start a membership campaign, by the Executive Committee on March 3rd. This committee's activities were suspended on account of the pressure of business connected with the B.C. professional meeting.

Applications Committee:—In view of the duties of the branch executive, relating to applications for admission and transfer, as laid down in section 28 of *The Institute* by-laws, it is recommended that the Executive Committee, in future, appoint a sub-committee of three, to make the necessary investigations, in order that this highly important duty may be fully discharged in accordance with the intention of the above mentioned section of the by-laws.

Addressograph:—The secretary-treasurer wishes to express sincere appreciation for the labour-saving features of the addressograph placed at his disposal by the council of the Association of Professional Engineers of B.C. The outlay of $15.00 on plates, indexing tabs and a filing drawer, by the Vancouver Branch, is a small indication of the value of this welcome acquisition to the office equipment.

Membership

Owing to the constant movement of members, within the province, it is difficult to keep an accurate membership roll for the branch. The standing at the date of this report is:—

Grade	Dec. 19th, 1922	Dec. 18th, 1921
Members	50	51
Associate Members	81	86
Juniors	5	8
Students	16	11
Affiliates	1	1
Total	153	157

We deeply regret to report the decease of Arthur E. B. Hill, M.E.I.C., and G. D. Addison, A.M.E.I.C.

During 1922, the Executive Committee has made a point of trying to interest the student engineers attending the University of British Columbia, by inviting them to our meetings, whenever possible. This is a field which the incoming Executive Committee should make a special effort to exploit for new members. The fruits of such a policy will be thoroughly appreciated by the branch when these men become members of the profession in B.C. So far, the branch has been mainly dependent on the influx of engineers from other parts of Canada, Great Britain and the United States of America.

Financial Statement

The following is the treasurer's statement as at December 19th, 1922:—

Receipts

Balance on hand, Jan. 2nd	$138.96
Rebates on fees, Nov. 1921 to Oct. 1922	255.05
Branch news, Nov. 1921 to Oct. 1922	69.41
Refund from Headquarters of certain expenses incurred for B. C. professional meeting	31.83
Special advertising in August number of the Journal	225.00
Surplus from Sumas visit	2.27
	$722.52

Expenditures

Rent — 930 Birks Building	$240.00
Rent — Board of Trade auditorium	17.50
Printing	56.51
Postage, telegrams, etc	44.50
Stationery, etc	6.44
Addressograph plates and file	14.83
Canadian Engineer	3.00
Honorarium to secretary	50.00
Bank exchange	1.20
Miscellaneous expenses	14.00
Balance, Dec. 19th, 1922	274.54
	$722.52

"Miscellaneous expenditures" includes such items as group photographs, $2.00; lettering door at branch office, $3.10; special lantern screen, $1.50; lapel badges, $4.25; etc. There are no outstanding accounts to be paid. The balance on hand, amounting to $274.54, when reduced by the amount received from special advertising in the August number of *The Engineering Journal*, totals $49.54 as compared with $138.96 on hand at the commencement of the year. This shows an actual shrinkage in funds of $89.42, or about 60 cents per member. During 1921, the branch received $295.50 from Headquarters rebates on fees and branch news, and in addition, $125.00 were collected in branch dues, making a total ordinary revenue of $420.50. During 1922, however, the branch received $294.46 in rebates, but collected no branch dues, which caused a shrinkage in ordinary revenue of $126.04.

It should be noted that the net office rent for 1921 was $190.00, whereas we paid out $240.00 during 1922, an increase of $50.00. The incoming Executive Committee should look into this question, and make an effort to arrive at some more advantageous arrangement with the Council of the Association of Professional Engineers of B.C., especially in view of the fact that all our corporate members pay fees to both institutions, and further, that practically the whole of the books in the library are the property of or on loan to the branch, and yet are accessible to all members of the association.

Considering the $50.00 increase in rent, and the $126.04 shrinkage in revenue, it should be a matter for congratulation, that the shrinkage in our cash balance is only $89.42. It is not possible to give a statement of assets at present. An inventory and valuation of all books and furniture will have to be made, before such can be rendered.

Moberly Fund

This fund is invested in Victory Bonds whose par value is $400.00. The accrued coupon interest and savings bank interest to date amounts to $163.95. No part of this fund is included in the financial statement.

Respectfully submitted,

P. H. BUCHAN, A.M.E.I.C. *Secretary-Treasurer.*

Victoria Branch

The President and Council,

On behalf of the Executive Committee I have the honour to report to you the operations and activities of the branch during the year 1922, which I hope you will find encouraging and of interest.

Membership

Our membership has undergone some changes. One Associate Member, G. H. Dawson has resigned from membership in *The Institute*. Mr. Dawson as most members will know, has for some years ceased to take an active part in the work of the profession, so that his resignation will not be a surprise. On our list we have twenty-five Members, thirty-three Associate Members, one Junior, three Students and one Affiliate; sixty-three in all. Retired there are one Member, one Associate Member. Away from the city temporarily, or permanently there are three Members, eleven Associate Members, one Junior, and one Student; a total of sixteen. From general attendance at meetings I consider that we may count fifteen Members, eighteen Associate Members, one Junior, and one Affiliate, as comprising the active membership of the branch.

Meetings

During the year we have been favoured with the following papers and lecturers:—

1921

Dec. 14—"Super-Helium in the Stars", Harry Plaskett.

1922

Feb. 6—"History and Progress of the Manufacture of Coal Gas", F. J. Kennedy.

Apr. 16—"A Surveying Expedition into Syria from Damascus", F. G. Aldous, A.M.E.I.C.

Apr. 26—"Description of the New Dry Dock to be constructed at Esquimalt", J. P. Forde, M.E.I.C.

May 31—"The Scientific making of Concrete", Prof. Duff Abrams. M.E.I.C.

Nov. 8—"A discussion on Policy". Major Geo. A. Walkem, M.E.I.C.

Dec. 12—"Railway Construction by the Royal Engineers in Palestine", Major Geo. A. Walkem, M.E.I.C.

General Branch Activities

We have made visits to the New Dry Dock under construction by Messrs. Lyall, at Esquimalt, and also to the Bamberton Plant of the British Columbia Portland Cement Company.

Among those who have visited Victoria and have met the members of the branch at meetings, I would mention C. Brakenridge, M.E.I.C., chairman Vancouver Branch, in April; J.G. Sullivan, M.E.I.C., president of *The Institute*, in June; and in the same month the general secretary, Fraser S. Keith, M.E.I.C., whom we are always pleased to see

In February a reception and dance was held and well attended. An invitation to attend was extended to all local members of the Association of Professional Engineers of British Columbia, whether *Institute* members or not.

In June the ninth convention of the Canadian Good Roads Association was held here. Many members attended and our chairman, Mr. Philip, M.E.I.C., was elected a director for the coming year.

A western professional meeting of *The Institute* was held successfully in Vancouver under the joint auspices of this and the Vancouver Branch. Ten of our members attended there and took part in the discussions.

On December 2nd last, at the annual meeting of the Association of Professional Engineers, a past-chairman of this branch, A.E. Foreman, M.E.I.C., was elected to the office of president, and our chairman was elected a member of council. H. L. Johnston, M.E.I.C., who has actively represented us during the past retiring.

In the year two important committees of *The Institute* have presented reports which have been published in *The Journal*. I refer to the committees on Policy and Remuneration. Action is being taken along the lines suggested in the first named, and it is hoped the other will be equally effective.

Insurance has been effected upon the property of the branch contained in the room at Brown Building.

The branch is officially represented by a member in the Chamber of Commerce. Your executive considered it advisable to take this step in order that the profession may take an interest in public questions when advisable.

Branch Dues

A suggestion has been made and endorsed by the Executive, that the branch dues for the coming year be reduced to three dollars. Some effort will be necessary to keep within the limit thus set in the matter of expenditure, but it is thought that the relief afforded will enable some members who are in arrears to get in good standing again. Also some members have found difficulty in keeping up to date with fees to *The Institute* and if the efforts to reduce obligations is successful the branch will benefit by increased rebates. While discussing this matter of financial obligations of members, the news that a discount of $5 from the annual fee will be allowed to members of the Association of Professional Engineers who remit before January 20th, will be welcome.

It is hoped during the coming year to have papers read on "River Bank Protection", "Marine Borers," "Johnson Street Bridge," "Electricity-Production and Use" and other subjects. The dry dock will be again visited and progress noted.

Financial Statement

Balance Sheet, Dec. 1st 1921 to Dec. 1st 1922.

Balance in bank, Dec. 1st 1922	$ 64.18	
Cash on hand	18.88	
		$83.06

Receipts

Fees from Dec. 1st, 1921 to Nov. 30th, 1922	$168.00
Rebates from Headquarters, Montreal	116.21
Interest on war bond	5.50
Sale of war bond	99.40
	$389.11

Disbursements

Rent of room, Nov. 1st, 1921 to Nov. 30th, 1922...	$187.50	
Insurance on contents of room	5.45	
Postage	40.50	
Contribution to joint meetings with Vancouver Island Section, Association of Professional Engineers	10.00	
Stationery	26.03	
Charts, Remuneration Scale	7.20	
Shelving	12.50	
Moving to new room	11.25	
Publications	8.32	
Light	1.41	
Victoria Chamber of Commerce (Subscription)	25.00	
Janitor	9.00	
Lectures, expenses	3.50	
Sheet for lantern	4.76	
Reception, deficit	33.70	
Telegrams	4.00	
Dinner to General Secretary	12.00	
Commission on cheques	.80	
	$402.92	
Excess of disbursements over receipts		$ 13.81
Balance on hand		$ 69.25

Assets

Bank balance	$ 60.17	
Cash	9.08	
	$ 69.25	

E. P. Girdwood, M.E.I.C.
Treasurer.

The books, vouchers and balance sheet have been examined and found correct. (Signed) W. M. Everall, J. B. Shaw, Auditors.

In retiring from the position of secretary of the branch, I wish to thank each member and also the several executives for their co-operation during the time, over three years, that I have occupied that position. I have tried to do my best, as I saw it, in the interest of *The Institute* and the branch, and if I have partially succeeded I am amply repaid in the pleasure-and pain-of the work. Thank you.

Respectfully submitted,

H. M. BIGWOOD, A.M.E.I.C., *Secretary*.

Winnipeg Branch

The President and Council,

On behalf of the Winnipeg Branch we beg to submit the following report for the year 1922:

Membership

The active membership of this branch at this date is 306, being a decrease of 3.3%. The membership is distributed as follows:

Members	48
Associate Members	175
Juniors	34
Students	19
Associates	5
Local Associates	25
	306

Meetings

The branch held fourteen regular meetings during the year, and one special meeting was held on June 27th, at which the general secretary gave a very interesting address on the report of *The Institute's* Committee on Policy. The Executive Committee held twenty-two meetings during the year, the large number being necessary to make arrangements for the holding of the annual general professional meeting, which was held in Winnipeg, September 5th, 6th, and 7th.

The Programme Committee, P.Burke-Gaffney, A.M.E.I.C., chairman, decided at the outset that its functions included not only the arrangement of a programme of papers and addresses to be delivered at the regular meetings, but also measures to quicken interest in the proceedings of the branch, to promote discussion at the meetings and to encourage professional activities. Several meetings were taken up with reports of investigations and research by various standing committees, and these were found to be very interesting and valuable. The committee has also arranged for a series of public lectures under the auspices of the branch in the coming Spring, on the general topics of power, water-supply, roads, and municipal service.

Meetings

Following is a list of meetings, with appurtenant information, held during the year:—

Date	*Subject*	*Speaker*	*Attendance*
Jan. 5—	Maryland Bridge	F. C. Green, M.E.I.C.	67
Feb. 2—	Electric Arc Welding	J. M. F. Wilson, A.M.E.I.C.	66
	Oxacetylene Welding	Mr. Brown	
Feb. 16—	Illumination	Prof. E. P. Fetherstonhaugh, M.E.I.C.	63
Mar. 2—	Engineering for Land Drainage in Manitoba	D. L. McLean, A.M.E.I.C.	51
Mar. 16—	Problems, Duties and Responsibilities of the Municipal Engineer	J. N. Finlayson, M.E.I.C., W. E. Hobbs, A.M.E.I.C., Wm. Aldridge, A.M.E.I.C., J. W. Battershill, A.M.E.I.C.	54
Apr. 6—	Self-Corrosion of Buried Lead Pipes	W. N. Smith, M.E.I.C.	54
Apr. 20—	Geology and Economic Significance of Oil	Dr. R. C. Wallace	47
May 4—	Annual Meeting		40
Oct. 3—	Concrete Highway Investigations and Specifications	Col. H. C. Boyden	31
Oct. 19—	Relativity	Rev. Father Morton	94
Nov. 2—	Electric Furnaces	A. W. Lamont, A.M.E.I.C.	37
Nov. 16—	Economics of Rate Making	F. H. Martin, M.E.I.C.	56
Dec. 7—	Progress Report; Committee on Foundations	Harold Edwards, A.M.E.I.C.	48
Dec. 21—	Operation of a Distribution System	C. A. Clendening, A.M.E.I.C. H. G. Mitchell	26

Committee Activities

The Committee on Municipal Engineering under the chairmanship of Prof. J. N. Finlayson, M.E.I.C., held several well attended and interesting meetings during the year. Sub-committees were struck to deal with special phases of the work of this committee as follows:—

1. Duties and responsibilities of the municipal engineer.
2. Fundamental data on size and growth of cities, density of population, and city districts.
3. Water supply and distribution, including methods of apportionment of costs of service, and financing.
4. Sanitation in its various phases.
5. Other utilities, such as electric light and power, roads and pavements, bridges and culverts.

The committee reported to the branch at the regular meeting of March 16th, a good resumé of which is contained in the April *Journal* on page 217. This committee emphasized the necessity for more uniformity in design

and construction of public works in the various municipalities, especially those contiguous to cities, which may at a later date be absorbed. Uniformity in design and construction would prevent either serious inconveniences or great expense when this came about. An organization chart was prepared which indicated the best arrangement of various departments to prevent overlapping of responsibility, and duplication of work. Emphasis was placed on the necessity for proper town planning, not only to provide a more artistic lay-out, but in the interests of economy in the construction of the public utilities.

The Committee on Foundations, under the chairmanship of Harold Edwards, A.M.E.I.C., carried on some valuable research and investigation along the line of the general geology of the district, the best practice as to soil loading, and the design for surface foundations. The committee has been following carefully the investigations of other engineering organizations, particularly the work of the committee of the American Society of Civil Engineers on the bearing value of soils and railway track stresses. Two very interesting reports which elicitted valuable discussion by the members, were given to the branch. The comprehensive data furnished indicated that a great deal of time had been spent on this work. The experience of the committee, however, indicates that in order to achieve sound progress, the work will have to be carried on slowly and carefully.

The Committee on Remuneration, under the chairmanship of D. A. Ross, M.E.I.C., were active in protecting the interests of the members, having achieved specific results in a number of cases. It was apparent, however, that great success will be difficult to achieve until general action is taken by *The Institute* as a whole. With Dominion-wide competition, employers can readily obtain engineering services from other parts if larger remuneration were demanded in any isolated section. The committee called the attention of the Branch Executive to advertisements of certain rural municipalities which appeared to be illegal in that they called for applications for the position of municipal engineer on a basis of competitive tendering in regards to salary. This, of course, if persisted in would tend to lower salaries for municipal engineers, and should be vigourously opposed.

The work of the Library Committee of the branch has virtually been taken over by a similar committee of the Association of Professional Engineers, the latter organization providing ample funds to procure all late publications and periodicals, which are at the disposal of the members at the Winnipeg Public Library.

The Natural Resources Committee, under the chairmanship of E. V. Caton, M.E.I.C., held several interesting meetings. As this committee was primarily organized to deal with the question of protection of Manitoba waters from outside influences, and as it appeared that the question had political affiliations, and as the final agreement between the various interests providing for proper protection of these waters has been drawn, the object of the committee no longer exists.

The Branch has been signally honoured this year in having one of its members, J. G. Sullivan, M.E.I.C., elected president of *The Institute*.

General Professional Meeting

A successful general professional meeting was held under the auspices of this branch from September 5th to 7th, inclusive. Interesting and instructive papers were read and discussed. Visits were arranged to several important engineering projects, and entertainment provided for the delegates. Details of the convention will be found in the October issue of *The Journal*.

Financial Statement

The financial statement of the branch is as follows:—

Receipts

Receipts from local dues collected during the year amounted to	$491.00
Rebates from Headquarters — three quarters	403.50
Branch news	27.91
Expenses general professional meeting paid by Headquarters	243.84
Special advertising	166.25
General professional meeting	583.50
Bond interest	27.50
Current interest	13.59
Total receipts	$1,957.09
Cash in bank at December 31st, 1921	356.92
	$2,314.01

Expenditures

Total expenditures	$1,720.82
Cash in hand	12.39
Bank balance	580 80
	$2,314.01

Assets

Cash balance	$593.19
Rebates last quarter	61.25
Branch news	9.45
Advertising	16.65
Local dues in arrears	465.00
Office furniture and library	340.65
Victory bonds	500.00
Total	$1,986.19

Liabilities

Accounts payable	$ 0.00
Surplus	$1,986.19

Respectfully submitted,

E. V. CATON, M.E.I.C., *Chairman.*

GEORGE L. GUY, M.E.I.C., *Secretary-Treasurer.*

Thirty-Seventh Annual Meeting

Registration

	Name	Address
1	J. G. Sullivan	Winnipeg.
2	John T. Farmer	Montreal.
3	U. P. Boucher	Montreal.
4	Walter C. Adams	Montreal.
5	T. A. Barnett	Niagara Falls.
6	Georges Kydd	Orillia.
7	W. H. Magwood	Cornwall.
8	A. B. Lambe	Ottawa.
9	L. M. Arkley	Kingston.
10	C. J. Desbaillets	Montreal.
11	R. Bickerdike, Jr.	Montreal.
12	S. Fortin	Montreal.
13	E. A. Ryan	Montreal.
14	Fraser S. Keith	Montreal.
15	Alex. Bertram	Montreal.
16	Peder P. Wetsbye	Peterborough.
17	A. L. Killaly	Peterborough.
18	C. P. Edwards	Ottawa.
19	G. R. MacLeod	Montreal.
20	A. W. Robinson	Upper Melbourne.
21	A. Plamondon	Montreal.
22	Guy C. Dunn	Toronto.
23	Phelps Johnson	Montreal
24	W. G. McNaughton	New York City.
25	L. G. Papineau	Montreal.
26	N. Cageorge	Montreal.
27	T. A. Chubb	Montreal.
28	R. H. Findlay	Montreal.
29	J. F. F. MacKenzie	Montreal.
30	Fred Newell	Montreal.
31	Alexander Peden	Montreal.
32	D. C. Tennant	Montreal.
33	A. S. Wall	Montreal.
34	E. E. Weibel	Montreal.
35	L. A. Herdt	Montreal.
36	Chas. M. McKergow	Montreal.
37	Jas. H. Huner	Montreal.
38	Albert J. Kelly	Montreal.
39	G. H. Duggan	Montreal.
40	R. L. Dobbin	Peterborough.
41	J. L. Dansereau	Montreal.
42	V. Denis	Montreal.
43	Jos. Landry	Montreal.
44	Frank B. Thompson	Montreal.
45	Walter J. Francis	Montreal.
46	S. E. Oliver	Montreal.
47	H. W. B. Swabey	Montreal.
48	J. G. Caron	Montreal.
49	T. A. G. Bishop	Montreal.
50	R. M. Walker	Montreal.
51	L. H. Marotte	Montreal.
52	C. H. Mitchell	Toronto.
53	Charles H. Keefer	Ottawa.
54	R. de la B. Girouard	St. Vincent de Paul.
55	R. E. Jamieson	Montreal.
56	B. E. Norrish	Montreal.
57	W. W. Benny	Ottawa.
58	G. W. Volckman	Ottawa.
59	Geo. Reakes	St. Lambert.
60	Wm. D. Lawrence	Montreal.
61	Frederick W. Cowie	Montreal.
62	H. S. Van Scoyoc	Montreal.
63	Frederick B. Brown	Montreal.
64	F. L. C. Bond	Montreal.
65	A. S. Going	Montreal.
66	O. M. Falls	Toronto.
67	W. J. McAllister	Montreal.
68	Eugene O'Sullivan	Montreal.
69	D. G. Anglin	Montreal.
70	H. H. Donnelly	St. Vincent de Paul.
71	J. A. Duchastel	Outremont.
72	A. T. Spencer	Toronto.
73	C. R. McCort	Three Rivers.
74	Arthur W. Sullivan	Valleyfield.
75	Geo. A. Mountain	Ottawa.
76	A. Gray	St. John, N.B.
77	Charles Chapais	St. Hyacinthe.
78	G. Percy Cole	Montreal.
79	A. F. Byers	Montreal.
80	C. G. Porter	Montreal.
81	B. F. Haanel	Ottawa.
82	F. P. Shearwood	Montreal.
83	L. W. DesLauriers	Montreal.
84	Alex. J. Grant	St. Catharines.
85	H. S. Duebelbeiss	Montreal.
86	Leo. G. Denis	Montreal.
87	O. Lefebvre	Montreal.
88	P. G. Gauthier	Montreal.
89	Edw. A. Evans	Quebec.
90	W. Chase Thomson	Montreal.
91	J. A. Burnett	Montreal.
92	K. O. White	Montreal.
93	James Ewing	Montreal.
94	Geo. K. McDougall	Montreal.
95	J. Cecil McDougall	Montreal.
96	Ernest V. Moore	Montreal.
97	G. E. Bell	Montreal.
98	R. E. Hunter	Montreal.
99	E. A. Forward	Montreal.
100	Norman E. D. Sheppard	Montreal.
101	A. Ghysens	Montreal.
102	Fred J. Dawson	Vancouver.
103	E. C. Kirkpatrick	Montreal.
104	H. M. Jaquays	Montreal.
105	R. B. Jennings	Montreal.
106	James Ferguson	Montreal.
107	Percival W. St. George	Montreal.
108	P. B. Motley	Montreal.
109	J. M. R. Fairbairn	Montreal.
110	K. B. Thornton	Montreal.
111	Wm. Kennedy, Jr.,	Montreal.
112	J. Robertson	Montreal.
113	R. H. Mather	Montreal.
114	P. S. Gregory	Montreal.
115	H. W. McMillan	Montreal.
116	D. A. Scarnegie	Montreal.
117	John W. Seens	Montreal.
118	James Weir	Montreal.
119	H. B. Stuart	Montreal.
120	H. H. Hawkes	Montreal.
121	D. E. Perriton	Montreal.
122	Wm. P. Anderson	Ottawa.
123	B. W. Seeton	Montreal.
124	Huet Massue	Montreal.
125	Aimé Cousineau	Montreal.
126	Chas. Stephen	Montreal.
127	A. St. Laurent	Ottawa.
128	C. R. Coutlee	Ottawa.
129	W. A. B. Hicks	Montreal.
130	G. R. Heckle	Montreal.
131	A. R. Henry	Montreal.
132	R. S. Howard	Montreal.
133	H. L. Sheenbuch	Montreal.
134	G. B. Dodge	Ottawa.
135	H. V. Haight	Sherbrooke.
136	I. J. Tait	Montreal.
137	L. R. Wilson	Montreal.
138	W. P. Murray	Montreal.
139	H. G. Thompson	Montreal.
140	W. F. Gronan	Montreal.
141	L. B. Kingston	Montreal.
142	S. A. Neilson	Montreal.
143	J. B. Walcot	Montreal.
144	C. A. Mullen	Montreal.
145	W. P. Roper	Montreal.
146	W. McG. Gardner	Montreal.
147	W. M. Reid	Montreal.
148	C. L. Hervey	Montreal.
149	J. Chalmers	Montreal.
150	F. A. Combe	Montreal.
151	S. H. Woodard	New York.
152	R. M. Hannaford	Montreal.
153	C. McL. Pitts	Ottawa.
154	E. V. Gage	Montreal.
155	D. Hillman	Montreal.
156	A. L. Harkness	Montreal.
157	Wm. Smaill	Vancouver.
158	G. G. Underhill	Montreal.
159	Gordon McL. Pitts	Montreal.
160	S. Barr	Montreal.
161	A. C. Tagge	Montreal.
162	Chas. F. Medbury	Montreal.
163	S. Svenningson	Montreal.
164	F. C. Laberge	Montreal.
165	Alex. Larivière	Quebec.
166	H. W. Fairlie	Montreal.
167	J. M. Robertson	Montreal.
168	J. C. O'Brien	Montreal.
169	Douglas Bremner	Montreal.
170	J. H. Larmonth	Montreal.
171	H. Irwin	Montreal.
172	E. S. M. Lovelace	Montreal.
173	M. A. Scott	Montreal.
174	Geo. D. Macdougall	New Glasgow, N.S.
175	C. A. Allen	Strathmore.
176	P. L. Pratley	Montreal.
177	Louis O'Sullivan	Westmount.
178	W. C. Adams	Montreal.
179	S. Blumenthal	Montreal.
180	B. J. Forrest	Westmount.
181	J. R. Donald	Montreal.
182	A. L. Spafford	Sherbrooke.
183	J. R. Macauley	Montreal.
184	Robert Fleming	Toronto.
185	A. C. Mackenzie	Montreal.
186	H. G. Welsford	Montreal.

ARTHUR T. ST. LAURENT, B.A., C.E., M.E.I.C.,

PRESIDENT

The Engineering Institute of Canada.

Arthur T. St. Laurent, B.A., C.E., M.E.I.C., President of *The Engineering Institute of Canada* for the year nineteen hundred and twenty-three, holds one of the most responsible engineering positions in the Dominion as chief engineer of the Department of Public Works of Canada, for which position he is eminently fitted through training and high personal qualifications, which mark him as belonging to that superior type to whom men delight to pay tribute.

Mr. St. Laurent was born at Rimouski on the 20th of November, 1859, and after taking the complete course at Rimouski College, studied at l'Ecole Polytechnique of Montreal, from which he graduated in 1885 with the degree of Civil Engineer. Following graduation he spent the first summer on harbour surveys with the department of public works, and in November of the same year took a position with J. E. Vanier, A.M.E.I.C., in making preliminary survey for the Montreal and Western Railway, working successively as rodman, transitman and draughtsman. During the next two years Mr. St. Laurent spent the major part of his time on the Temiscouata Railway construction, principally under the late C. LeB. Miles, the late Sir John Kennedy and R. Adams Davym, M.E.I.C., chief engineer.

In 1888, Mr. St. Laurent was appointed in the engineering branch of the department of public works, under the late H. F. Perley, then chief engineer, working on the design of wharves, bridges and lock gates. In 1889 he acted as first assistant to the late E. D. Lafleur, on important surveys in Ontario The following year he was appointed assistant resident engineer at Winnipeg for the district of Manitoba and the northwest territories under the department of public works, the late Louis Coste being at that time chief engineer. The work consisted of hydrographic surveys, bridge construction and river improvements. In 1895 Mr. St. Laurent was in charge of a special examination of the Red river below Winnipeg and prepared plans and designs of a proposed lock and movable dam.

In 1895 he was appointed assistant engineer in the department, and since then has been elevated successively until he has reached the highest engineering position in the department, that of chief engineer, to which position he was appointed a year ago. As evidence of the esteem in which Mr. St. Laurent is held, the Ottawa branch called a special luncheon meeting in his honour at that time, where a remarkable demonstration of esteem and goodwill was displayed towards him. On that occasion fitting tributes were paid to him by Premier Oliver of British Columbia, J. B. Hunter, deputy minister, department of public works, Clarence Jameson, of the civil service commission, G. J. Desbarats, M.E.I.C. deputy minister, department of naval affairs, and George A. Mountain, M.E.I.C., chief engineer of the Board of Railway Commissioners.

ARTHUR T. ST. LAURENT, B.A., C.E., M.E.I.C.

President

The Engineering Institute of Canada.

In addition to having the responsibility of the engineering work for one of the largest spending branches of the government, which extends to every point in Canada where Federal public works are carried on, Mr. St. Laurent is the technical representative, chosen by the deputy minister, as a member of the Federal Civil Service board of hearing and recommendation, in which position his natural courtesy, sympathy and consideration are appreciated.

Mr. St. Laurent's association with *The Institute* began in 1898, at which time he was made an Associate Member, being transferred to Membership in October 1909, during which year he was a member of Council. He occupied the office of vice-president during 1915, 1916 and 1917, and has, at all times, taken an active interest in the affairs of this organization. He is a member of the American Society of Civil Engineers and the International Congress of Navigation.

In all his actions Mr. St. Laurent reveals the fact that he is a true gentleman in every sense of the word. Of a quiet, almost retiring disposition, he possesses a friendly nature which those who know him best fully appreciate. Possessing superior ability and the highest engineering qualifications, Mr. St. Laurent embodies executive ability of a high order, and a personal charm that has endeared him to those with whom he is associated. It is noted with regret that Mr. St. Laurent has not enjoyed his usual health recently, but it is hoped that he will soon be restored to the full enjoyment of health and strength.

THE
ENGINEERING JOURNAL

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VOL. VI February 1923 No. 2

Canadian Institute of Mining and Metallurgy Invites Members of Institute to attend Annual Meeting.

The following invitation has been received from the Canadian Institute of Mining and Metallurgy, to officers and members of this organization to attend their Annual General Meeting.

Montreal, January 26th., 1923.

Dear Mr. Keith:—

The Council of the Canadian Institute of Mining and Metallurgy extend a cordial invitation to the officers and members of *The Engineering Institute of Canada* to attend our forthcoming Annual General Meeting at the Mount Royal hotel, in Montreal, on the 7th, 8th and 9th of March, 1923.

The principal theme for discussion at the meeting will be "Canada's Fuel Problems", and as many of your members are actively interested in this subject Council hopes that they will attend the sessions and also take part in discussion.

Thursday, March 8th, has been set aside for the programme on fuel and the subject will be introduced by the presentation of a paper by the Dominion Fuel Board. The domestic fuels, peat and wood, of Ontario and Quebec will be described by authorities on these subjects and some time will be devoted to the problem involved in marketing western coal.

Probably the most interesting part of the programme will deal with the relationship of the United States bituminous and anthracite fields to Canada together with the announcements, through representatives of British producers, relative to the establishment of a permanent export coal business with this country.

Yours faithfully,
(*Signed*) GEO. C. MACKENZIE,
Secretary-Treasurer

It is anticipated that a large number of our members will attend the meeting of the Canadian Institute of Mining and Metallurgy, not only because of the fact that the papers to be presented are without exception of outstanding interest to all members of the engineering profession but also as an evidence of appreciation of the cordial good-will extended by the Council of the Canadian Institute of Mining and Metallurgy as evidenced by the letter from Secretary MacKenzie published above.

Elimination of Waste through better Industrial Management

In a paper entitled Measurement of Management, Joseph W. Roe, president of the Society of Industrial Engineers, attacks the problem of the elimination of waste in industry from the standpoint of executive efficiency and urges the necessity of developing a method of measuring the effectiveness of management. This, he states is the best single answer to the question, "How can industrial engineering be of service to industry?"

Mr. Roe quotes from the report of the Committee on Elimination of Waste in Industry, of the Federated American Engineering Societies as follows: "Over fifty per cent of the responsibility for these wastes can be placed at the door of management, and less than twenty-five per cent at the door of labour, while the amount chargeable to outside contacts is least of all."

Such a statement emanating from so important a committee, emphasizes the urgent need for greater efficiency in industrial management. With the increasing recognition of the engineer as the logical executive head of industry, the subject is one which may well demand more serious consideration by the engineering profession.

The Thirty-Seventh Annual Meeting

The annual meeting of *The Institute*, was held at headquarters, on Tuesday, January twenty-third. President Sullivan, M.E.I.C., opened the meeting at ten thirty a.m.

Reading of Minutes

It was moved by Walter J. Francis, M.E.I.C., seconded by Geo. R. MacLeod, M.E.I.C., that the minutes of the last annual meeting as published in the February, 1922, *Journal*, be taken as read. Motion carried.

Appointment of Scrutineers

It was moved by John Farmer, M.E.I.C., seconded by P. P. Westbye, M.E.I.C., that S. J. Fortin, M.E.I.C., and D. C. Tennant, M.E.I.C., be appointed scrutineers to report the result of the officers' ballot to the secretary. Motion carried.

Appointment of Auditors

It was moved by Sir Alex. Bertram, M.E.I.C., seconded by Walter J. Francis, M.E.I.C., that Messrs, Riddell, Stead, Graham and Hutchison, be appointed auditors for the ensuing year. Motion carried.

Report of Council

It was moved by Walter J. Francis, M.E.I.C., seconded by John Farmer, M.E.I.C., that the report of Council as published on page forty-nine of the February *Journal*, be adopted. Motion carried.

Reports of Committees

Publications Committee:—It was moved by Geo. R. MacLeod, M.E.I.C., seconded by Geo. Kydd, A.M.E.I.C., that the report of the Publications Committee as published on page fifty-one of the February *Journal*, be adopted. Motion carried.

Students' Prizes Committee:—It was moved by Sir Alex. Bertram, M.E.I.C., seconded by B. E. Norrish, A.M.E.I.C., that the report of the Students' Prizes Committee, as published on page fifty-one of the February *Journal*, be adopted. Motion carried.

Gzowski Medal Committee:—It was moved by Col. W. H. Magwood, M.E.I.C., seconded by R. L. Dobbin, M.E.I.C., that the report of the Gzowski Medal Committee as published on page fifty-one of the February *Journal*, be adopted. Motion carried.

Finance Committee:—It was moved by Sir Alex. Bertram, M.E.I.C., seconded by Gen. C. H. Mitchell, M.E.I.C., that the report of the Finance Committee as published on page fifty-two of the February *Journal*, be adopted. Motion carried.

Library and House Committee:—It was moved by H. S. Van Scoyoc, M.E.I.C., seconded by Geo. R. MacLeod, M.E.I.C., that the report of the Library and House Committee, as published on page fifty-four of the February *Journal*, be adopted. Motion carried.

Legislation and By-laws Committee:—It was moved by Walter J. Francis, M.E.I.C., seconded by C. H. Keefer, M.E.I.C., that the report of the Legislation and By-laws Committee, as published on page fifty-five of the February *Journal* and page five hundred and eighty-seven of the December 1922, *Journal*, the latter showing the proposed changes in the by-laws, be adopted. Motion carried.

Proposed changes in the by-laws:—

Objects.

Section 1.—The objects of *The Institute* shall be (a) to develop and maintain high standards in the engineering profession, (b) to facilitate the acquirement and the interchange of professional knowledge among its members, (c) to advance the professional, the social and the economic welfare of its members, (d) to enhance the usefulness of the profession to the public, (e) to collaborate with universities and other educational institutions in the advancement of engineering education, (f) to promote intercourse between engineers and members of allied professions, (g) to co-operate with other technical societies for the advancement of mutual interests, (h) to encourage original research, and the study, development and conservation of the resources of the Dominion.

Classes of Members.

Section 3.—The membership of *The Institute* shall consist of Honorary Members, Members, Associate Members, Juniors, Students and Affiliates. Members, Associate Members, and Honorary Members who have previously been corporate members, shall be styled corporate members. Juniors, Students, Affiliates, and Honorary Members who have not previously been corporate members, shall be styled non-corporate members. Non-corporate members shall not be entitled to vote on Institute affairs, or to hold office, as an officer of *The Institute*, or as chairman or vice-chairman of a branch, or to vote on branch affairs, except as hereinafter provided. Juniors shall be entitled to vote on branch affairs, and to hold branch offices other than those of chairman or vice-chairman.

Title.

Section 4.—Any Honorary Member, Member, Associate Member, Junior, Student or Affiliate, having occasion to designate himself as belonging to *The Institute*, shall state the class to which he belongs, according to the following abbreviated forms: Hon. M.E.I.C., M.E.I.C., A.M.E.I.C., Jr.E.I.C., S.E.I.C., Affiliate E.I.C.

Resident and Non-Resident Members.

Section 5.—Corporate and non-corporate members residing within Canada and not more than twenty-five miles from the headquarters of a branch, shall be styled branch residents. Those residing within Canada, but beyond twenty-five miles of a branch headquarters, shall be styled branch non-residents. Those residing outside of Canada shall be styled non-residents.

Members.

Section 7.—A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of hirty years, shall be considered as responsible charge.

Associate Members.

Section 8.—An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be conid ered as professional responsibility.

Affiliates.

Section 11.—An Affiliate shall be one who is not an engineer by profession but who pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

Officers.

Section 12.—The officers of *The Institute* shall be a president, five vice-presidents, one councillor from each branch having less than two hundred corporate members, two councillors from each branch having two hundred and less than four hundred corporate members, and three councillors from each branch having four hundred or more corporate members.

Term of Office-Vacancies.

Section 13.—The term of office of the president shall be one year, of the vice-presidents two years and of the councillors one year, except in the case of councillors from branches of over two hundred corporate members. The term of office for such councillors shall be two years for those representing branches having a corporate membership of two hundred and less than four hundred, and three years for those representing branches having a corporate membership of over four hundred, one councillor to be elected each year from each branch.

"For the first election of councillors under this by-law, elections shall be held only as necessary to maintain the provisions of this by-law allowing the councillors in office to complete their term."

The term of each officer shall begin at the close of the annual general meeting at which such officer is elected, and shall continue for the period above named or until a successor is duly elected or appointed by the council.

A vacancy in the office of president shall be filled by the senior vice-president. Seniority shall be determined by priority of election to the office of vice-president, and, failing that, by priority of admission to corporate membership.

A vacancy in the office of vice-president shall be filled until the following annual election by the senior councillor from the zone in which the vacancy occurs. Seniority shall be determined by priority of election as a councillor and, failing that, by priority of admission to corporate membership.

A vacancy in the office of councillor shall be filled until the following annual election by a corporate member chosen by the council from a list of nominees submitted by the executive of the branch concerned.

Admission to practice in the Province of Quebec.

Section 26.—Delete entire section. "No person shall be admitted into the Institute to practice in the province of Quebec, except in accordance with the laws of that province, and the provisions of Sections 7, 8, 9, 10, 11, 27, 28 and 29 shall not apply to such person."

Renumbering Sections.

Renumber all following sections to allow for deletion of section 26, and renumber other sections in the interests of uniformity.

FEES.

Entrance Fees.

Section 33.—The entrance fees payable by those admitted to the Institute shall be as follows:—

Members	$25.00
Associate Members	15.00
Juniors	10.00
Affiliates	10.00

Honorary Members and Students shall be exempt from entrance fees.

Annual Fees.

Section 34.—The annual fees payable by Montreal Branch Residents shall be as follows:—

Members	$13.00
Associate Members	10.00
Juniors	6.00
Students	1.00
Affiliates	10.00

The annual fees payable by all other Branch Residents shall be as follows:—

Members	$10.00
Associate Members	8.00
Juniors	4.00
Students	1.00
Affiliates	10.00

The annual fees payable by Non-Residents shall be as follows:—

Members	$8.00
Associate Members	6.00
Juniors	3.00
Students	1.00
Affiliates	10.00

Honorary Members shall be exempt from annual fees.

Arrears—Exemptions—Life Membership List.

Section 38.—The secretary shall notify any member who fees become more than three months in arrears. Should the fees become six months in arrears, the member shall lose the right to vote or to receive the publications of the Institute. Should the fees become nine months in arrears, the member shall again be notified in form prescribed by the council, and if such fees become one year in arrears, he shall cease to be a member of the Institute. The council, for cause deemed by it sufficient, may extend the time for payment and for the application of these penalties.

The council may for sufficient cause, temporarily excuse from payment of annual fees any member who from ill health, advanced age or other good reason assigned, is unable to pay such fees, and the council may remit the whole or part of fees in arrears.

The council, upon written request, and at its discretion, may exempt from further payment of annual fees, any corporate member who has reached the age of sixty-five, or who has been a corporate member for thirty years, or who has rendered signal service to the Institute. The names of such members shall be placed on a Life Membership List.

Branch Membership.

Section 50.—The membership of a branch shall consist of the members of *The Institute* of all classes residing within a distance of twenty-five miles from the headquarters of the branch and the members of all classes residing within an area so allocated that such members are members of the branch most convenient geographically, branch districts to be so apportioned that all members of all classes resident within the Dominion shall be members of a branch. The boundaries of the branch districts shall be determined by the council.

A non-resident member shall have the right to designate himself a member of any branch he may choose, failing which designation he shall be attached for Institute voting purposes only, to the Montreal Branch.

Branches may at their option admit to branch privileges persons not members of *The Institute*, which persons shall be styled "Branch Affiliates." The qualifications, fees and privileges, of Branch Affiliates, shall be such as may be specified by branch by-laws.

Revenue.

Section 57.—The secretary of *The Institute* shall each year remit to each branch a rebate of the annual fees, current or arrears, received from the members of that branch during that year, payments being made quarterly, as follows:—Thirty per cent to all branches having a corporate membership of less than one hundred; twenty-five per cent to all branches having a corporate membership of one hundred and less than two hundred; and twenty per cent to all branches having a corporate membership of two hundred or more.

Provincial Divisions

Management.

Section 60.—Each provincial division shall be managed by an executive committee consisting of (a) those members of council resident within the division, (b) one representative to be appointed by the executive of each branch of the division, (c) the officers of the division, (d) the past-chairman and the past secretary-treasurer for the year following their term of office.

Nominations and Elections of Officers

Electoral Districts.

Section 65.—For the purpose of the nomination and election of officers the membership of *The Institute* shall be divided into branch districts for the election of councillors, and zones for the election of vice-presidents. The branch districts shall be determined by the council. The four vice-presidential zones shall be (a) the four western provinces, (b) the province of Ontario, (c) the province of Quebec, and (d) the Maritime provinces.

List of Members.

Section 66.—Council may direct that a list of members with the names arranged alphabetically and geographically, indicating the zones and branches, be sent to corporate members each year not later than August first.

Election of Nominating Committee

Section 67.—The nomination of officers of *The Institute* shall be made by a nominating committee. The honorary councillors shall be ex-officio members of this committee. The remaining members, who shall not be officers of *The Institute*, shall be elected annually as follows:—Each branch shall appoint one member, an additional member appointed by the council shall be chairman of the committee. The membership of the committee shall be announced at the annual general meeting.

Nominating Committee to prepare Officer's Ballot.

Section 68.—The nominating committee shall prepare an officers' ballot, which shall contain the names of not less than two nominees for each office to be filled, with the exception of that of president, for which only one name may be submitted.

A vice-president shall be elected by vote of the corporate members resident within the zone for which he is a candidate, an election to take place every two years in each zone, except in zone (c) where an election shall take place each year. One vice-president shall be elected from each zone, except zone (c) from which two vice-presidents shall be elected, one of whom must be resident within twenty-five miles of the headquarters of *The Institute*.

A councillor shall be elected by vote of the corporate members resident within the branch district for which he is a candidate.

The officers' ballot shall be presented to the council by the nominating committee not later than the first day of October, and shall be accompanied by a letter of acceptance of nomination from each nominee.

The council shall examine the officers' ballot submitted by the nominating committee. If the council find a nominee ineligible for the office for which he is nominated, or should the consent in writing of a nominee to appear on the officers' ballot not to be furnished, or should any nominee after such consent withdraw his name, such name shall be deleted, and the council shall substitute another name therefor. The words "Proposed by Nominating Committee" and "Proposed by Council" shall be printed conspicuously on the ballot, to indicate the manner of nomination of all nominees.

"For the first election of vice-presidents under this by-law, elections shall be held only as necessary to maintain the provisions of this by-law allowing the vice-presidents in office to complete their term.

The Officers' Ballot.

The officers' ballot shall be mailed to corporate members at least thirty days before the annual general meeting, and shall state the name and residence of each nominee, his class of membership and the zone or branch district in which he resides. The names of the nominees for any one office shall be arranged alphabetically by zones and branches.

Voters may strike out names from the officers' ballot and may substitute other names therefor, but the number of votes cast for each office must not exceed the number to be elected to such office. In voting for councillors, each voter shall vote for the councillor to be elected from his own branch. Directions in accordance with the above provisions shall be printed conspicuously on the ballot, and any vote which does nor comply with them shall be rejected.

In accordance with the Constitution the Chair named Walter J. Francis, M.E.I.C., to prepare the arguments for, and Robt. Bickerdike, Jr., M.E.I.C., against, the proposed amendments, to accompany the ballot on the proposed changes in the by-laws.

Papers Committee:—It was moved by Frederick B. Brown, M.E.I.C., seconded by Geo. R. MacLeod, M.E.I.C., that the report of the Papers Committee, as published on page fifty-six of the February *Journal*, be adopted Motion carried.

Committee on Deterioration of Concrete in Alkali Soils:—It was moved by Geo. A. Mountain, M.E.I.C., seconded by H. S. Van Scoyoc, M.E.I.C., that the report of the Committee on Deterioration of Concrete in Alkali Soils as published on page fifty-seven of the February *Journal*, be adopted. Motion carried.

Board of Examiners and Education Committee:—It was moved by Sir Alex. Bertram, M.E.I.C., seconded by R. E. Hunter, M.E.I.C., that the report of the Board of Examiners and Education Committee, as published on page sixty-four of the February *Journal*, be adopted. Motion carried.

Nominating Committee:—It was moved by Walter J. Francis, M.E.I.C., seconded by Sir Alex. Bertram, M.E.I.C., that the Nominating Committee-1923, as published on page sixty-four of the February *Journal*, be approved. Motion carried.

Publicity Committee:—It was moved by Commander C. P. Edwards, A.M.E.I.C., seconded by Geo. A. Mountain, M.E.I.C., that the report of the Publicity Committee, as published on page sixty-four of the February *Journal*, be adopted. Motion carried.

Committee on Biographies:—It was moved by John Farmer, M.E.I.C., seconded by Capt. H. W. B. Swabey, M.E.I.C., that the report of the Committee on Biographies, as published on page sixty-five of the February *Journal*, be adopted. Motion carried.

Canadian Engineering Standards Committee:—It was moved by Sir Alex. Bertram, M.E.I.C., seconded by Walter J. Francis, M.E.I.C., that the report of the Canadian Engineering Standards Committee, as published on page sixty-five of the February Journal, be adopted. Motion carried.

Canadian National Committee, International Electro-Technical Commission:—It was moved by A. B. Lambe, A.M.E.I.C., seconded by John Farmer, M.E.I.C., that the report of the Canadian National Committee of the International Electro-Technical Commission, as published on page sixty-seven of the February *Journal*, be adopted. Motion carried.

Uniform Boiler Specifications Committee:—It was moved by L. M. Arkley, M.E.I.C., seconded by J. A. Burnett, M.E.I.C., that the report of the Committee on Uniform Boiler Specifications, as published on page sixty-seven of the February *Journal*, be adopted. In view of the suggestion in the fourth paragraph of the report, it was resolved that the report be referred back to the committee with the request that reconsideration be given to the fourth paragraph thereof. Motion carried.

Ontario Provincial Division:—It was moved by Col. W. H. Magwood, M.E.I.C., seconded by R. L. Dobbin, M.E.I.C., that the report of the Ontario Provincial Division, as published on page sixty-seven of the February *Journal*, be adopted. Motion carried.

Committee on Policy:—It was moved by A. B. Lambe, A.M.E.I.C., seconded by Gen. C. H. Mitchell, M.E.I.C., that the report of the Committee on Policy as published in the June 1922, *Journal*, be adopted. Motion carried.

Classification and Remuneration Committee:—It was moved by Frederick B. Brown, M.E.I.C., seconded by J. H. Hunter, M.E.I.C., that the report of the Classification and Remuneration Committee, as published in the November 1922, *Journal*, be adopted, and referred to Council for final action. Motion carried.

The meeting adjourned until two thirty p.m.

Reports of Branches

Branch reports were presented as follows, and on motion by John Farmer, M.E.I.C., seconded by Frederick B. Brown, M.E.I.C., were adopted. Motion carried.

	February Journal page		February Journal page
Border Cities Branch	69	Ottawa Branch	78
Calgary Branch	70	Peterborough Branch	81
Cape Breton Branch	71	Quebec Branch	82
Edmonton Branch	71	Saskatchewan Branch	83
Halifax Branch	72	Sault Ste Marie Branch	84
Hamilton Branch	73	Lakehead Branch	84
Kingston Branch	73	St. John Branch	85
Lethbridge Branch	74	Toronto Branch	85
London Branch	75	Vancouver Branch	86
Montreal Branch	75	Victoria Branch	89
Moncton Branch	77	Winnipeg Branch	90

Niagara Peninsula Branch 77

It was moved by Walter J. Francis, M.E.I.C., seconded by Geo. R. MacLeod, M.E.I.C., that the four paragraphs, under British Columbia Technical Association, British Columbia Provincial Division, Joint Library Committee and Addressograph, shown in the Vancouver Branch report on page eighty-six of the February *Journal*, and also the first paragraph under Committee Activities, shown in the Winnipeg Branch report on page ninety of the February *Journal*, be referred to the Council for separate consideration. Motion carried.

Past-Presidents' Fund

A letter was read from immediate Past-President, J. M. R. Fairbairn, M.E.I.C., announcing the establishment for *The Institute* of a past-presidents' fund for the purpose of providing revenue to donate prizes for papers presented either at a branch or professional meeting. The announcement that the fund already established

amounted to two thousand, three hundred and fifty dollars was received with applause. It was suggested that the trustees of the fund be the three past-presidents. It was moved by Frederick B. Brown, M.E.I.C., seconded by Major J. A. Duchastel, M.E.I.C., that the question be referred to the Council for immediate action, and, that a hearty vote of thanks be tendered Phelps Johnson, M.E.I.C., for suggesting, and to him and the other past-presidents, for contributing towards the establishment of this fund. Motion carried unanimously with applause.

Installation of Newly-Elected President

An interesting ceremony was performed when President Sullivan requested Past-Presidents Colonel W. P. Anderson, M.E.I.C., and Geo. A. Mountain, M.E.I.C., to kindly escort the newly-elected president, Arthur St. Laurent, M.E.I.C., to the chair. Mr. St. Laurent, accepted the office with a brief address expressing his appreciation of the honour, and his desire to carry out the duties associated with the office to the best of his ability.

WALTER J. FRANCIS, M.E.I.C.,
Elected Vice-President of the Engineering Institute of Canada at the Annual General Meeting on January 23rd, 1923.

Presentation of Honorary Membership Badge

President St. Laurent then introduced a pleasing and unique feature to the meeting in the presentation of an honorary membership badge to C. E. W. Dodwell, Hon. M.E.I.C. Keen regret was expressed that owing to ill health, Mr. Dodwell was unable to be present. After speaking of Mr. Dodwell's splendid qualities the president called upon Past-President Geo. A. Mountain, M.E.I.C., to make the presentation. The badge was received by Major J. A. Duchastel, M.E.I.C., in Mr. Dodwell's absence. Mr. Mountain spoke in feeling terms of his long association with Mr. Dodwell from the time of the commencement of the Canadian Society of Civil Engineers, and his high regard and appreciation of his true worth and excellent qualities. Major Duchastel received the badge and expressed thanks on behalf of Mr. Dodwell, advising that he would forward the badge and convey the message to him.

Officers Elected

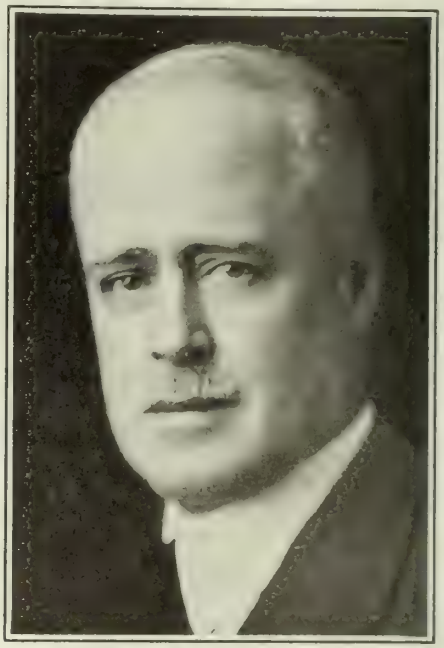
The report of the scrutineers as read by S. J. Fortin, M.E.I.C., giving the result of the ballot, showed that the following officers and members of Council had been elected:—

President.....Arthur St. Laurent, M.E.I.C.
Vice-Presidents.....Geo. A. Walkem, M.E.I.C.
Walter J. Francis, M.E.I.C.

Councillors:—District No. 1: Frederick B. Brown, M.E.I.C., Chas. M. McKergow, M.E.I.C. District No. 2, A. R. Decary, M.E.I.C. District No. 3: Geo. D. Macdougall, M.E.I.C. District No. 4: C. P. Edwards, A.M.E.I.C. District No. 5: Geo. T. Clark, A.M.E.I.C. District No. 6: Geo. F. Porter, M.E.I.C. District No. 7: E. P. Fetherstonhaugh, M.E.I.C. District No. 8: R. N. Blackburn, M.E.I.C. District No. 9: B. L. Thorne, M.E.I.C. District No. 10: Chas. Brakenbridge, M.E.I.C.

Vote of thanks to Retiring Officers

It was moved by C. H. Keefer, M.E.I.C., seconded by Percival St. George, M.E.I.C., that this meeting extend a hearty vote of thanks to the retiring officers of *The Institute*. Motion carried.



Major GEORGE A. WALKEM, M.E.I.C.,
Elected Vice-President of the Engineering Institute of Canada at the Annual General Meeting on January 23rd, 1923

Luncheon

During the noonday recess from the business session of the annual meeting a luncheon was held in the Salle Dore of the Mount Royal Hotel, and provided a most enjoyable relaxation from the arduous proceedings of the morning. The luncheon was attended by over one hundred and fifty members of *The Institute* and was presided over by President Sullivan, M.E.I.C., while at his right was President-elect Arthur St. Laurent, M.E.I.C. and on his left was immediate Past-President J. M. R. Fairbairn, M.E.I.C.

A special feature of the luncheon was the presentation by President Sullivan of his valedictory address, and the introduction by him of President-elect Arthur St. Laurent, M.E.I.C. The latter in his characteristically pleasing manner expressed his very sincere thanks for the honour bestowed upon him in electing him president of *The Institute* for the year nineteen hundred and twenty-three.

Throughout the luncheon the members joined in the singing of a number of engineering songs which, with the spirit of good fellowship, made the function most enjoyable to all in attendance.

Retiring President's Address

J. G. Sullivan, M.E.I.C.

Delivered on January 23rd, 1923 at The Mount Royal Hotel, Montreal, Que.

Ninety per cent of the success of a business is management. The president who picks the right man as manager will make a success. In our *Institute* from the very nature of conditions the president, who acts for only one year, is often from a remote part of our large country, can have but a very superficial supervision over the affairs of our society, and therefore I am not going to burden you with a lot of cribbed statistics and statements. All of this information is in the reports which are before you and I think you will bear me out in the statement that *The Institute* is most fortunate in having an efficient and capable general manager in the person of our genial secretary, Mr. Keith.

There is one matter that has caused me some concern for a number of years and that is: "How is the standard of the profession to be improved?" In the improvement of some social matters legislation seems to be a joke. It is a question if all modern nations have not too many laws on their statutes of the nature, "Thou shall not", I am reminded of an article appearing in one of the current magazines, explaining why the Chinese are generally honest as compared with the Japs and other more modern nations. The answer is given by a Jap philosopher, He puts it in these words, as near as I can recollect:— "Oh! the answer is very easy. China is a very old nation. They have outlived all laws; they have no laws or courts, as we know them, therefore there can be no contract or no way of enforcing a contract if you should make one, but the Chinese must do business and the only way he can do business is on trust. Therefore, as a natural result, in order to do business, the Chinaman must be trustworthy and he has become so, — that is the answer."

We are not in that fortunate position and must move with the crowd. Therefore, what we are doing in having legislation passed to regulate to a certain extent the practice of the profession, which will, to my mind, have a very beneficial effect in years to come, not so much as it effects the action of the individual, but as it regulates the actions and requirements of those who wish to enter the profession, and I believe that while this beneficial effect will come in time, we should not be discouraged by some of the difficulties we may experience. On account of having to get provincial legislation instead of Dominion, the consequence is that, our institution being national, it becomes necessary to organize provincial bodies which may become more or less rivals of our national institution. My own personal opinion is that this extra tax on us should be made as light as possible by having the provincial bodies perform only the bare duties required by law. If we try to make our provincial bodies rivals of the national society, then the expense will become so great that our *Institute* will be bound to be the loser, as there will be no choice as to which society the individual must drop, when he decides that he is going to cut down expenses. I am very glad to say that to date my fears in this matter have not been entirely justified.

There is another matter that concerns the entire world, in which I would like to see the engineers take a more active part. I refer to our economic problems. The world, to my mind, is passing through more strenuous times than those of 1914 to 1918. At that time there were patriotic motives and the spirit of self-preservation that held opposing forces and thought in check. This is a subject entirely too vast to be gone into in any detail at this time and I will only refer to one question, "Labour and Capital".

Capital

This is a question that every engineer should take seriously, for his work is the proper guidance of these forces in the development of our modern civilization with the ultimate aim of the uplifting and betterment of the human race.

Let us analize our subject. What is capital? It is stored labour. How is it created? By self sacrifice. What does it amount to? About six hundred dollars per head for the people on this earth to-day. A small portion is in the form of money, which if it was equally divided each of us would not have enough to pay our hotel bill at this tavern for a single day. What is its use? To make living more easy and increase the happiness and comforts of life. Who controls it? In some cases men who inherited the control from their parents. In other cases, men of great force of character who, by their ability and power, have acquired the individual control, but the vast majority of the world's capital is managed and directed by men who are either elected or chosen for the positions they hold on account of their ability to manage and control large affairs.

What are the faults and objections to capital? There can be no fault or objection found with capital, notwithstanding socialist and communist to the contrary. Those in control may abuse their trust, as history would indicate has been done in the past, and further on account of capital being capable of being loaned and therefore commanding a price for its use, most nations have found it necessary to pass laws restricting the right to entail the control of capital, for the obvious reason that it might be possible for a control to become so enormous that the entire world would be paying tribute to one man, or to one group of men.

Labour

Who are the labourers? Every person who either creates or assists in the distribution of the world's goods.

Among the men there are to-day probably not more than one out of a thousand who would not be properly classed a labourer. We will not discuss the ladies in this connection.

What are the objects of labour organizations? To better the conditions of the working man. Do they live up to this object? My answer is emphatically "no". By false teaching that all men are equal, by teaching that the organized labourer is producing from two to twenty times what he gets paid for, and by teaching that there is sufficient capital in the world for all to live in comfort and leisure, if it were equally divided, they have created a feeling of unrest, hatred and distrust in the minds of their members. By teaching and putting into practice the false doctrine that the less a man will do, the more jobs there will be for others, by restricting the kinds of work a man may do and by restricting the time he may work and the amount of work he may do in a given time, they have increased the cost of production to such a point that they themselves, as well as the rest of the world, are scarcely able to make both ends meet. All the people of the world are consumers and anything that increases the cost to the consumer is a detriment to the world.

The most objectionable feature of union rules is the one restricting the kinds of work a man may do. Let me give you one example. Imagine a poor section foreman being threatened with expulsion from his union and a fine of nine hundred and ninety-nine dollars and ninety-nine cents for daring to repair an air hose on a freight car at a cost of forty-five cents, when this car was located one hundred and fifty miles from a headquarters where the car repairs were located. This was out on a branch line with two trains per week. To send out a car repairer and pay demurrage, car rental, etc., was calculated to cost thirty-five dollars. Is it any wonder we have high freight rates?

You may ask what brings about such conditions. My personal opinion is that the professional labour leader is the guilty party. It is to his personal advantage that the members of his unions be kept poor, that they be kept as tenants rather than home owners, and that they be kept in trouble and strife. It is only under these conditions that the leaders can exploit the poor man. You can draw your own conclusions. Look up the records of the probation of John Mitchell's will. Ask your financial agents for the rating of Samuel Gompers. See the public press re the voting of two hundred and fifty thousand dollars to John L. Lewis, to be used without accounting during the recent coal strike. He can easily explain to his dupes why he should not show a receipt for the work similar to that done at Herrin.

I may be painting a black picture, but there is a silver lining. When you see working men parading with a large banner, showing a jackass standing on a railway track and a monster engine approaching at full speed, and the legend underneath "We will knock hell out of him", the loco is labelled "O.B.U.", the ass is labelled "International", further on you see another banner with very fat hog with both feet in the trough, this hog is labelled "International", and further on you see another banner with a red-headed be-whiskered Russian anarchist, labelled "O.B.U.", gentlemen, this does not represent the best interest of the working-man, neither does it represent the idea of one working-man of the other, it only represents one exploitor's idea of another exploitor, who both want the same job. This looks like disintegration and as soon as the majority of working men begin to realize that they are the abject slaves held in bondage by the exploitors, you may expect to see something doing. Socialism has much more to say for itself than the closed shop teaching of most unions. The closed shop denies the brotherhood of man; the outsider is a scab and if the unions had their way, such a one would be more effectively deprived of making a living than are the cripples of the Great War.

Well now, what are we going to do about it? Stop, and stop at once, toadying to labour unions and take your employees into your confidence. Gives them a say in the management of your business. I can best express my ideas by an example. I was at a large isolated industrial plant, over a year ago, employing about three thousand men. The plant was working and the town had the most cheerful appearance of any I had visited in a trip of over two thousand miles. When I asked the manager, whom I knew very well, how he was able to keep open, when practically all similar plants were closed down, he replied, "The men are working and we are producing twenty-five per cent cheaper than a year ago, and that without cutting wages". When I asked him how he was able to get men to work, he replied that they had a committee of twenty-one men entirely elected by the men in the different branches of the works, and that these men sat around the table with the officers every week or so, and that they knew as well as the officers everything connected with both the financial and working of the plant, and that when any dispute arose it was referred to this committee, and that the management had not been turned down in over two years. When I asked how the unions permitted such an arrangement, he replied that they had no unions, they had a strike and would not open up until three hundred "reds" were run out of town, and the men organized and elected their own representatives. The company does not object to a union man, but they will not have any dealings with union representatives. The result is that practically all the men have quit their respective unions.

Italy is showing us the way. They are five years ahead of us in this matter, in the statement of a very prominent engineer, who has recently returned from there. A year ago last March, at the invitation of the then Minister of Labour, there was a meeting in Ottawa of interest employing one hundred and forty-five thousand men, who were all working under the Industrial Council plan. This is a good beginning for Canada, and if you engineers will give this matter the study that your personal interest in the subject deserves, I have hopes of living to see the time when co-operation will take the place of hatred, distrust and discontent. Be fair and honest with your employees and you will command their respect, and once you get that you may hope to get co-operation.

PERSONALS

J. MacD. Gilchrist, A.M.E.I.C., is stationed at Iroquois Falls, Ontario, with the forestry department of the Abitibi Power and Paper Company.

J. M. Cuddy, S.E.I.C., of Montreal, has accepted a position with the Dryden Paper Company, Limited, at Dryden, Ontario.

F. S. Kuhns, A.M.E.I.C., has been appointed sales manager of the Bishopric Manufacturing Company, Limited, with headquarters in the Birks Building, Ottawa.

Arthur Donaldson, S.E.I.C., of Edmonton, Alta., who received his degree of B.Sc., from the University of Alberta, is on the staff of the Carter Hall Aldinger Company, at Ponoka, Alta.

E. L. M. Burns, Jr.E.I.C., has been transferred from Halifax, N.S., to Ottawa, on the branch of the assistant director of military surveys, Department of National Defence at Ottawa.

W. D. Proctor, Jr.E.I.C., has resigned from the staff of James, Proctor and Redfern Limited, consulting engineers, Toronto, and has been appointed to the staff of McGregor and McIntyre, Limited, of the same city.

J. P. Chapleau, Jr.E.I.C., is now located with the Quebec Development Company, Limited, at St. John d'Alma, Lake St. John, Quebec. Mr. Chapleau is a graduate of Ecole Polytechnique of Montreal.

Chas. A. Fox, A.M.E.I.C., of Montreal, is situated at Larder Lake, Ont., with the Crown Reserve Mining Company, Limited. Mr. Fox graduated in mining from McGill University in 1911.

C. D. Norton, A.M.E.I.C., who, for the past years, has been on the engineering staff of the Canadian Pacific Railway, at residence 3, Kipawa, has resigned to accept a position with J. S. Metcalf Company, Montreal.

Thomas S. Scott, M.E.I.C., who last year was appointed city engineer for the city of Niagara Falls, Ontario, has this year been appointed city manager, Niagara Falls having adopted a city manager system for the first time.

L. H. DeLa Franier, S.E.I.C., has recently left for Rancaqua, Chile, South America, to accept a position with the Braden Copper Company. Since 1920, Mr. De La Franier has been working in South America and Africa and only returned to Canada in October last.

J. M. Conroy, Jr.E.I.C., who graduated from McGill University in 1918 with the degree of B.Sc., and who until recently has been with the Department of Naval Service at Ottawa, is now with the Marconi Wireless Company of Canada, at Montreal.

V. Denis, A.M.E.I.C., is now located at the Montreal office of the Public Works Department. Mr. Denis has been connected with the department for a number of years in various capacities, and comes from the Ottawa office.

H. B. Muckleston, M.E.I.C., for a number of years chief engineer of the Lethbridge Northern Irrigation District, has been appointed manager, which is a tribute to Mr. Muckleston's executive capacity as well as to his engineering ability.

W. E. Hobbs, A.M.E.I.C., D.L.S., has been appointed deputy provincial secretary of the provincial government of Manitoba. Mr. Hobbs who has been director of town planning for the province will continue to function in that capacity.

E. R. Woodward, Jr.E.I.C., of Montreal, is now on the chemical staff of the Tide Water Oil Company of Boyonne, N.J. Mr. Woodward graduated from McGill University in 1922, with the degree of B.Sc., in chemical engineering, following which he went to New York City with Ledoux and Company, metallurgical analysts.

John H. Curzon, A.M.E.I.C., has resigned from the staff in engineering drawing at the University of Toronto, and has accepted a position as designing engineer with the sewer section, department of works of the city of Toronto. Mr. Curzon graduated from the above university in 1911, having received his degree of B.A.Sc.

S. Eastman Root, S.E.I.C., has been appointed to the position of field engineer and assistant to the construction engineer with the St. Lawrence Paper Mills, Limited, at Three Rivers, Quebec. Mr. Root was on the engineering staff of the Thompson Starrett Company, on the construction of the paper company's new mill at Three Rivers.

R. J. McClelland, A.M.E.I.C., of Kingston, received the congratulations of those present at the opening of the new rink of the curling club at Kingston, on January 11th, on account of the satisfactory work he did as engineer and contractor for the building, which was completed in a manner that was appreciated by the members of the club.

A. B. McEwen, A.M.E.I.C., is superintendent for William I. Bishop, Limited, consulting engineers, Montreal, on the construction of a dam and power house for Price Brothers and Company, Limited, on the Chicoutimi river. Before accepting his present position he was with the Canadian Explosives Limited, and prior to that he was principal assistant to R. S. and W. S. Lea, of Montreal.

Donald Ross-Ross, A.M.E.I.C., graduate of the class of 1917 in mechanical engineering, at McGill University, has been appointed assistant master mechanic to the Canadian Rubber Factories, Canadian Consolidated Rubber Co. Ltd., Montreal. Mr. Ross-Ross was previously with the planning department of the general rubber goods factory with the same company.

James McAdam, A.M.E.I.C., is combining business with pleasure in a winter vacation to the Old Country, as he intends associating himself with the Board of Transportation for Great Britain on reconstruction of county highways. Mr. McAdam has had considerable experience with road work in Toronto, being connected with the road section, works department, of that city for about nine years, and has had charge of the highway department of the firm of Frank Barber and Associates, Limited, Toronto, for several years.

Wm. H. Eassie, A.M.E.I.C., is engineer of roads and bridges, with the public works and sea defence department at Georgetown, Demerara, British Guiana. Mr. Eassie is a native of London, England, and received his primary and technical education in the Old Country. He has spent a number of years in British Guiana on engineering work prior to 1917, at which time, due to ill health, he came north to British Columbia where he was

engaged in general engineering work until returning to British Guiana recently.

Commander C. P. Edwards, O.B.E., A.M.E.I.C., returned from England on December 23rd, 1922, where he represented Canada at the Imperial Conference on the Imperial chain of wireless telegraph stations. While coming up the Bay of Fundy on their return trip, Commander and Mrs. Edwards were given a hearty welcome on their safe return to Canada by wireless telephone by F. P. Vaughan, M.E.I.C., of the Vaughan Electric Co., Ltd., from his radio phone station, Nine B.I., which is located in Mr. Vaughan's laboratory in St. John, N.B.

Carl P. Richards, A.M.E.I.C., was assistant resident bridge engineer on the construction of the Oregon City—West Linn bridge which was formally opened in December last. This bridge completes the major link in the Pacific highway from Canada to Mexico, and has been described in detail in the Engineering News-Record and the Engineering World on account of its unique design. Mr. Richards was for a number of years on bridge construction in Saskatchewan prior to taking up work in the United States.

David B. McLay, M.E.I.C., has left Singapore, Straits Settlements, and has given a temporary address of "Rose Lea", Uddingston, Lanarkshire, Scotland. Mr. McLay received his degree of B.Sc., from Glasgow University in 1910, and the following year came to Canada and joined the city engineer's staff at Toronto, later being appointed resident engineer for the McAlpine Robertson Construction Company, Limited, on tunnel construction work at Illecillewaet, B.C. For four years until 1914, Mr. McLay was with the city engineer's department of Vancouver, B.C., following which he returned to Scotland, and in 1916, enlisted with the Royal Engineers on active service in India, and Mesopotamia, during which time he was appointed to Acting Captain, R.E.

Gordon L. Shanks, A.M.E.I.C., has left Rockwood Municipality, Manitoba, for Wood River, Illinois, where he was appointed, early in December, chief draughtsman in charge of the design of a large oil refinery extension programme for the Royal Dutch Steel Oil Company. Mr. Shanks graduated from the University of Manitoba in 1912, and subsequently was employed with the Foundation Company as engineer and office assistant to the western branch in Vancouver, B.C., and later as office manager and civil engineer on the straightening of the North Transcona Elevator, with headquarters at Winnipeg. From April 1915 until receiving his recent appointment, he was municipal engineer for Rockwood Municipality, at Stonewall, Man.

Ira P. MacNab, M.E.I.C., superintendent of the tramway department of the Nova Scotia Tramway and Power Company, Limited, has accepted an executive position with the Riverside Iron Works, Calgary. Mr. MacNab has been connected with the tramway company for seven years, and previous to that, following his graduation from the Nova Scotia Technical College, was with the Truro Foundry and Machinery Company. Mr. MacNab, at the time of leaving Halifax, was vice-president of the branch, in connection with which he has taken an active part since its organization. He has also been on the council of the Association of Professional Engineers of Nova Scotia since the passing of the act, and has, at all times, taken a keen, constructive interest in the welfare of the profession. Before leaving Halifax he received many marks of the esteem in which he is held, both by his fellow engineers and those with whom he came in contact both in business and socially.

S. B. Clement, M.E.I.C., chief engineer of the Temiskaming and Northern Ontario Railway, and J. G. G. Kerry, M.E.I.C., consulting engineer of the same railway, have prepared a report on the electrification of this road, which has been under consideration for some time. The report recommends electrification as a self-sustaining investment of capital funds. The report contains further recommendations regarding the securing of the necessity power in connection with the project.

S. F. Ricketts, A.M.E.I.C., of Winnipeg, Man., is vice-president and sales manager of the Western Elevator and Motor Company, Limited, having been a director of the company since its inception four years ago. Mr. Ricketts was born at Cheswick, London, England, in 1883, and received his early education in the Old Country. Before coming to Canada he was in charge of the Central Power Station at Cheswick, London W., for the London United Electric Tramways, Limited, from 1900 to 1903, following which he spent the next seven years in China; first as resident engineer for the China Light and Power Company Limited, and later as executive manager for the same company. Since coming to Canada Mr. Ricketts has been general superintendent for the North Arm Steamship Company, Vancouver, and in 1912 he was in charge of construction of the new power plant for the city of Moose Jaw, Sask. In 1916, he was appointed to the staff of the Canadian General Electric Company's, first on the staff responsible for this company's sub-contracts on electrical work for the Transcontinental Railway, and the following year as sales engineer at Toronto and later as apparatus sales engineer and assistant manager of the company's district office in Toronto.

Industrial Activity Indicated by Re-opening Engineering Plant

D. E. Grant, M.E.I.C., has completed arrangements whereby the Longueuil plant of Armstrong, Whitworth of Canada, Limited, will be opened up at once for the manufacture of pulp and paper machinery and general engineering work, the Longueuil works being turned over to a new Canadian company, Charles Walmsley Company (Canada) Limited. The parent company, Charles Walmsley Company, Limited, has supplied a considerable amount of machinery to Canada, including news print machines of Price Brothers at Kenogami, and the news print machinery at Iroquois Falls of the Abitibi Power and Paper Company.

The policy of the new company will be to carry out the whole of Charles Walmsley's Canadian business and to acquire the necessary rights to manufacture other specialities so as to form a complete line of equipment for pulp and paper mills and hydro-electric installations. Agreements on these lines have been already concluded with Sir W. G. Armstrong Whitworth and Company,

Limited, whereby the new company acquires rights for the manufacture of water turbines, Pelton wheels, hydraulic pumps, lock gates, and sluice valves, etc., etc. It has also obtained the rights to manufacture the specialities of the Watford Engineering Works, Limited, which include their well known "Tremor" strainer. Similar arrangements have been completed with Gwynnes Limited, of Hammersmith, London, covering their universally known "Invincible" centrifugal pumping machinery.

The Canadian Board is not yet completed but it will be a very strong one. Sir William Price is president, and other directors are: — F. H. Anson, vice-president of the Abitibi Power and Paper Company; the Hon. G. G. Foster, and H. B. Walker. The management of the new company will be entirely under the control of the Canadian Board of Directors, who will, when they consider it advantageous to do so, obtain assistance from the parent companies in technical, operating and administrative matters.

Appointed Deputy Commissioner of Public Works and Mines, Nova Scotia

THOMAS J. BROWN, M.E.I.C.

Thomas J. Brown, M.E.I.C., of North Sydney, has recently been appointed deputy commissioner of Public Works and Mines for Nova Scotia, and will enter upon his new duties on the first of February. Mr. Brown is a native of Cape Breton, and has had very extensive experience in the mining industry in Nova Scotia, having been connected, in an official capacity, with The Nova Scotia Steel and Coal Company, Ltd., The Dominion Coal Company, Ltd., The Inverness Coal and Railway Company, Ltd., and other companies. For the past two or three years Mr. Brown has been practising as a consulting mining engineer, at North Sydney. He is a member of the Nova Scotia Society of Professional Engineers, and of the Cape Breton Branch of *The Engineering Institute of Canada.*

New Chairman of Ottawa Branch

Oswald Sterling Finnie, M.E.I.C., the new chairman of the Ottawa Branch, is an old Ottawa boy. He was born in Arnprior, but came to Ottawa at an early age with his parents, Mr. D. M. Finnie, late general manager of the Bank of Ottawa, and Mrs. Finnie. He was educated at the public schools in Ottawa and graduated from McGill University in 1897, with the degree of Bachelor of Science. He entered the service of the Dominion Government in 1898, going into the Yukon in that year as mining recorder with the late Mr. William Ogilvie, who had just been appointed governor of the Territory. He returned to Ottawa in 1910, having been appointed inspecting engineer of mines for the Department of the Interior.

He was admitted to *The Engineering Institute*, then the Canadian Society of Civil Engineers, as an Associate Member in 1912, and was made a Member of *The Institute* in September, 1921. He was appointed director of the North West Territories Branch, Department of the Interior, in December, 1920, with headquarters at Ottawa.

O. S. FINNIE, M.E.I.C.

This branch was later enlarged to administer Yukon affairs at Ottawa and is now known as the North West Territories and Yukon Branch. He was commissioned a Dominion Land Surveyor in March, 1915. He also became a member of the North West Territories Council in June, 1921. He is a member of the Rideau Club.

James H. Barber, M.E.I.C., Honoured by C.P.R. Officials at Toronto

James H. Barber, M.E.I.C., for many years on the engineering staff of the Canadian Pacific Railway, has recently retired from active service with the company, and to mark the occasion, and as an expression of esteem,

a number of officials of the company gathered at the office of General Superintendent Grout, and presented Mr. Barber with an engrossed address suitably framed, a well filled purse of gold, and a handsome case of pipes, as well as a beautiful bouquet of roses for Mrs. Barber.

During Mr. Barber's long service he has been especially identified with the construction of the Credit Valley Railway, the Ontario and Quebec Railway, the Guelph Junction Railway, (all now forming part of the C.P.R.), the Richelieu River bridge, double tracking St. Lawrence River bridge, Sortin yard, double tracking Montreal to Farnham, bridge reconstruction Dominion Atlantic Railway, double tracking Lachine Canal swing bridge, and grade separation work at North Toronto, and during the last three years has been division engineer of Toronto terminals.

In addition to Mr. Grout the following officials of the company were noticed at the function: — H. J. Humphrey, assistant general superintendent; Col. Blair Ripley, district engineer; Angus MacMurchy, K.C., company's solicitor at Toronto; Robert Scott, superintendent Toronto terminals; R. McKillop, superintendent Bruce division; F. Ronaldson, district master mechanic; A. P. Walker, assistant district engineer; L. S. Rudder, division engineer, Trenton division; V. A. G. Dey, division engineer, Bruce division; Walter Code, roadmaster Toronto terminals; J. Hawkins, B. & B. master, Toronto terminals; Harry Ross, B. & B. master, Bruce division; and many others of his numerous long-time friends.

Mr. Barber was one of the original members of the Canadian Society of Civil Engineers, founded in 1887, now *The Engineering Institute of Canada*, and his first work in the city of Toronto was as engineer in charge of laying the track from the Don river five miles down the Kingston road for the Toronto Gravel Road and Concrete Company. This line now forms a portion of the trackage of the Toronto Transportation Commission.

Manitoba's New Big Hydro-Electric Development now in Operation

The first unit of the Manitoba Power Company's 168,000-h.p. development at Great Falls on the Winnipeg river was started on December 28th, and has since been operated on commercial load in parallel with the existing plants of the Winnipeg Electric Railway Company.

The plant was officially started by Sir James Aikins, Lieutenant-Governor of the Province of Manitoba, in the presence of the directors and officials of the company and a party of Winnipeg business men.

The remarkable progress of construction of this plant can best be gauged by the fact, that a year ago the site of the plant was in its primeval state. To-day there has been constructed a plant representing an investment of nearly $7,000,000. in dams, power house and transmission lines. The work of installing the machinery did not start until October, when the first shipments of turbine parts were received. By the end of November the stator for unit No. 1 was the only portion of the electrical equipment on the work, this having been centred but not grouted in. The turbine runner and shaft was still in the factory, and all the remaining portions of the generator were still in transit or in the shop. By December 22nd the turbine had been erected complete and all connections to the governor had been made. Connection was made between the generator and turbine on December 27th, and on December 28th, unit No. 1 together with all the necessary auxiliary equipment, was placed in operation under partial head.

The plant is an all-Canadian product, and the power company have in every possible instance, procured all materials, equipment and labour in Canada. By the time the plant is completed more than $5,000,000. will have been spent in wages to Canadian workmen for the construction of the plant and the manufacture and installation of the materials.

The design of this plant provides for the installation of six 28,000-h.p. units, giving a total capacity of 168,000 h.p. The present construction includes all of the permanent works and substructure for the complete plant, and one-half of the power-house superstructure to accommodate three units, two of which are now being installed, and it was announced at the official opening of the plant that plans are in preparation for the installation of the third unit.

Publications received during the month

General Publications

Presented by Chapman and Hall, Limited.

Reinforced Concrete, by R. J. Harrington Hudson.
Boiler Plant Testing, by David Brownlie.
Mechanical Testing, Volume 1, by R. G. Batson and J. H. Hyde.
Mechanical Testing, Volume 2, by R. G. Batson and J. H. Hyde.

Presented by Phelps Johnson, M.E.I.C.

Fourteenth National Conference on City Planning, Springfield, Mass., June 1922, proceedings.

Presented by A. C. Selig, M.E.IC.

Plans of Two Schemes for Bridges over the St. Lawrence River, near Quebec (dated 1851 and 1884).

Transactions, Proceedings, etc.

Presented by the societies.

American Society for Testing Materials, Philadelphia, Pa.,
Twenty-fifth Annual Meeting, Atlantic City, N.J. June 27-30, 1922 proceedings, volume 22, part 1, committee report, new and revised tentative standards.
Twenty-fifth Annual Meeting, Atlantic City, N.J. June 27-30, 1922 proceedings, volume 22, part 2, technical papers.
Canadian Engineering Standards Association:
Standard Specification for Steel Highway Bridges, number 6-1922.
Standard Specification for Flexible Steel Wire Rope and Flexible Strand for Aircraft Purposes, number 7-1922.
The New Zealand Society of Civil Engineers, proceedings, 1921-1922 volume 8.

Reports

Presented by Bureau of Standards, Washington, D.C.

Scientific Papers:—
Theory, Construction, and Use of the Photometric Integrating Sphere, number 447.
An Electron Tube Amplifier using 60-cycle Alternating Current to supply Power for the Filaments and Plates, number 450.
Spectrophoto Electrical Sensitivity of Bournonite and Pyrargyrite, number 451.
Structure of Martensitic Carbon Steels and changes in Microstructure which occur upon Tempering, number 452.
Preparation and Properties of Pure Iron Alloys, number 453.
Action of Charred Paper on the Photographic Plate and a Method of Deciphering Charred Records, number 454.
Gases in Metals, number 457.
Table of contents and index to volume 15, 1919-1920.
Technology Papers:—
Effect of Temperature, Deformation and Rate of Loading on the Tensile Properties of Low-Carbon Steel below the Thermal Critical Range, number 219.
Magnetic Susceptibility and Iron Content of Cast Red Brass, number 221.
Reclamation of used Petroleum Lubricating Oils, number 223.
Weights and Measures, Fifteenth Annual Conference; miscellaneous publication, number 51.
Bureau of Standards, annual report, year ending June 30th, 1922.

BRANCH NEWS

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

On December 14th, 1922, the Hamilton Branch had a very interesting address from Frederick A. Gaby, M.E.I.C., chief engineer of the Hydro-Electric Power Commission on hydro radials. Mr. Gaby came armed with volumes of statistics and reports and prepared to handle the subject without gloves. It had been intimated to him that some pointed questions would be asked.

Mr. Gaby reviewed the history of hydro power from its inception in 1903 by twelve municipalities and the building of a transmission system at a cost of three millions, leading up to the question of local transportation in 1912, which resulted in legislation in 1913 and 1914, placing the engineers of the commission at the service of those municipalities desiring radial railways. Reports were immediately asked for by six hundred municipalities covering 3,500 miles of railway. After thorough investigation by the commission's engineers, whose reports included 4,000 feet of plans and profiles; 325 miles of railway were recommended, extending from Bowmanville to Niagara Falls, Toronto to Guelph, Hamilton to Guelph, London and Port Stanley, and Sandwich, Windsor and Amherstburg. Of these 325 miles of railway, 125 miles are constructed and in operation and 200 miles partly in operation. The Hamilton radial line can be incorporated into the system.

As the commission has to construct, operate, administer and finance the railways, great care was taken to be sure they would get the results indicated in the reports. To get at probable revenues the territories were canvassed as to riding habits, industrial activities and terminals. Bion J. Arnold and Company, engineers of Chicago, spent eight months studying the conditions and reporting on equipment and probable cost of operation. The commission has thus collected more data on electric railways than any organization on the continent, based on data not only in Canada but in the United States and Europe.

On checking the reliability of this data with actual roads, it is claimed to be on the conservative side. Take the Rapid Railway of Detroit, the estimates would indicate a revenue of $771,000., as against an actual revenue of $900,000., and an estimated passenger traffic of 3,186,000, as against 3,593,000, actually carried. The Metropolitan line gives an estimated revenue of $259,700., as against an actual revenue in 1920 of $320,400. The Detroit, Jacksonville and Chicago road gives an estimated revenue of $1,036,000., as against $1,081,359., actual. Taking the revenue per capita, the Cleveland and Detroit road of 593.4 miles and population of 2,000 per mile, the revenue is $16,450. per mile, or $8.20 per capita. The commission estimated $7.70 per capita.

The proposed roadbed would be of the same class as high grade steam roads. The freight revenue would be small, covering local freight only. The London and Port Stanley road is taken as a model of the construction and equipment to be used. This was constructed in 1914-15. Latice steel poles are used and catenary construction of trolley line.

In 1916 the Port Credit to St. Catharines road was approved by vote of fifteen municipalities and validated by parliament in 1918. Bonds to the extent of $11,360,360., were guaranteed by the municipalities. In 1919 a new government came into power and insisted on an investigation which was carried out by the Sutherland commission. They recommended connecting up existing roads. This, however, would destroy the estimates of the commission, whose road was to run on its own private right of way at high speeds, which would be impossible on less high class roads operating on public highways over heavy grades and on city streets.

High class construction and equipment is essential to high class service. Failure of electric railways in the past has been due largely to lack of thorough investigation of conditions and requirements, and proper construction to meet them. When properly located electric railways are successful. The new agreements simply re-affirm what had already been approved.

As to existing steam roads, the electric roads would take the short hauls or act as feeders, co-operating with the National lines. Mr. Fiske of the G.T.R., was quoted as stating that commuter service was not their business. It interferes with the long haul service. The case is similar to that of the 110,000-volt transmission line with its feeders at lower voltage for local points.

Auto buses and trucks cannot compete with fast electric service. The commission would give a one-hour service to Toronto as against two to three hours by bus. The cost of handling freight on electric cars is one fifth that of trucks. An electric car can handle twenty to forty tons as against five tons on a truck. The commission proposed to grade their service to suit local conditions, from "trolley bus" service on the streets of suburban areas to the "one-man car" for denser areas, and the usual two-man car for congested areas. A number of interesting slides were shown illustrating the type of equipment to be used, and the stiff construction proposed for the all steel passenger cars to make them capable of resisting shock in case of accident.

At the conclusion of Mr. Gaby's address he offered to answer any questions upon the subject under discussion. F. W. Paulin, M.E.I.C., rose and addressed a number of queries to the speaker. Mr. Paulin declared that if the St. Catharines and Niagara Falls railway were not approved by the municipalities involved, as far as Hamilton was concerned, the line would end at St. Catharines. Similarly, if Toronto turned down the entrance project, the end of the line would be Port Credit, and that in any case Hamilton would derive no benefit on the earnings except on the line between these two points. He also pointed out that the fixed charges on the road would be $17,000, per mile as compared with $2,700 on the T.H. & B., and doubted the possibility of competing with such a heavy handicap. Percy Ford Smith asked if it were the intention to bring the line through Harvey and Dundurn Parks, as stated in the agreement and Mr. Gaby said it would be arranged, he thought, to bring the line in on the north side of the Grand Trunk Railway.

The chair was occupied by J. W. Tyrrell, M.E.I.C., and the meeting was closed by a hearty vote of thanks to Mr. Gaby for the time and trouble he had taken in coming here to address us. Mr. Gaby stated that he was glad to answer any questions. The interest in the meeting was shown by the large attendance, about 150 engineers and their friends being present.

The secretary requested the members to support the election of Geo. F. Porter, M.E.I.C., of Windsor, as councillor for district No. 6, as requested by the Border Cities Branch.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
Floyd K. Beach, A.M.E.I.C., Branch News Editor.

Inspection of Institute of Technology

In describing the aims of the new Provincial Institute of Technology and Art, J. H. Ross, A.M.E.I.C., the acting principal, defined *education* as everything one learns throughout life, and *technical education* as a special branch to enable each individual to earn his living. It is the oldest form of education and was specially featured by the medieval guilds, which obtained legislation in the 14th century to compel a seven years apprenticeship. This English law was repealed in 1842 and the present aim is to enable students, (1) to do more work in a given time, (2) to do better work in the same time, and (3) to obtain the same results with less material. The Institute was started in 1916 with five day-students and is now instructing over seven hundred, including the correspondence courses. English and arithmetic are the only entrance tests and the studies are all applied to special branches of practical work such as motor mechanics, and other industrial occupations. The electrical course is the most popular at the present time and the correspondence subjects include mining and steam engineering.

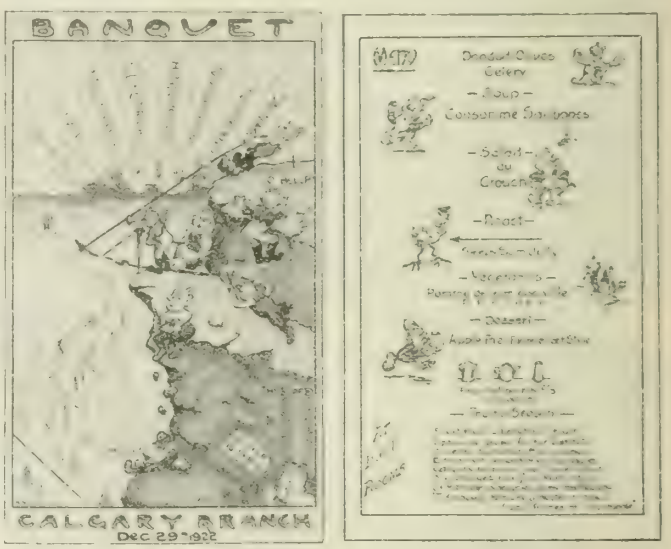
These facts were briefly outlined by Mr. Ross in introducing the work of the new institute to his fellow-members of *The Engineering Institute* on December 1, when about fifty engineers and their friends inspected the laboratories and workshops on Crescent Heights. Although the equipment is not yet quite complete the visitors were very much impressed by the excellent work being done for education of artisans and others who wish to become more efficient in their chosen occupations.

On the motion of P. Turner Bone, M.E.I.C., seconded by F. K. Beach, A.M.E.I.C., a hearty vote of thanks was accorded to Mr. Ross and his staff for the facilities afforded in connection with the inspection of the building and appliances.

Annual Banquet

The annual banquet held at the Board of Trade on December 29th was quite the best in the history of the branch. Some seventy members and guests assembled and after a dinner that warmed everyone's spirits to a sense of sociability and good feeling, the chairman, P. J. Jennings, M.E.I.C., proposed the toast to the King, and there followed a toast list that combined evidences of careful preparation by the various speakers with the spontaneity born of the stimulation induced by the presence of many keen brains and sympathetic personalities. A musical program was interspersed under direction of A. S. Chapman, A.M.E.I.C., who presided at the piano, while songs were rendered by M. H. Marshall, M.E.I.C., W. J. Gale, A.M.E.I.C., and G. H. Patrick, A.M.E.I.C., and W. G. Guthrie. Gilbert Patrick is recognized as the outstanding humorist of the branch and his rendering of six limericks set to music was the best he has yet done, and Mr. Guthrie in Scotch costume and dialect songs took the gathering by storm.

The toast list was opened by W. J. Dick, M.E.I.C., who proposed *The Institute.* He reminded us of the emblems of three business mens clubs; Kiwanis with the emblem *K* representing the K girders of the Quebec bridge, Rotary with its gear wheel, and Gyro with its gyroscope, all three have taken emblems that come from the engineer. *The Institute* should not be content to lend such bodies their emblems, but should be the confidential advisers of Boards of Trade and other business men's clubs on all matters coming in any way under an



engineering head. This is a power age, an age of engineering and we must step forward and take our place in all public spirited matters. During the expansion of a decade ago many towns spent far more on improvements than time has shown they were warranted in spending. The engineer directed the spending under orders from the people, and there is an inclination now to blame the engineer for the financial tangles resulting regardless of the fact that his work was done only under orders. For this reason it devolves on the engineer to make a study of civic problems in order that he may be an adviser as well as a builder.

G. W. Craig, M.E.I.C., responded to the toast, and as a retiring councillor he summed up the progress of the past year. After reviewing the stimulus to the branch resulting from the visits of General Mitchell, M.E.I.C., J. B. Challies, M.E.I.C., and Fraser S. Keith, M.E.I.C., he reviewed the work of some of the more important committees. The work of the Policy Committee was placed first as being the result of much careful work and thought,

and as having the greatest influence on the affairs of *The Institute*. J. B. Challies, M.E.I.C., as the head of this committee deserves great credit, and our own F. H. Peters, M.E.I.C., is a member. The principal features of the report of the Policy Committee were repeated. *The Institute* is the only organization of engineers in Canada having a national outlook and it behooves us to uphold its standards. It is becoming an influence in shaping the policies of engineering education. We find as a result of its efforts that various seats of learning are broadening their curricula to include public speaking, the study of business and industrial problems. *The Institute* also sponsored the various provincial acts for the recognition by law of the engineer. Mr. Peters may be looked on as the father of the movement that resulted in the passage of acts in most of the provinces of the Dominion.

In touching on the report of the Committee on Remuneration, Mr. Craig felt that while we cannot look on *The Institute* as a trade union, we are still quite within our rights in outlining our views as to proper scales of remuneration.

The Institute has a code of ethics. The present one may need revision but it still is good so far as it goes. Each member should commit it to heart and it should be a standard of guidance in his relations with those he meets in the practice of his profession. This little poem by Colonel Robert Isham Randolph, a parody on Kipling's "If" sums up our ethics.

If you can climb a stool and not feel lowly,
Nor have your head turned by a swivel chair;
If you can reach your judgment slowly,
And make your rulings always just and fair;
If you can give yourself and all that's in you,
And make the others give their own best too;
If you can handle men of brawn and sinew,
And like the men and make them like you too.

If you can't boast a college education,
Or, if you've got a sheepskin, can forget;
If you get a little wage for compensation,
And give a little more than what you get;
If you meet with triumph or disaster,
And treat them without favour, nor with fear,
You'll be a man and your own master:
But what is more, you'll be an **Engineer**.

After Mr. Craig's talk, the chairman called on new members of the branch and members who have been advanced in grade during the year to rise to their names and respond briefly, after which B. Russell, A.M.E.I.C., rose to toast the "Association of Professional Engineers of Alberta". After a short and pithy talk he coupled with his toast the names of F. H. Peters, M.E.I.C., William Pearce, M.E.I.C., G. W. Craig, M.E.I.C., and A. S. Dawson, M.E.I.C. Mr. Russell's toast was responded to by W. B. Trotter, A.M.E.I.C., vice-president of the association, who briefly pointed out that the two organizations cannot be looked on as conflicting or competitive. Each has a function in the community. As a provincial organization there are local problems that require consideration, among the foremost of which is the proper development and exploitation of Alberta coal. This problem has been taken under the wing of the Board of Trade and it is even more of interest to the association. The forthcoming meeting at Lethbridge should be an occasion for the furthering of the strength of the association.

A breathing spell was filled by a "stunt" arranged by Frank Emery, A.M.E.I.C., which afforded great amusement and introduced some of the visitors, after which J. H. Ross, A.M.E.I.C., proposed a toast to "The University", outlining its phenomenal growth from its opening in September 1908 when forty-five students were enrolled, to its present enrollment of over twelve hundred. The toast was responded to by R. S. L. Wilson, A.M.E.I.C., professor of civil engineering. He outlined the change made in the curriculum three years ago when he took office, pointing out that subsequent consultation with leading educators in other parts of Canada has shown that the decisions were sound and in keeping with the best practice of the present day. Some time ago as a result of a move by the American Association of Civil Engineers, C. W. Mann circularized some 30,000 engineers to get their views on the things most to be desired in engineering education. The consensus of opinion placed character first, while technique came sixth. Judgement, understanding of men, and knowledge were among the intermediates.

Alberta is singularly favoured among the provinces in the functions of the senate of the university. None of the professions can be accused of being close corporations, since it is the senate, and not the other members of each profession who pass on the credentials of those desiring permission to practise.

In closing, Prof. Wilson pointed out that in Germany the professional man who does not carry out some form of original research is the exception. We should encourage more of the same thing among our profession.

The closing toast of the evening to "Our Guests" was very ably proposed by A. S. Dawson, M.E.I.C., who in his happy way illustrated his points by amusing stories. After illustrating that the real engineer must be one with more than mere technique of a few branches of the profession at his finger ends, even as a doctor is more than a hospital orderly, Mr. Dawson complimented the members of other professions present and gave words of encouragement to the students of the university present. A. G. Graves, commissioner-elect of the city and Arthur McGuire, local representative of the Canada Cement Company, replied briefly and most fittingly.

It was the feeling of the gathering that in the short space of three hours a near approach to an engineering convention had been achieved, and in closing, the chairman make acknowledgements to the members who had done most to make the affair a success: A. S. Chapman, A.M.E.I.C., for the musical arrangements, and W. St. J. Miller, A.M.E.I.C., for the programmes.

Visit of Sir Henry Thornton

Sir Henry Thornton visited Calgary on January 15th. He was unable to accept the invitation of the Calgary Branch to address them, having accepted the invitation of the Calgary Board of Trade, but through the courtesy of that body, the engineers were able to attend the luncheon, and about seventy members of *The Institute* were present.

A most enthusiastic and representative gathering assembled in the dining room of the Palliser hotel. Mayor Webster pointed out some of the local problems in connection with the Canadian National Railways, and expressed confidence that so far as national problems are concerned they are in very able hands.

Sir Henry won the entire confidence of those assembled by the broad minded outlook he showed in viewing our greatest national problem. He emphasized, however, the truth that no matter how efficient the Canadian National Railways may become they will still fail unless our population can be materially increased, with resulting increase of business.

R. B. Bennett, K.C., in moving a vote of thanks sounded the note of congratulation to Canada in having secured such an able man to lead our Government railways out of the difficulties into which they have come, and his tribute to Sir Henry as having greater responsibilities and greater power than any cabinet minister of the prime minister himself, can be taken as a public expression of appreciation of the engineering profession, of which Sir Henry is a member.

London Branch

F. J. Bridges, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmstead, A.M.E.I.C., Branch News Editor.

Geo. F. Porter, I.L.D., M.E.I.C., chief engineer of the Canadian Bridge Company, Ltd., Walkerville, Ontario, was the speaker at the regular monthly meeting of the London Branch, held at the City Hall on Wednesday evening, the 15th instant, and gave an interesting and instructive address on bridge erection. Mr. Porter was engineer-in-charge of construction on the Quebec bridge, and was awarded the Gzowski Medal of *The Institute* for a joint paper on the Quebec Bridge. H. A. Brazier, M.E.I.C., was the chairman of the meeting, which was well attended. H. B. R. Craig, M.E.I.C., district engineer of the Public Works Department of Canada, introduced the speaker, who was cordially welcomed by those present.

Mr. Porter began his address, which was illustrated throughout with lantern slides, by an account of the erection in 1897 of the Victoria Jubilee bridge, Montreal, and clearly showed how the new bridge was erected around the old one and the railway traffic maintained without interruption during the whole period of erection.

Bridge Erection

The old bridge, which was constructed of wrought iron plate girders arranged in tubular form, was designed by the late Robert Stephenson, the well known English engineer, and was erected in 1857. The speaker paid a tribute to the solidarity of design, particularly of the masonry piers, built to resist the ice pressure of the St. Lawrence river, and which are to-day as good as ever and in fact only needed to be enlarged at the top to enable them to carry the new bridge which carried two railroad tracks, whereas the old one only carried one. Mr. Porter gave a full description of the method of erection and also the special travelling derricks used in the putting up of this bridge and also of several large bridges and viaducts the firm have erected in various parts of Canada. He also gave a description of several specially designed cranes and derricks which the Canadian Bridge Company have in their equipment. Several of these huge contrivances were later shown on the screen, handling steel girders weighing 60 to 70,000 pounds at a height of 300 feet above ground, with apparent ease. Some interesting remarks were made by the speaker in comparing the older and present day methods of erecting iron and steel structures over large spans. He showed how in the old days, it was customary to erect timber staging and build the iron or steel structures thereon plate by plate, and bar by bar, while now-a-days, the girders were wholly or partly built in the works, transported to the site and either handled bodily by the contrivances before mentioned, or projected by a system of cantilevering into their place. Another point was noted by the lecturer and that was a point of economy in construction by utilizing for temporary purposes, a part of the subsequently permanent structure. A notable instance of this was given in the erection of a steel bridge of the Warren sub-divided hog back truss type, across the French river. This bridge has a span of 410 feet and was built entirely on the shore, without one bearing projecting over the abutment. A steel truss (part of the permanent structure of another span) was then placed on a floating scow and brought under the projecting end of the bridge. By this means, the free end of the bridge was drawn or floated across to the other side and placed in position.

Another prominent engineering accomplishment cited by the speaker, was the erection of the steel viaduct at Lethbridge, Alta. This consist of a large number of steel trestles, 100 feet apart and 300 feet high, carrying plate girders 100 feet long, for a single track railroad. This was erected by one of the special derricks already referred to and travelled along the tops of the plate girders already erected and had a double boom of 108 feet by which means each trestle was lowered into its place by sections. A working cage was also slung from the end of the boom, to enable the men to rivet up the work, section by section. The operation of the engine was controlled by telephone from this cage. The 100-foot plate girders, weighing 70,000 pounds each, were run under the derrick on flat cars and then picked up and run out by means of the boom, into their place. Although this work was carried out partly in winter weather, it was done without injury to any of the workmen.

Other instances of steel erection of magnitude were given by the speaker, where, by the exercise of engineering skill and special appliances, the Canadian Bridge Company had mastered the erection of structures that would almost appear unpracticable. An admirable example of this was mentioned by the speaker in commenting upon the Johnson street bridge, over the inner harbour at Victoria, B.C. In this case, the Canadian Bridge Company, having the contract for the steel work of a single leaf Strauss Bascule type highway bridge, made use of a 180 feet long derrick boom. This derrick was designed to meet the necessity of erecting the bridge in its fully open position, that is at an angle of 80 deg. to the horizontal. This lift bridge just completed, is part of a double bridge; that is one part to be used only for railways and the other part to be used for a highway bridge. These two bridges use the same piers and abutments. Mr. Porter also gave some interesting facts regarding the effect of temperature on steel structures, showing that they are alive rather than dormant.

A vote of thanks was proposed in a neat eulogistic speech by E. V. Buchanan, M.E.I.C., and seconded by C. Talbot, A.M.E.I.C., and Mr. Porter in responding, gave a short comparison of the different methods employed in erecting the Forth bridge, Scotland, and the Quebec bridge, Canada, and the reasons therefor.

Addresses by prominent engineers and others will be given throughout the season at the monthly meetings of the London Branch.

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

At the first meeting of the Branch for 1923 held on January 11th, an address was given by H. C. Don Carlos, Fellow A.I.E.E., chief operating engineer of the Hydro-Electric Power Commission of Ontario, entitled, "The Operation and Maintenance of Generating and Transmission Systems". The meeting was well attended and among those present were members of the Peterborough Utilities Commission and the City Council.

Mr. Don Carlos in opening his address threw some light on the magnitude of the transmission systems under the control of the commission. The organization which was responsible for the operation and maintenance of these systems was outlined by him. It must be a flexible one, he said, so that in cases of emergency large forces could be concentrated if necessary, at points where trouble occurred. Careful records had to be kept so that charges could be properly made and rates of increase noted so that future possible demands could be forecasted.

Mr. Don Carlos emphasized the importance of operating experience especially to young graduates of the universities as making an excellent groundwork for design and layout. Shop experience, he said, was important, but not more so than that of operation.

The large generating stations at Niagara of which the commission now operates three, were described. Slides were shown depicting the ice conditions which had to be met with, and experiences with the three main varieties of ice were related. For block ice dynamite was often used as well as mechanical means and ice deverters at the intakes. Protective measures such as breaking links were provided to prevent serious damage to turbines from anchor ice, but cases were known where these devices did not function as intended. The frazil or slush ice was combatted by the use of heating apparatus to prevent adherance to the metal parts of equipment and by pulling the racks.

In the operation of the plants under the commission, Mr. Don Carlos said that great importance was attached to cleanliness as being a potent factor in maintaining efficiency in the operating forces as well as showing up flaws and defects in equipment. In describing plant maintenance he said great things had been done by the electric welding process in the repairing of turbine runners and parts, often saving great expense in replacements as well as improving continuity of operation.

The various parts of the transmission systems were described, also the system of periodic inspection and records which was maintained by the commission to forestall trouble. He spoke of oil switches as being a serious source of trouble, in transmission systems. The various types of lightning arresters were described, with their relative merits, the principal of those in use being the electrolytic arrester. The oxide film arrester, he said, gave good results but was rather expensive to maintain. The principal source of trouble in transmission systems was due to the weather and they were designed to withstand its effects.

The economic basis for design was taken as ½ inch of ice around the conductor, a 50-mile wind and a temperature of minus 20 deg. F. Types of insulators were discussed by the speaker, and slides were shown of these and different types of line construction. Communication systems in connection with transmission systems were discussed and radio-telephony was said to be coming into its own in this particular field, especially in cases of emergency where failure of wire communication had occurred.

Mr. Don Carlos' address was received with applause and many questions were answered by him on points of particular interest.

Chairman P. P. Westbye, M.E.I.C., read several messages of New Year greetings from sister branches and one from the president of *The Institute*, following which two reels of motion pictures were shown of water powers in eastern and western Canada.

Halifax Branch

O. S. Cox, A.M.E.I.C., Secretary-Treasurer.

The annual meeting of the Halifax Branch was held on December 19th. As the branch by-laws have been revised during the year, changing the branch year, this meeting dealt only with that period from May to December. The meeting took the form of a supper at the Green Lantern, after which the regular business meeting was held. Owing to what the executive considered a growing lack of interest among the members in branch affairs, a special effort was made to obtain a large attendance with the result that approximately 50 per cent of the membership were present. This was quite a gratifying attendance, considering the fact that many members were unavoidably absent on duty, and for other various reasons. The secretary-treasurer's report showed a slight gain in membership and a satisfactory balance in the treasury. The retiring chairman then presented his address as follows:—

Gentlemen:—

In rising to make a few validictory remarks, I am keenly conscious of the fact that any address that I can make must inevitably be compared, and therefore unfavourably, with the addresses to which we have listened at our last two annual meetings. Our immediate past chairman possesses an ability to use the Kings' English which is at once the admiration and the despair of his fellow engineers and his addresses have been possessed of literary merit of a high order beside containing a wealth of thought. To use a mathematical simile; if his productions were to be represented by the letter x, any effusion on my part would have to be represented by the first, or more properly the second, differential of x. But we are told in Holy Writ that, while the man who had ten talents was expected to multiply and increase them and did so, the man with only one talent was not excused from trying to use that talent to the best advantage. My inference is obvious.

In casting about for the subjects to be touched on in what has come to be known as the Chairman's address, I am confronted by a wealth of material rather than by the reverse. There are so many things on which I might speak that the difficulty has been to select rather than to secure pertinent topics. I am therefore passing over many items that might properly be of interest to a gathering such as this, and will confine myself to two or three major points which seem to me to be of paramount importance at this time.

In the beginning, I would like to call the attention of the Halifax Branch as a body to the fact that one of our members has been singled out for the highest honour within the gift of *The Institute*. The doors leading to the rank of Honorary Member are jealously guarded and there are few who pass the portals. Presidents come and go, vice-presidents serve their terms of office and retire, councillors are elected, "do their bit" and become "one of us" again, but the rank of Honorary Member, once conferred, is permanent. We can now, as a branch, bask in a reflected glory and feel proud that we have in the city of Halifax, one of the Immortals. That this honour is richly deserved needs no proof or statement from me, if for no other reason than his life long connection with *The Institute*. He was one of the earliest members of the Canadian Society of Civil Engineers, one of its early secretaries, councillor eleven times, vice-president three times, the father of engineering legislation in Canada and at all times a capable and active member on behalf the profession. The time is fitting and the occasion is opportune for me to extend to C. E. W. Dodwell, Hon.M.E.I.C., on behalf the Halifax Branch, simply but sincerely, our heartiest congratulations and to express the hope that he will long be spared to us to give us the benefit of his mature wisdom and to dignify our meetings by his presence.

Another event of outstanding importance to us, both as professional engineers and as citizens of a common country, is the appointment of an engineer to the most difficult and arduous position in the Dominion. In selecting Sir Henry Thornton as the President of the Canadian National Railway system, I think we will all agree, whatever be our political leanings, that the present administration at Ottawa has shown a flash of real genius. As citizens of Canada his success is a matter of vital importance to us, and, as he won his spurs in the engineering profession, his appointment merits more than a passing comment. We sincerely hope that he may prove to be the Moses to lead our railways out of the Egypt into which they have fallen and we wish him every success.

In *The Institute* there has been a healthy activity during the year and I would like to call your attention to the reports of two important committees particularly as these reports may have far reaching effects. The recommendations of the committee on Policy were made with

the view of more firmly knitting together the membership as a whole and to give the branches more direct connection with headquarters To this end they have recommended that every member be attached to some branch and the branch area consequently extended. They have also proposed that every branch have direct representation on the council and further that each councillor, not resident in Montreal, be given the opportunity of attending personally at least one meeting of the council each year, his expenses being paid by *The Institute* as far as their funds will permit. These changes seem to me to be in line with a progressive policy and recognize more than ever the growing power and importance of the branches. Many of the proposals of this committee have been incorporated in proposed changes in the by-laws on which you will be asked to vote in the near future.

The second committee to report is the one that for some time has been engaged in the preparation of a schedule of salaries and fees for professional engineers. Two years ago the council approved of the establishment by *The Institute* of rates of remuneration for its members with the additional resolution that *The Institute* would endeavour to uphold these rates. There are some who did not and who still do not approve of the idea but it has come to be part of the policy of *The Institute* and now that this report is before us it is our duty to discuss it in the most thorough manner and record our wishes and opinions. The whole subject is of the utmost importance to the profession. In this connection, it appears to me that our first problem is the matter of self education; I doubt if a more detailed schedule is desirable or necessary until every member of *The Engineering Institute of Canada* is firmly convinced that some scale of fees and salaries is feasable. We must always remember that increased emoluments will not fall on us like manna from Heaven but we must be prepared to struggle and even to suffer before we obtain our goal. We are all quite willing to admit that our own honorariums are far below our actual worth but are we ready and willing to back up a fellow member in his efforts to obtain just compensation for his services, would we refuse to accept the same position at a smaller salary, no matter what our needs? Would we decline to work under or with one who has violated the schedule? These are merely a few of the questions we should ask ourselves before taking any positive action, this whole matter can easily offer a fruitful subject for discussion at our meetings this winter. To use a commercial expression, we must first sell this idea to ourselves before we can sell it to anyone else. Unfortunately, some of the worst offenders with respect to salaries are members of our own profession, even members of *The Institute*, and they must have this idea sold to them. When we can include in our code of ethics a clause, written or unwritten, to the effect that no member of *The Institute* shall offer to any engineer a salary smaller than called for by the schedule or accept any work or any position at a lower rate than the amount attached to that position by our scale, we shall have accomplished all we can.

Up to this point I have been speaking in a somewhat laudatory manner, congratulating ourselves on what we have done or on what has happened, but, when I turn to the other side of the shield, the writing, as I decipher it, is not so pleasant. In taking stock of the Halifax Branch and of the interest shown in branch affairs, I am measuring by the yard-stick of attendance. The secretary's count shows attendances of 13, 16, 20, 22, 25, 30, and occasionally more and, as these numbers frequently include guests, I am safe in saying that our average attendance is less than 30 per cent. There are some who find consolation in the fact that the average attendance at meetings of other bodies in this city is about the same as ours, others say that some of the other branches — the larger ones — have the same attendance proportion as we have. We should remember, in making these comparisons, that these other organizations are larger in numbers and meet more frequently and it is reasonable to suppose that they would find it difficult to always get the great majority of their members present. This meeting to-night is the largest we have had for some time but it took most strenuous efforts on the part of a few devoted members to get this attendance; were the interest general and genuine it should never be necessary to resort to a personal canvass as we had to. I have asked some of our members why they did not attend more frequently and others have volunteered the information. I will give a few of the answers: — one says there is no pep or punch to the meetings (the expression is his, not mine), possibly a punch of the proper consistency would produce the desired pep, but I don't think that was his meaning; another says the meetings are too stiff and formal; another: — I come to the meetings a stranger and go away a stranger; another: — the papers don't interest me, and so on. Let me ask this question: Do these and similar statements constitute the reason or are they merely excuses? But whatever the reasons, the fact remains that something must be done to increase the interest on the part of a majority of our members. Some say that we should get more speakers from outside the city but when we do get such speakers, and we occasionally do, what happens? do we have to hang out the S.R.O. sign? look at the attendance records for those meetings and answer. No, gentlemen, I do not think that the fault is in our speakers or in their subjects, but goes deeper.

Now how can this condition be remedied? I believe that this problem is of first importance to the branch and should be studied exhaustively. For fear you may think that I am merely finding fault without offering constructive criticisms, let me make a few suggestions It has been said that one of the best ways to get anyone interested in an organization is to give him something to do; if so, why not create occupations that will give more of the members a chance to share the limelight. At present, the executive committee including the officers, and one or two standing committees, only give an opportunity for about fifteen to very actively participate in the conduct of the affairs of the branch and it must be remembered that these fifteen are selected from a comparatively small percentage of the whole membership. Why not adopt the method in vogue among the luncheon clubs of the city and have a different presiding officer for each meeting? this officer to introduce the speaker and conduct the discussion leaving the chairman of the branch to preside over the business section. This officer could be selected by lot, or alphabetically, or by the executive, preference being given to those holding the grade of member, no one on the executive committee to be eligible for this office except that the vice-chairman should have an opportunity to preside at at least one meeting.

It has been said that we do not get enough publicity, that our meetings are not reported in the press and that therefore the public are unaware of our existence. Immediately I hear some one say Why doesn't the secretary look after this? and I reply in the Yankee way by asking another question why should he? Do you realize that the secretary is easily the hardest working member we have and does at least twenty to forty times as much work as any other single member? then why work a willing horse to death? If this publicity is desirable, I fear we shall have to be our own reporters, certainly for the present, so why not appoint two or three for each meeting to write up the account and see that it appears in the daily papers. While it might be said that one man could do this, having two or more would introduce the element of competition both in quantity and literary quality, and at the same time provide more with jobs. We might even extend this idea and have some one at each meeting write up the account for *The Journal*, some of the branches already have a Branch News Editor.

Our total registration is not as large as it should be; this is partly due to the industrial situation but there are undoubtedly professional engineers in this city who should belong to *The Institute* and if any of those present know of such a one, why not constitute yourself a committee to bring the wanderer into the fold. There are some who just won't join and with these our course will be to make the branch meetings so attractive that they will be standing outside our doors, hat in hand, begging to be admitted. But there is a large reservoir on which we have not drawn as heavily as we should; I refer to the students at the Nova Scotia Technical College and in the engineering courses at Dalhousie. Immediately I hear the question why don't the Professor get these young men to join? but this isn't as easy as it sounds and may, in their eyes, savor of compulsion. We might be more successful if we made a drive for them, so why not set apart one night as a students' night, and invite these young men, not as a body but as individuals, and regale them with a programme not wholly scientific but partly social, something in the way of eats might appeal to them and possibly prove a drawing card for some members of the branch as well. At this meeting, the advantages of membership in *The Institute* could be laid before them with, I believe, satisfactory results.

These, gentlemen, are merely a few of the ideas that have been in the back of my head for some time, I care not what you do with them; pick them to pieces if you wish, ridicule them if you will, but if I have aroused your interest to the point of getting on your feet and arguing, I shall have accomplished my object. What we want is to have everybody actively interested in the branch, to keep *The Engineering Institute of Canada* prominently before your minds. Let me suggest one thing more: *The Institute* issues a certificate of membership, how many have one? I see before me some wearing a Rotary button, other a Masonic pin, others with the three links of the Oddfellows, others with the insignia of other fraternal or social orders; how many wear the badge of *The Institute*, the possession of one or both of these articles I have mentioned will have a psychological influence on your interest, so send your orders in. When we meet a year hence, shall we be able to look back on an active successful year or not, the answer is in your hands.

The report of the scrutineers gave the following as the branch officers for the ensuing year:—

Chairman.....F. R. Faulkner, M.E.I.C.
Secretary-Treas...O. S. Cox, A.M.E.I.C.
Executive.....H. W. L. Doane, A.M.E.I.C.
K. H. Smith, M.E.I.C. } two years
C. H. Wright, M.E.I.C.
A. F. Dyer, A.M.E.I.C.
C. A. Fowler, A.M.E.I.C. } one year
I. P. Macnab, M.E.I.C.

The chairman's address as above quoted contained many valuable suggestions for increasing interest among the members, and for enhancing the usefulness of the branch to the members and the meeting was thrown open for a general discussion of these matters. The enthusiasm with which practically all present entered the discussion augurs well for the future of the branch. Many of the suggestions contained in the chairman's address, as well as others offered by the members, were adopted. The following are some of the results of the discussion:—

A committee of five is to be appointed to have charge of the details of each regular branch meeting.

A committee of student members has been appointed to interest the engineering student body in *The Institute* with a view to inducing a larger number to apply for admission.

It was suggested that a room might be procured for the use of members where they might meet socially and where engineering journals, books and other literature would be available. A committee has been appointed to report on this matter.

A different chairman is to be appointed from among the membership to preside over the entertainment portion of each meeting, the business portion being conducted by the branch chairman.

Two members are to be appointed for each meeting to write accounts of the meeting for the local press.

Following the above discussion the report of the Committee on Classification and Remuneration was considered at some length but owing to the fact that this report is as yet incomplete, action by the branch was deferred.

General Monthly Meeting

At the regular monthly meeting of the branch held in the N.S. Technical College on January 4th, a number of the recent suggestions adopted at the annual meeting were put into practice. The details of the meeting were in the hands of a committee of which H. W. L. Doane, A.M.E.I.C., was chairman and among the novel features introduced were several selections by the college students' orchestra. The "objects of *The Institute*" had been handsomely engrossed and was prominently displayed. The walls of the room were decorated with flags and bunting and presented an attractive appearance. The meeting was presided over by Engineer Commander, R. H. Wood of H. M. Dockyard, who introduced the speaker of the evening, J. F. Paige, Operating Manager of the Halifax shipyards, gave a most interesting address on the development of ship-building and marine engineering. The speaker stated that water transportation was one of the earliest means of communication developed by man and its history can be traced back to primeval days.

From the earliest examples of crude dugouts and rafts the speaker followed the development of various forms of canoes, boats, sailing craft and power-propelled vessels, through to the present day leviathans of the deep, luxuriously equipped for the comfort of passengers, and propelled by the latest types of oil engines, marine turbines, electric motors and other highly developed products of engineering skill. The different methods of construction and propulsion were briefly described. Mention is made in the story of Moses of baskets built of rushes and made watertight with pitch. An early form of vessel was made by stretching bark, or the skins of animals over a light framework of wood, and was propelled by paddles or oars. Probably the most highly developed vessel propelled by oars was the galley of the Romans. It is not known whether sailing vessels were first used by the Saxons or by the Chinese.

Of especial interest to a Halifax audience was the fact that Nova Scotia during the past has occupied a prominent place in the ship-building world. The first vessels to be built in this country were constructed at Port Royal in 1606. Activity in shipbuilding increased as the country developed until in 1863, one-third of the total registered tonnage of British North America,—310,000 tons — hailed from this province. Prominent among the world's greatest designers and builders of clipper ships as well as prominent in the list of great men of this province, is the name of Donald MacKay. A number of clippers designed and built by him established records which have never been bettered by sailing vessels.

The first steam propelled ships were built early in the nineteenth century, "The Accommodation" built in Montreal in 1809, being the first Canadian Steamboat. This boat was 72 feet long, 16 feet wide, 6 h.p., and had a speed of 5 miles per hour. *The first vessel to cross the Atlantic under steam alone was the "Royal William" built in Quebec in 1830-31.* She sailed from Pictou, August 18th, 1833, and made the passage to the Isle of Wight in nineteen days. Her dimensions were 160 feet long and 28 feet wide, gross tonnage 1,370; 200 h.p. When these figures are compared with the largest present day ships from 700 to 900 feet in length, 70,000 h.p. and upwards, and crossing the Atlantic in a little over four days, some idea is obtained of the wonderful development in shipbuilding in recent years.

Mr. Paige described the tremendous development of the marine engine, explaining in detail the various types of turbines, oil engines, electric motors, the gyro-compass and other modern marine equipment. The lecture was profusely illustrated by lantern slides the majority of which were pictures taken by the speaker showing ship construction, launching and operation. In addition to these a number of slides on electric propulsion, gyro-compass and turbine reduction gearing were shown by courtesy of the Canadian General Electric Company, the Sperry Gyroscope Company and the Bethlehem Shipbuilding Corporation.

The subject of shipbuilding as presented by Mr. Paige and covering so many branches of engineering, bore evidence of the speaker's wonderful versatility and broad knowledge gained by long experience in the shipbuilding industry in various parts of the world. At the conclusion of his address he was tendered a hearty vote of thanks.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

On December 21, 1922, C. A. Clendening, A.M.E.I.C., assisted by H. G. Mitchell, A.M.E.I.C., gave a very instructive address on the operation of the city hydro distribution system. The lecture was illustrated with lantern slides and gave an excellent idea of the many factors governing the problem. At the present time the primary distribution system is being changed from a three phase, three wire, delta connected system, to a four wire star system; the advantage claimed for the latter being that with the neutral one-half the size of the mains, the power can be distributed about three times the distance with the same regulation. The balancing of lay-out, power factor and rates presents a very pretty economic problem, and with the system of records in vogue in the city as described by the speaker, sufficient statistics should be readily available to determine an adequate solution.

The subject of January the 4th meeting was "Automatic Fire Protection", presented by J. C. Davis, A.M.E.I.C. After explaining the chemistry of combustion, the speaker pointed out that there were two methods of fire control — prevention and protection. It has been attempted to achieve the former by propaganda, with little success as may be judged from the fact that the fire tax in the Dominion for 1922 was about $15 per capita. He advocated the teaching of fire prevention methods to children in the schools. The speaker explained, with the aid of typical structures, the causes of explosions frequently heard at fires, due to the restriction of explosive gases to confined spaces. Stairways and elevator shafts form a convenient path for the distribution of fire over a whole building. Protection is achieved by restricting the possibility of the flames spreading and by the use of non-combustible construction materials; the flame is extinguished by water or by a blanket of a gas which does not support combustion. The speaker described, with the aid of lantern slides, the general layout of a sprinkler system and the details of the various kinds of apparatus used therein.

On January 17th, a moving picture and lecture were presented by D. M. Buck on the manufacture of galvanized steel. The pictures showed the process of manufacture from the extraction of the raw ore from the mine to the finished product.

Ottawa Branch

F. C. C. Lynch, Associate E.I.C., Secretary-Treasurer.

At a luncheon of the Ottawa Branch, held in the Chateau Laurier on January 3rd, the guests of honour were two very prominent geodetic officials from Washington: — Dr. Wm. Bowie, chief, Division of Geodesy, and G. T. Rude, chief, Division of Tides and Currents, United States Coast and Geodetic Survey. Dr. Bowie is an engineer of international reputation which has earned for him the presidency of the section of Geodesy of the International Union of Geodesy and Geophysics, which held its meeting last May in Rome. The purpose of his visit to Ottawa is to confer with Noel Ogilvie, M.E.I.C., superintendent of the Geodetic Survey of Canada, in connection with the geodetic work which is being carried on by both countries. Mr. Rude is an authority on the important line of work in which he is engaged and the purpose of his visit at Ottawa was to confer with Dr. W. Bell Dawson, M.E.I.C., superintendent of Tidal Surveys, in connection with matters of importance relating to both the United States and Canada

Those seated at the head table, together with Dr. Bowie and Mr. Rude were: — Lt.-Commander C. P. Edwards, A.M.E.I.C., acting chairman of the Ottawa Branch; Hon. Charles Stewart, minister of the Interior; Alex. Johnston, deputy minister of Marine and Fisheries; G. J. Desbarats, C.M.G., M.E.I.C., deputy minister of National Defence; Dr. Charles Camsell, deputy minister of Mines; Dr. W. Bell Dawson, M.E.I.C., superintendent of Tidal Surveys; Noel Ogilvie, M.E.I.C., superintendent of Geodetic Survey; J. J. McArthur, M.E.I.C., H.M. International Boundary Commissioner; W. J. Stewart, M.E.I.C., chief hydrographer; Dr. Collins, director of Geological Survey; Dr. E. Deville, Hon.M.E.I.C., director general of Surveys; G. A. Mountain, M.E.I.C., chief engineer, Board of Railway Commissioners; Col. Anderson, M.E.I.C.; John Murphy, M.E.I.C., electric engineer, Department of Railways and Canals.

Commander Edwards introduced both the visiting gentlemen and paid tribute to the important organization which they represented. Dr. Bowie, who first addressed the meeting, spoke in most happy vein. His speech was full of weighty facts given in a very simple and straightforward manner, with no attempt at rhetoric. They were supported by such logical reasoning that they could not fail to carry conviction.

Importance of Complete Topographical Surveys

The border line between the United States and Canada, he said, was little more than an imaginary line. The customs of the two peoples on either side thereof were identical; their sports the same. The currency, too, was the same on both sides, — "You take ours and we take yours". "Sometimes," he added, amidst general laughter, "one of us takes a little more than the other." The national beverage even was the same in the two countries. This similarity was still more pronounced in the case of surveying, in which no frontier existed. Insofar as triangulation and levelling are concerned there is one geographical unit for the two countries. North America is the only continent which can boast of this uniformity. Other continents have been striving for seventy years to attain it, but, so far, without success. Co-operation between the heads of the surveying departments of the two countries was most conspicuous and most happy. He had the pleasure of being associated with Dr. Deville and Mr. Ogilvie in the councils of the International Union of Geodesy held last year in Rome, and complete harmony prevailed. Each studied the common interests of all and mutual benefit resulted.

Turning to the war for a lesson, Dr. Bowie laid stress on the important part which engineers played in winning it. Now it was the part of these engineers to help pay for that war. Still more was it their duty to help prevent its recurrence. One of the most potential preventives of war was knowledge. Most of the big wars owed their origin to misunderstandings. Knowledge would obviate these. The exact resources of the country, of all countries, must be known. Information must be accurate. Topographical maps would not only provide this information, but would also show which resources were the most easily obtained. Then these resources could be traded and it would no longer be necessary to fight for them.

Engineers can take a leading part in this. Most of the wealth and resources, food and clothing, comes from the land. Exact stock must be taken thereof. *Engineers must be in the field at the beginning of every venture.* It was useless to choose a site on a river bank and say that a bridge must be built there and afterwards to call in an engineer and tell him to go ahead and put the bridge at that spot. It is too late to call in an engineer after mining operations have been

commenced in an unfavourable spot. In the speaker's opinion *engineers should be on the board of directors of every activity to guide the policy from the very beginning of the venture.*

A great and urgent need was the completion of accurate topographical surveys of Asia, Africa and South America. In Europe considerable progress had already been made. By this means only could accurate information be obtained of the position, extent and value of the most valuable resources; coal, iron, timber, water power, irrigation, and drainage possibilities, and very specially soil fertility. Engineers must obtain this information. They must "take stock" as it were of the world. Then statesmen must follow who will say: "Here are our resources. There are yours. We will not fight amongst ourselves for them, but we will trade for mutual benefit."

From the point of view of expense, these topographical surveys would pay for themselves. At the present moment the United States had a bill under discussion under the provisions of which $40,000,000 would be spent during the next 20 years on topographical maps. All this money would come back, and more besides, in the form of revenue that would be derived from the extension of highways. Expense, then, was no drawback.

Oceanography

Mr. Rude followed Dr. Bowie, and in opening his address said, that geodetic survey covered land and water. Dr. Bowie had dealt with the land. He would refer to its application to water covered areas. Oceanography embraced the charting of tides and currents, the surveying of oceans and ocean beds. The science of surveying as applied to the seas was even older than land surveying. Forty years before the commencement of the Christian era crude maps or charts had existed. These were necessary, because by far the greatest highways and byways of transportation were the oceans. He then dealt with the many reasons and purposes for mariners' charts, and referred to the old lead as a very crude instrument for determining the nature of the ocean bed, as it only touched ground in one spot and when next dropped a grave danger may have been passed over. The development of the wire drag had given them the means of making accurate surveys of the bed of the ocean and perfect maps can now be drawn.

Then, oceanography was also of use to engineers to enable them to determine the mean sea level. It was of great assistance, also in coast protection and harbour improvement. By its study the mariner was able to predict in advance the time of high and low water. Not the least important branch of the science was the study of tides and currents, particularly of wind-driven currents. By this science hundreds and thousands of lives had been saved and economy had been effected inasmuch as the insurance rates on vessels had been lowered. Future research work in oceanography would enable a larger percentage of available food to be taken from the ocean. Sir John Murray had stated that there was at least as much food in the ocean as on land, and yet at present only five per cent of the food consumed came therefrom.

Mr. Rude referred to the happy co-operation that existed between England, Canada and the States with regard to the exchange of facts. Tidal predictions, tidal changes and similar data were mutually exchanged, and a great saving resulted from this concerted action. He trusted that in the future relations would be even still more satisfactory between these two great countries with 4,000 miles of boundary line without a single fortification.

The Minister of the Interior, Hon. Charles Stewart, thanked the speakers for their splendid addresses. He acknowledged that he had learned many facts during their addresses. He was a great believer in the necessity of rigourous scientific research work, and every plan that had for its end the improvement of conditions in this great Dominion, and in the world at large, would have his wholehearted support. He would use every particle of his influence to endeavour to bring it about that such research work should receive the necessary financial support. He was no statesman, but he was a close student and heart and soul he was interested in the development of Canada.

Commander Edwards, in thanking the speakers on behalf of *The Engineering Institute*, paid also a tribute to the Hon. Charles Stewart, who, they all knew, had already proved that he was essentially a statesman. He trusted that their geodetic visitors would soon honour them again with their presence. They would always be welcome.

About 150 sat down to lunch and listened with evident appreciation to the addresses delivered.

Annual Meeting

Concurrently with the holding of the annual meeting of the Ottawa Branch at the Daffodil Tea Room on the evening of January 11th, a year of very satisfactory results was brought to a close. A report containing a concise review of the organization's activities during the past twelve months was presented by K. M. Cameron, M.E.I.C., retiring chairman, and was received with expressions of appreciation.

O. S. Finnie, M.E.I.C., director of the Northwest Territories and Yukon Branch, Department of the

J. B. CHALLIES, M.E.I.C.,
Chairman of Committee on Policy, whose report was adopted at the Annual General Meeting, upon which much favourable comment has been passed.

Interior, was the choice of the members for the chairmanship of the branch during 1923. F. C. C. Lynch, Associate E.I.C., superintendent of Natural Resources Intelligence Branch was re-elected as secretary-treasurer and L. H. Cole, M.E.I.C., mining engineer, Department of Mines, and L. Sherwood, M.E.I.C., assistant chief engineer, Department of Railways and Canals, were elected to the Managing Committee.

The report presented by Mr. Cameron, the retiring chairman showed that the branch had held eight luncheons, and seven evening meetings in 1922. Mr. Cameron pointed out that the Ontario Legislature had placed on the statute books an act respecting professional engineers, and emphasized the importance of the measure as passed being fully supported. During the year the branch welcomed Dr. E. Deville, I.S.O., director-general of Surveys, as an honorary member, and the council of *The Institute*

was to be congratulated for this noteworthy step. The financial position of the branch, as revealed by the report of the secretary-treasurer, F. C. C. Lynch, Associate E.I.C., was considered very satisfactory. The report showed a substantial balance. The branch now has a total membership of about 400, including 67 new members enrolled during the year. The branch recorded with regret the death of four members, Messrs. E. D. Lafleur, H. P. Borden, A. Timbrell, and Major R. W. Powell. References to valuable assistance rendered by the local press was made, and a vote of thanks to the two Ottawa dailies for their courtesy was adopted.

In outlining the activities for the coming year, it was announced that arrangements had been completed for the following lectures: February 1, John McLeish, director of the Mines Branch, on "Mining in Ontario"; February 15, W. Kinoch, superintendent of the Forest Products Laboratory, on "Wood and its Possibilities"; March 1, J. D. Craig, M.E.I.C., advisory engineer of the Northwest Territories and Yukon Branch, on "Canada's Wonderful Northland", with the annual popular lecture by Lt.-Com. C. P. Edwards, A.M.E.I.C., on March 15. A vote of thanks was tendered the retiring officers. The regular meeting was followed by a short entertainment and refreshments.

Toronto Branch

O. M. Falls, A.M.E.I.C., Secretary-Treasurer.

The Toronto Branch held its first meeting of the winter session Thursday evening, January 11th, at the Engineers Club, which took the form of an informal dinner and entertainment at which almost one hundred were present and which was greatly enjoyed by all. Mr. Storrie, before proceeding with the programme as arranged, called upon Willis Chipman, M.E.I.C., newly elected president of the Ontario Association of Professional Engineers and F. W. Paulin, A.M.E.I.C., chairman of the Hamilton Branch, for a few remarks.

Mr. Chipman briefly outlined the progress that had been made towards a fuller recognition of the engineering profession. The Ontario Act respecting professional engineers, he stated, was simply a registration measure, but it formed an excellent foundation upon which if wisely guided a very serviceable super-structure might be raised. He urged all engineers to register under the provisions of the Act and to make use of the title, — *Registered Professional Engineer*, and thus strengthen the hands of the council so that in due time necessary amendments might be secured. In conclusion Mr. Chipman emphasized the importance of the problem of heat to Canada to-day. Our country, he said, was dependent on a foreign country for its coal supply. The solution of the problems of heat storage and transportation he considered among the most vital of any demanding the attention of the present engineers.

Mr. Paulin, following the line of thought of the previous speaker, recalled the efforts of the German scientists, during the war, who, in order to provide their forces with an adequate supply of coal, petrol, and grease, had utilized sources of supply hitherto considered valueless. A similar treatment might with advantage be adopted to develop our Ontario deposits of peat.

The major portion of the evening, however, was given over to free and easy sing-song and amusement. Vocal and violin solos rendered by accomplished artists were very much appreciated. The School of Science Hawaian Orchestra scored a great triumph if the storm of applause which followed their selection could be taken as a measure of appreciation. The students have some very promising and original talent, and the thanks of the branch is unreservedly due them for placing their services at the disposal of the branch.

Professor Cockburn's rendering of Rudyard Kipling's "Commissariat Camel", was one of the high spots of the evening, and as one speaker remarked that if all the professors were as entertaining it is little wonder that applied science is the most popular faculty at the university. Mr. Wynne-Roberts was in charge of the programme of the evening, and his admonition to cast aside our dignity was fully observed throughout the evening.

The programme as arranged for the month of February is as follows:—

February 1st — Moving picture film on "The Analysis of Motion by High Speed Photography", and a paper entitled "Some Recent Psychology", both by Professor H. E. T. Haultain, M.E.I.C., of the University of Toronto.

February 8th — "Rainfall and Its Measurement" by Sir R. Frederick Stupart, director of Meteorological Service, Toronto.

February 15th — "Radial Entrances with Special Application to the City of Toronto" by Henry K. Wicksteed, M.E.I.C., formerly chief locating engineer of the C.N.R.

Quebec Branch

Hector Cimon, A.M.E.I.C., Secretary-Treasurer.

Ice problems of Canada were ingeniously treated of in a causerie given by John Murphy, M.E.I.C., at a meeting held in the Recorder's room of the City Hall, Monday evening, December 11th, 1922.

Ice, Anchor Ice and Frazil

How submerged machinery with a temperature below freezing point will attract ice particles and become a virtual ice-factory was clearly demonstrated by Mr. Murphy who spoke before a gathering of Quebec engineers and the general public on the subject of the formation of ice and its prevention in hydro-electric plants. The speaker, by means of moving pictures, illustrated the growth of the mere snow-flake into a mass of solid and obstinate ice and he introduced logical methods to prevent ice from adhering to machinery and from forming in a stream.

Mr. Murphy showed that to prevent ice from adhering to dams, turbine cases, gates, etc., it is sufficient to raise the temperature of the exposed surfaces the minute difference of a thousanth of a degree above the freezing point; and as to the preventing of ice from forming at a given point in any river, that but a small quantity of heated water is necessary on the surface of the stream.

The meeting was presided by A. R. Décary, M.E.I.C., and Sir George Garneau warmly praised the lecturer and proposed a vote of thanks which was carried with enthusiasm by the audience.

The Kinetic Energy of the Winds and its Possible Utilization

At a luncheon at the Chateau Frontenac, on Monday January 15th, a noteworthy paper of unusual interest was read by Gabriel Henry, A.M.E.I.C., who is consulting engineer at the Quebec Department of Roads.

Mr. Henry submitted general considerations that moved scientists during the great war to make investigations on the available energy in its different forms that could be developed in Europe and in the United States. He gave definitions of what is termed "energy" and its few transformations, he dealt with the origin of the commercial power and produced comparative figures showing the quantities of energy contained in coal, water and wind. The general economic conditions of the problem involved were elaborately stated and discussed by the speaker.

Mr. Henry reviewed all the practical factors concerning electricity derived from hydraulic powers and from steam plants and its transmission to the desired points. He went into scientific details on the construction, establishment and operation of windmills and summarized their recent improvements. In the course of the lecture he pointed out that the quantity of energy developed by windmills is very irregular on account of the varying velocity of the winds. Another important fact is while water and coal can easily be stored, windmill energy has to be transformed, for transmission, either into electricity or chemical products. Windmills present notable advantages: they can be established anywhere, at the most convenient points and they require rather small areas of land.

The paper on kinology contributed by Mr. Henry was replete with interesting details and proved deep study and careful consideration. The lunch was presided by A. R. Décary, M.E.I.C., and Alex. Fraser, on behalf of the members of *The Institute*, moved a vote of thanks which was adopted amidst applause.

Cape Breton Branch

Donald W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

D. A. Y. Colquhoun, Jr.E.I.C., of the construction department, Dominion Coal Company, Ltd., was the speaker introduced by the Chairman, Mr. Marsh, at a regular monthly meeting of the Cape Breton Branch, held in the branch rooms on Tuesday evening, January ninth.

In opening his paper, which was on "Shaft Sinking", Mr. Colquhoun stated that perhaps more so than most new projects the sinking of each shaft was a problem in itself, and it would be necessary therefor to treat the subject in a general way. This he did under the following headings: Size of shaft and number of compartments required; organization or working force; sinking plant; drilling; explosives and blasting; ventilation; unwatering of shaft during sinking; disposal of muck; shaft lining or timbering; speed and cost of sinking.

The speaker also described some of the particular problems met with in the construction of a shaft within his own experience, and compared the methods used, and the sinking records made, with those of some other important operations of the kind. The shaft in question is rectangular in section being thirty-one feet two inches long by thirteen feet four inches wide, and was probably unique in being located over underground workings, so that it was only necessary to put down a bore hole at the centre of the shaft location, to drain off the water, thus doing away with costly and cumbersome pumping equipment.

Mr. Colquhoun illustrated his paper with drawings and lantern slides showing equipment used, methods of drilling and shooting, etc.

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

Annual General Meeting

The annual general meeting of the Vancouver Branch was held in the Board of Trade auditorium, on Tuesday, December 19th, 1922, at 8.30 p.m. The chair was occupied by Chas. Brakenridge, M.E.I.C., retiring chairman of the branch.

Following the reading of the notice calling the meeting, and the adoption of the minutes of the last annual general meeting, held on Wednesday, December 21st, 1921. Mr. Brakenridge addressed the branch on the developments during his tenure of office, and the outlook for the future.

In presenting his address, he stated that on account of the comprehensive report to be read by the secretary-treasurer, he would not dwell to any extent on the activities of the branch during the past year. He urged the members, individually and collectively, to take a more active interest in public affairs, particularly when engineering questions were involved. In this connection he cited the example set by the Engineers' Club, which had shown great keenness, even to the extent of trying to obtain a candidate for civic alderman from amongst its members.

Whilst occupying the chair, he had endeavoured to act at all times in a conservative manner, following along the traditional lines established by previous executives; but personally, he believed that until engineers, both as individuals and as a body, were prepared to show more active interest in the affairs of their own organizations, as a primary duty, and extend this interest to matters of public welfare, they could never expect to see which advancement in their material rewards, or obtain from the public, the recognition which they considered their due.

The Engineers' Club had been formed, the speaker thought, because of a desire among the members of the Association of Professional Engineers of B.C., to find some means of getting together between annual general meetings. He believed that the luncheon meetings held by the Club, had solved the difficulty in a most satisfactory manner, and moreover he could not discern any interference with the normal activities of *The Institute*. The relations of the two bodies had been most cordial, and he hoped that the same harmony and goodwill would

continue in the future as in the past. He suggested that same form of agreement covering the relative spheres of activity of *The Institute* and the Club would materially assist in the maintenance of their present harmonious relations.

Briefly reviewing the development of *The Institute*, the chairman pointed out that the body as a whole was progressing in a sound and splendid manner; and being a Dominion-wide organization with twenty-three branches, it had become so firmly established, that the isolated members in the west scarcely realized what a powerful and influential body they belonged to. He urged the members of the Vancouver Branch to do all in their power to bring the branch up to the high standard of *The Institute* as a whole.

The speaker extended his cordial thanks to all the members of the executive committee for the good work accomplished and the happy relationship that had at all times existed between them, and expressed his genuine pleasure in being one of their member during the year to come.

Upon the conclusion of the chairman's address, the secretary-treasurer read his annual report, the text of which may be found elsewhere in the present number of *The Journal*. A short discussion of the report was followed by a hearty vote of thanks to the secretary-treasurer for his work during the past year, accompanied by a resolution granting him an honorarium from the branch funds. In expressing his sincere thanks for these marks of the cordial appreciation of the members for the service he had been enabled to render the branch, he stated that he did not wish the members to overlook the exceedingly high value he placed on the reward of experience and greater usefulness which he had gained through the discharge of his various duties. He further pointed out that much of the success in the affairs of the branch during the past year was due to the thoroughness and diligence of his predecessor in office, J. N. Anderson, A.M.E.I.C., whose labours had set a high standard for all who follow him.

At this stage in the meeting, the scrutineers handed to the chair, the returns of the election for the 1923 officers and executive committee, which were duly announced as follows:—

Chairman.....A. C. Eddy, M.E.I.C.
Vice-Chairman.....J. Muirhead, M.E.I.C.
Secretary-Treasurer.....P. H. Buchan, A.M.E.I.C.
Executive Committee:—
To hold office during 1923 and 1924:
W. G. Swan, M.E.I.C.
W. H. Powell, M.E.I.C.
D. O. Lewis, M.E.I.C.
To hold office during 1923 only:
T. W. Fairhurst, A.M.E.I.C.

The two other members of the Executive Committee elected at the last annual general meeting, to retire at the end of 1923 are Wm. Smaill, M.E.I.C., and J. N. Anderson, A.M.E.I.C. Mr. Fairhurst was elected to replace Major-general R. G. Edwards Leckie, A.M.E.I.C., who resigned on December 4th, 1922. The ex-officio members of the executive committee are Chas. Brakenridge, M.E.I.C., retiring chairman, and Geo. A. Walkem, M.E.I.C.

In view of the irregularity occasioned by the failure of the nominating committee to obtain two candidates each for the offices of chairman, vice-chairman and secretary-treasurer, as prescribed in section 5 of the branch by-laws, it was moved by Major Walkem, M.E.I.C., seconded by J. N. Anderson, A.M.E.I.C., and resolved, that in the case of the present election, the rules be suspended, and that A. C. Eddy, M.E.I.C., Jas. Muirhead, M.E.I.C., and P. H. Buchan, A.M.E.I.C., be and are declared elected to the offices of chairman, vice-chairman and secretary-treasurer, respectively, for the year 1923.

Following the announcement of the election returns, Mr. Brakenridge formally vacated the chair in favour of the newly elected chairman, who was greeted with hearty applause.

Mr. Eddy asserted his keen appreciation of the honour attached to the office of chairman and of the splendid work accomplished by Mr. Brakenridge. He stated, however, that while he approved of the past chairman's conservative policy in the conduct of branch affairs, he believed that the time was ripe for the adoption of new ideas, and he purposed to make use of whatever means the Executive Committee should deem advisable, to try and stimulate the interest of the branch membership, during his tenure of office.

In addition to Mr. Eddy's remarks, a number of those present, expressed their own personal appreciation of Mr. Brakenridge's services to the branch, following which a vote of thanks was tendered to him with hearty and prolonged applause from the meeting.

The first item of business after the installation of the new chairman was the appointment of the 1923 branch nominating committee, as required by the 1921 amendment to section 5 of the branch by-laws. Upon resolution of the meeting, this duty was delegated to the chairman, who made the following appointments:—

W. R. Bonnycastle, M.E.I.C.
J. W. R. Blackman, M.E.I.C.
J. R. Grant, M.E.I.C.
H. Idsardi, M.E.I.C.
J. McHugh, A.M.E.I.C.

A resolution was also passed appointing A. C. Eddy, M.E.I.C., and P. H. Buchan, A.M.E.I.C., joint signing officers in respect of the financial transactions of the branch, for the year 1923.

Owing to he difficulties arising out of the administration of branch by-laws in reference to annual general meetings and election of officers, it was resolved that the Executive Committee be required to consider the question of amending the by-laws, giving particular attention to the following points:—

1. The proposal to have the vice-chairman automatically take the office of chairman for the following year, and the secretary-treasurer to be annually reinstated without an election, unless an election be necessary on account of resignation or other just cause.
2. The proposal to change the date of the annual general meeting to a period more in harmony with branch activities.

In the course of the meeting, Major Walkem, M.E.I.C., gave a brief outline of his activities as councillor for the branch during the past year, making special reference to the western professional meeting at Winnipeg in September, at which he represented the branch.

Major Geo. A. Walkem, M.E.I.C., Elected Reeve of Point Grey

A very noteworthy event occurred on Saturday, January 13th, in the election of Major Geo. A. Walkem, M.E.I.C., to the office of reeve of the municipality of Point Grey, with a majority of 966 votes.

Major Walkem ran for this office one year ago, and failed; but nothing daunted, he came up smiling this year for a vigourous renewal of the contest, and won. His fellow members of *The Institute* and of the Vancouver branch in particular, join in heartiest congratulations, not only because of his success, but because of his determination to carry out the policy which he and other prominent members of *The Institute* have been advocating for many years, namely, to bring the engineering profession into active relation with the administration of public affairs.

The new reeve of Point Grey is a very able man, both as an engineer and as a business executive. The profession believes that such a combination of qualities in the chief executive of a growing and ambitious community, is of a value far superior to any other. Coupled with a forceful but genial personality, these characteristics will undoubtedly win for Reeve Walkem a high degree of public favour and esteem. His numerous friends will watch with confidence, the development of his policies, and the vindication of the assertion that a successful administrator of public affairs can only be the logical result of the abilities and training of the successful engineer.

The Institute is to be congratulated upon possessing in its membership, one more man who has sufficient confidence in his powers, to face the ordeal of an election campaign and win that public trust to which his professional calling justly entitles him. May the example of Reeve Walkem serve as a stimulus to many of our able but less confident members, to offer themselves for similar positions of public trust, so that the profession may more quickly attain to its rightful inheritance.

Course of Lectures on Water-Power Development at University of Toronto

The special short course of lectures conducted last year by the Department of Hydraulics, of the University of Toronto, was of such a satisfactory nature that a similar course will be undertaken this year, and is now being arranged by Professor Angus, head of the Department of Mechanical Engineering and director of the hydraulic work.

Several very prominent engineers have already promised to assist, and it is expected that the course will be given during the latter part of February. Graduates of the university and any others interested are cordially invited, and as the lectures deal with engineering practice they will appeal to the engineers interested in water-power development.

Anyone interested may receive a copy of the programme, when ready, by addressing Professor Angus, Department of Mechanical Engineering, University of Toronto.

Trade Publications

Dominion Engineering Works, Limited, Montreal.—Have published a book of about 70 pages entitled *Progress in Hydraulic Engineering, 1922*, well illustrated by cuts and charts. It contains the principal papers presented at the 1922 hydro-electric conference held under the auspices of the Engineers' Club of Philadelphia and the American Society of Mechanical Engineers and allied bodies. The hydraulic and electrical features of the Queenston-Chippewa power development are described in some detail. The rapid development of the hydraulic turbine within the past few years has brought forward many new problems, and how some of these have been solved is outlined in a paper by H. Birchard Taylor and Lewis F. Moody, "The Hydraulic Turbine in Evolution". The book will be sent on request to hydraulic engineers or water-power owners.

Vickers Limited, through their Canadian agency, 225 Beaver Hall Hill, Montreal, are distributing a twenty-page catalogue describing and illustrating the Vickers-Petter medium compression, semi-Diesel oil engines of the stationary and marine type. In addition to setting forth the principal features of these engines, the catalogue contains data on fuel consumption, and power and dimension tables. It is of interest to note the announcement that Vickers Limited, have secured the order for a 20,000-ton, first class passenger liner for the Orient Line, which will provide new work for their famous Barrow establishment.

De Laval Steam Turbine Company, have lately distributed two pamphlets describing equipment installed by them in the manufacturing plants of the Marquette Cement and Manufacturing Company, Lasalle, Ill., and the Crown Willamette Paper Company, West Linn, Ore. In the former case direct current is used for the operation of cranes, hoists, crushers, etcetera, which is supplied by a direct current generator of 3,750 kw. capacity driven by a De Laval compound geared turbine, while in the latter plant the separate sections of the paper machine are driven electrically by direct current motors. A De Laval gear turbine drives the direct current generator in this case also. A further descriptive pamphlet has been issued by the company describing the new type of multi-stage centrifugal pump in which the company has retained the advantages of the volute construction of its single-stage machines. These pamphlets may be secured upon request from the company at Trenton, N.J.

Newly elected chairman of Montreal Branch at their Annual Meeting recently.

J. T. FARMER, M.E.I.C.,

EMPLOYMENT BUREAU

AND MEMBERS' EXCHANGE

To make this department more valuable it is proposed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Civil Engineer

Wanted a young engineer preferably graduate of two years by a building speciality industrial organization; one ambitious to become connected with a large well known firm, with a view to learning the work for advancement with the organization. Apply Box No. 1-V.

Chemical Engineer

A large industrial firm requires the services of a chemical engineer who has had at least a few years experience. Apply Box No 2-V.

Mechanical Engineer

Wanted by a pulp and paper company in Quebec a young man, single, recent graduate of mechanical engineering, with some draughting experience and preferably some knowledge of pumps and mill layouts although this is not absolutely necessary. The company is prepared to teach the particulars of their work. Apply Box No. 3-V.

Mechanical or Civil Engineer

Young mechanical or civil engineer required by a firm of engineers in Montreal for a position of inspection or structural work. Apply Box No. 4-V.

Mechanical Draughtsman

Required immediately by a large well known company in Northern Ontario, mechanical draughtsman, capable of designing, under supervision, structural and machinery and general repair sketches. Salary $200 per month with railway fare to point of employment. Apply stating qualifications to Box No. 5-V.

Draughtsman

Draughtsman required by a large industrial firm in Northern Ontario a young man with technical training to prepare drawings and perform some detail work. Apply stating qualifications to Box No. 6-V.

Structural Steel Designer

Structural steel designer and estimator for western city. Should have at least two years designing experience as well as general detailing and checking of structural steel and be familiar with reinforced concrete design. Salary $175.00 to $200.00 per month. Give full statement of experience and state soonest available to Box No. 7-V.

Paper Expert

Wanted a man thirty to forty years of age who has had practical paper mill experience. One who is conversant with the different qualities of paper, and has had considerable experience in the manufacture and handling of high class linens and bond writing papers. Should have a pleasing personality and be capable of meeting and conversing easily with people visiting the plant. An executive position in the purchasing department. Salary depends on the qualifications of the man. Apply Box No. 8-V.

Draughtsman

An industrial firm in Montreal will shortly be requiring the services of a few draughtsmen, capable of doing some design work and having had considerable general experience in this line. Apply Box No. 9-V.

Situations Wanted

Structural Engineer

Structural engineer, A.M.E.I.C., age 32, now employed, desires position of greater responsibility and future; sixteen years varied experience in structural steel and reinforced concrete, as assistant engineer, designer, chief draughtsman. Location, Montreal or Toronto. Apply Box No. 2-W.

Civil Engineering Student

Wanted,—permanent position by a third year student in civil engineering. Has had about two years experience in municipal work. Will accept any position where there is a chance of advancement. Apply Box No. 3-W.

Civil Engineer

Civil engineer, A.M.E.I.C., graduate of University of Toronto, wishes position with contracting or consulting engineers. Has had two years experience in surveying and ten years in steel work. Employed at present as a designer in one of the leading structural steel companies of Ontario. Apply Box No. 4-W.

Civil or Mechanical

Graduate of McGill University, 1921, in mechanical engineering desires position in or near Montreal. With steel and car building companies during course; two years on road and hydro-electric construction. Apply Box No. 5-W.

Mechanical Engineer

Graduate of McGill University, age 32, married, desires position, practical mechanic: over ten years experience in manufacturing, duties covering charge of draughting, maintenance, master mechanic, efficiency, inspection, production and assistant to general manager. Successful and experienced in handling men. Apply Box No. 10-W.

Members' Exchange

A Large Microscope

A member of *The Institute* wishes to dispose of a large microscope, manufactured by Collins, London, Eng. The instrument is in good condition and a photograph of it will be forwarded to any interested party upon request. Price $125.00. Apply Box No. 1-E.

Gurley Light Mounted Transit

For Sale: A gurley light mounted transit in good condition, price two hundred dollars. The transit may be seen at room 506, Grand Trunk building, McGill street, Montreal, Quebec.

OTHER SOCIETIES NEWS

Association of Professional Engineers of Nova Scotia

The third annual meeting of the Association of Professional Engineers of Nova Scotia was held in the Green Lantern on January 18th, President C. E. W. Dodwell, Hon.M.E.I.C., presiding.

The report of council showed a registration of 244 members and a substantial financial balance to the credit of the association. The report of the scrutineers declared C. E. W. Dodwell, Hon.M.E.I.C., re-elected to the presidency of the association. A.R. Chambers, M.E.I.C., of New Glasgow, was chosen as vice-president.

A number of resolutions were adopted with a view to having the present act amended so as to make it more beneficial both to the engineering profession and to the public. An animated discussion took place on various matters relating to the welfare of the profession, and the enthusiasm displayed by the members gives promise that the association will continue to grow and to function with increasing power and usefulness.

Canadian Geodetic Society

The Canadian Geodetic Society held the second meeting of their present season on the afternoon of December 16th. The chief speakers were R. H. Field, A.M.E.I.C., of the survey laboratory, Topographical Surveys Branch and A. M. Grant, A.M.E.I.C., of the Geodetic Survey.

The meeting was opened by the president, J. L. Rannie, M.E.I.C., who referred to the very useful work carried on at the surveys laboratory, in the testing and improving of scientific instruments. He then called upon Mr. Field, who read a most interesting and well-prepared paper, "The Telescope and Vision". The lecturer discussed the theory of the telescope, with special reference to definition and resolving power. He also indicated by means of diagrams and formulae the above two properties, with their limitation, in the telescope and the human eye. Finally he showed how the theories established can be used for the practical testing and designing of telescopes for various classes of work.

Mr. Grant then explained how engineers can make use of telescope tests in selecting their instruments to suit atmospheric conditions. He laid special emphasis on the importance of using eye pieces with the largest possible exit pupils under poor conditions of visibility.

In a brief discussion which followed, C. A. Biggar, A.M.E.I.C., spoke of the usefulness of Gauss ocular, a device for illuminating the cross hairs of the telescope, and suggested the advisability of the adoption of this device with the help of the surveys laboratory.

Theory of Isostasy

The members of the Canadian Geodetic Society had the privilege of listening to a lecture of unusual interest. The speaker was Dr. William Bowie, chief of the Division of Geodesy in the United States Coast and Geodetic Survey. Dr. Bowie was introduced to his audience by Mr. Rannie, who spoke briefly of the excellent relations which have always existed between the Geodetic Surveys of Canada and the United States.

Dr. Bowie for upwards of an hour kept his audience intensely interested. The theory of isostasy, which was the subject of his lecture, may be briefly defined as an explanation of the causes which produce geological upheavals and subsidences.

The lecturer explained that the theory of isostasy had been originated by Archdeacon Pratt of England, about fifty years ago, during his residence in India. It had been taken up subsequently on more than one occasion, but had never until recently, been consistently developed. His own attention and that of his colleague, Professor Hayford, had been directed towards it in the course of their geodetic surveying, and in connection especially with explanations of the deviation of the plumb line due to irregularities of the earth's crust. The speaker showed a number of interesting lantern slides, and explained his subject in a most lucid manner. According to the theory of isostasy the density of mountainous areas is less, to a depth of sixty miles or so, than that at lesser elevations. Mountains are gradually eroded and sedimentary deposits gradually come to exert a tremendous downward pressure. This pressure is transmitted underneath the earth's crust and results in an upward pressure which produces new elevations. It is quite impossible in a short report to do justice to so fine a lecture, but it is appropriate to add one important argument by which Dr. Bowie backed up his theory, the fact that great mountain ranges have always occurred comparatively near to what were previously great sedimentary deposits.

The thanks of the audience to Dr. Bowie were expressed by Dr. E. Deville, Hon.M.E.I.C., seconded by Noel Ogilvie, M.E.I.C. The former spoke of the important addition to our knowledge made by such studies as isostasy. The latter enlarged on the world-wide importance of Dr. Bowie's scientific work. Dr. W. H. Collins, director of the Geological Survey, was equally appreciative. He told Dr. Bowie that geologists were always ready to welcome precisely tested facts on which to base their investigations. Dr. Bell Dawson, M.E.I.C., superintendent of the Tidal and Current Surveys, then gave a brief outline of what used to be the generally accepted theory with regard to the formation of mountains. In reply to this Dr. Bowie declared it as his opinion that such shrinkage and buckling as the theory presupposed would be enough to cause far more irregularity in the spherical shape of the earth than was actually to be found. The distinguished visitor then thanked his audience for the appreciation they had shown. A few words from the president brought the meeting to a close, and it can safely be said that the audience, which included a large number of visitors from other branches of the government service, never listened to a more interesting lecture.

University of Manitoba Engineering Alumini Association.

At the second annual dinner of the association, recently held at the St. Charles hotel, Winnipeg, Dean E. P. Fetherstonhaugh, M.E.I.C., was re-elected honorary president and B. A. Johnston, A.M.E.I.C., was the unanimous choice for the office of vice-president, while W. E. Lovell, S.E.I.C., was elected secretary-treasurer. The banquet was a most enjoyable affair and during the course of the evening short addresses were given by Major A. J. Taunton, A.M.E.I.C., Major N. M. Hall, A.M.E.I.C., and Professor J. W. Dorsey, A.M.E.I.C.

Engineering Standards

Canadian Engineering Standards Association has issued, during the past month, two new standard specifications: No. 6-1922, Standard Specification for Steel Highway Bridges, and No. 7-1922, Standard Specification for Flexible Steel Wire Rope and Flexible Strand for Aircraft Purposes.

CORRESPONDENCE

Further Discussion of Concrete Proportioning Theories

Saskatoon, Sask.
January 10, 1923.

Editor, *Journal*—
Dear Sir:—

The writer feels that some further explanation is due to the readers of *The Journal* who may be interested in the proportioning of concrete in connection with the letter discussion furnished by Mr. R. B. Young, A.M.E.I.C., in the December issue which commented on the writer's article, "Some Fallacies in Concrete Proportioning Theories", as published in the September 1922 issue.

While not intended to be "dogmatic" it was not possible in the original paper to include test data, either those presented when the first criticism was made in June 1918, or additional data which have been obtained in the years following. It was therefore necessary to make rather brief and condensed statements, but references were included to earlier discussions which, if referred to, would give any one interested a complete story of the controversy over the recently proposed proportioning theories.

For the benefit of those engineers who are interested in concrete proportioning methods the writer would like to clearly state the basic points involved in the controversy and to suggest a few tests which can be made in any laboratory, to demonstrate the truth or falsity of his claims.

The surface area theory of proportioning was presented in 1918 and the fineness modulus, or water cement ratio theory, in 1919, as Mr. Young states. The first theory claims that the strength of concrete will be found proportional to the ratio of the quantity of cement in the mix to the surface area of the aggregate. A formula for calculating the quantity of mixing water required to result in mortars or concretes of the same consistency was also furnished. The second theory claimed that when the same quantity of cement was combined with equal quantities of different aggregates varying in gradation, but having the same fineness modulus, the same quantity of mixing water would in each case result in the same consistency and in turn equal compressive strengths would be obtained. Complete data as to gradations and proportions employed were given by each as proof of the theories. The writer's original criticisms of these theories based upon repetition of tests of the mortars and concretes offered to support the theories may be briefly summarized as follows:

1. While it was definitely stated by the advocates of both theories that concretes should have the same consistencies to be comparable, this necessity was disregarded in the tests made public by both. The water formula proposed for the surface area theory furnished mortars having *widely different* consistencies. The water formula in the fineness modulus theory also furnished concretes which had markedly different consistencies. Contrary to the claims, equal consistencies could not be obtained when the concretes used in "establishing" the theories were repeated.

2. Disregarding the necessity for equal consistencies in order that concretes might be compared, the compressive strengths which resulted were not proportional to ratio of cement to surface area of the aggregate in the first case, nor were equal strengths obtained for concretes in which the fineness modulus and the water contents were the same.

The foregoing conclusions resulted from reproduction of the mortars and concretes employed by the proponents of the theories as well as for other concretes which were designed to fulfil the requirements of both theories.

It will not be difficult for any laboratory to independently determine the facts in the case by carrying out the following tests as outlined:—

1. *Test of the Surface Area Theory.* (For details of the author's original tests as well as gradations of aggregates and proportions employed see "The Canadian Engineer", July 4 and July 11, 1918). Prepare mortars with sands *C*, *E* and *G* as shown in tables V and VII. These sands are representative of the variation in surface area of the group of nine sands. Note that the quantity of mixing water furnished by the water formula results in a constant water cement ratio for the three mortars. Also note that the formula is inadequate to give a plastic workable consistency for all mortars and that equal consistencies are not obtained as claimed. Consistencies should be determined preferably by means of the flow table, or if not available by means of the cylinder slump test. Then disregarding the limitations of the water formula *add* sufficient water to the drier mixtures to bring all to the *same* consistency and prepare compression test specimens for test later. Finally note the variations in compressive strength which result.

2. *Test of the Water Cement Ratio Theory.*—(See bulletin No. 1, Lewis Institute for graduations of aggregates, water formula, etc.). Screen sufficient aggregate in general use in your district into the various sizes by means of Tyler sieves. Recombine these aggregates so as to obtain aggregates No. 40, 264, 271, 274, 278 and 280. These aggregates are representative of the twenty-seven aggregates included in table 2 of this bulletin. Prepare concretes with one part cement to five parts aggregate by volume. Use the water formula No. 4, on page 13 and note that equal quantities of mixing water are given to each batch. After mixing, determine consistency and note the variations among the group. If the theory of proportioning is correct, the same

consistencies should result for all. Note in table 2 the wide variations in cement content per surface area of aggregate. Here is seen the fundamental difference in the two proportioning theories. *By the "surface area theory" wide strength variations would be expected. By the water cement ratio theory the same compressive strengths are predicted.* Note that the water formula makes no provision for the great variation in surface areas of the aggregates, yet it is universal experience that a fine aggregate requires more water than a coarse aggregate to result in the same consistency.

Additional experiments which would point out the inadequacy of both theories might be outlined, but the two included above should be sufficient. The first and controlling criticism of both theories is that the requirement of equal consistencies for concretes which are being compared is ignored in the actual tests which are advanced to support the theories. The regrading of the aggregates as outlined and their combinations with cement to form mortars and concretes, followed by measurement of consistencies actually obtained will justify the writer's "expression of doubt as to the authenticity of the data on which they are based", and fully justify his claim "that sound principles of testing were violated in obtaining the data".

The "authenticity" of the test data and the "violation" of testing principles are matters which can be checked up by any one who has a set of testing sieves. It is a question of fact which can be determined by test and the fact that other critics have not made their criticisms known to the public should not necessarily carry weight.

However the writer is not alone in making public his criticisms as Mr. Young might lead the reader to believe. Professor Talbot, who as one of the pioneer investigators of the problems of concrete and reinforced concrete has directed the experimental work at the University of Illinois, refers to table No. 2 of the Lewis Institute Bulletin No. 1, as follows: — "Taking those aggregates of this table that come down to a workable basis for concrete, our tests with this material of the same sieve analysis indicate that the water content required to produce a given consistency or mobility for the aggregates with the higher surface areas given in this table, is 25 per cent more than that required for those aggregates having only one-third as great surface area, the fineness modulus being the same in both cases. Using the same amount of water for aggregates of the same fineness modulus as was used in the tests reported in this table, there is quite a difference in strength; if the same mobility and a consequent varying water content had been used, the discrepancies in strength would have been much greater." And later in further discussing the water cement ratio theory:

". . . . . the tests referred to indicate that the use of a water content based upon fineness modulus, ... , does not give concretes of the same mobility with aggregates which vary in surface area but have the same fineness modulus." The above two quotations are taken from volume XIX, proceedings of the American Society for Testing Materials.

In bulletin No. 2, 1921, section No. 6, School of Engineering Research, University of Toronto, Professors Gillespie and Duff make the following statement which has direct reference to tests made in connection with a study of the water-cement ratio theory of proportioning:— "Apparently there is no precise relation between strength and water cement ratio, but rather a general tendency for the strength to increase as the water-cement ratio diminishes. Referring to the three ordinates (figure 3) where the ratio is 0.65, 0.8 and 1.0 it will be seen that the strength may vary 100 per cent or more above a minimum."

The foregoing quotations are fully in accord with the writer's original criticisms of this method of proportioning.

Yours very truly,

G. M. WILLIAMS, A.M.E.I.C.

Test of Carrying Capacity of Steel I-Beams Supporting a Concrete Slab and Haunched in Concrete

Montreal, January 16th, 1923.

Editor, *Journal:*—

Dear Sir:—

At the Lachine Plant of the Dominion Bridge Company, Limited, and under the auspices of the Canadian Manufacturers' Association, there is being conducted an interesting and significant series of tests of the carrying capacity of steel I-Beams supporting a concrete slab and haunched in concrete. The result of these tests may lead to very important modifications in the design of steel buildings.

The tests are being made by Professor MacKay, Leluau and Gillespie, representing the McGill University, University of Montreal and University of Toronto, and from the results available up to date go to show that the concrete assists the steel beams very materially.

The following preliminary reports from Professor MacKay of McGill University, indicate that the fibre stress on the beams, when stressed by the usual building loads, is reduced by over 35 per cent, and the deflection shows less than 1/5 of that shown in the steel beams acting independently.

Further tests as to whether the effect of vibration will have a damaging influence on the combined action of the steel and concrete are to be made, and if no serious effect is manifested by them, it will clearly indicate that the present method of figuring the strength of steel beams in combination with concrete slab is not only incorrect but also wasteful, and one which good engineering must rectify in future construction.

Owing to the large number of inquiries received from engineers throughout Canada, this preliminary test is being forwarded for publication, in order that it may come to the attention of the engineering profession for their information.

Yours very truly,

F. P. SHEARWOOD, M.E.I.C.

McGill University,
Montreal, January 6th, 1923.

F. P. Shearwood, Esq.,
Chief Engineer, Dominion Bridge Company, Montreal.

Dear Sir:—

I beg to send you the approximate results of the tests made by Professor Gillespie, Professor Leluau and the writer, on the two floor panels erected by you in your plant at Lachine. While the figures are subject to slight changes on revision, they may be taken as substantially correct.

The two panels were identical, each consisting of a typical floor-slab 4 inches thick, and 10 feet by 16 feet in area. Each slab was supported by two 10-inch I-beams, 16 feet long. The I-beams were in turn riveted to girders, the whole being so constructed as to give very little end restraint, thus avoiding uncertainties in the computations and in the interpretation of the results. As the behaviour of the two panels showed only such slight differences as might be reasonably expected from variations in section or quality of the steel or concrete and from unavoidable errors in observation, the following results are averaged in so far as they apply to both panels.

The tests made were as follows:—

1. After erection but before pouring the concrete, a load was applied equal to the estimated weight of the concrete, or about 75 pounds per square foot. Subsequent weighing of the concrete showed this estimate to be practically correct. The stresses in the lower flanges of the I-beams due to this load were then measured by two different methods, and the deflection of the beams were also measured.

Results:	Flange stress, calculated	6,345 lbs. per sq. in.
	Flange stress, measured (av.)	6,360 lbs. per sq. in.
	Deflection, calculated	0.167 in.
	Deflection, measured	0.164 in.

2. A live load of about 110 pounds per square foot was next applied and the flange stresses and deflections due to this load measured.

Results:	Flange stress, calculated	9,195 lbs. per sq. in.
	Flange stress, measured	8,610 lbs. per sq. in.
	Deflection, calculated	0.241 in.
	Deflection, measured	0.230 in.

The stresses and deflections resulting from the above two I loads combined were therefore:

	Flange stress, calculated	15,540 lbs. per sq. in.
	Flange stress, measured	14,970 lbs. per sq. in.
	Deflection, calculated	0.407 in.
	Deflection, measured	0.394 in.

The close agreement of the above results showed the reliability of the methods used in making the measurements.

3. After the concrete had been poured and cured for 23 days, the flange stresses in the beam were again measured. The result was an average stress of 6,780 pounds per inch, as against 6,360 for an equivalent load in test No. 1. As the forms were suspended from the beams and not removed until after the concrete had set, any deflection due to their weight could not be recovered fully when they were removed. Some such increase of stress was therefor to be expected.

4. The previous live load of 110 pounds per square foot of slab was again applied. The load was not the same as in test No. 2. The observed flange stress was, on the average, 2,750 pounds per square inch, as against 8,610 for the same load in test No. 2, before concreting. The average deflection was 0.036 inch, as compared with 0.230 inch before concreting.

5. No further tests were made on panel No. 2, which proved slightly the stiffer throughout the above tests. The live load on panel No. 1 was however increased about 50 per cent above the normal. The observed flange stress due to this increased live load was 5,100 pounds per square inch, and the deflection 0.067 inch.

6. The live load was next increased to 100 per cent above the normal and the flange stress was found to be 7,600 pounds per square inch or 1,000 pounds less than that due to half as great a load before concreting. The deflection due to this load was 0.101 inch, or less than half as much as that due to half as great a load before concreting.

Combining the above figures it appears that the flange stress due to the dead and normal live loads together is about 36 per cent less after concreting than before. The stress due to the head load and a live load 50 per cent above the normal, acting together is some 20 per cent after concreting than that due to the dead and normal live load before concreting. Finally, after concreting the beams sustained the dead load and twice the normal live load with a smaller flange stress than that due to the dead and normal live load before concreting.

Yours very truly,

H. M. MacKay, M.E.I.C.

Student Member has exciting experience in Smyrna

St. Thomas, Ont.
December 18, 1922.

Editor, *Journal:*—

Dear Sir,

I thank you for your letter of the 16th instant, for your expression of sympathy over my material losses in the Smyrna disaster. As you say, I was lucky to get off with a whole skin, and I fully realize that now, although at the time it was rather embarrassing to lose one's possessions and position, or rather job.

I graduated in civil engineering from Queen's last May, and right after went to Smyrna, Asia Minor, where I was temporarily employed by the Standard Oil Company of New York, on general construction work. Later I obtained a job as assistant supervising engineer on building construction, but had barely commenced my duties when Kemal's hordes swept down on the place and our government ordered all British subjects to evacuate at short notice. I was first dumped on the island of Cyprus, a British possession in the eastern Mediteranean, along with a lot of other British refugees, and from there beat my way back to Athens where my credit was good enough to enable me to raise the price of a third-class passage to New York on a Greek steamer, Quite an experience, I assure you, which ended by my being sent to Ellis Island along with all the immigrants from south western Europe and Italy. However I got through that ordeal safely and proceeded on my way to God's country. I put in three weeks steady job-hunting before I finally obtained a job here as instrument-man with the city engineer, and am glad to be at work again in a country where one's life and property, if not one's job, are assured.

I am yours sincerely,

A. G. MacLachlan, S.E.I.C.

Publications

A Story of Railway Pioneers.

Major S. Snell, M.C., (Ex. R.E.), A.M.E.I.C., has made the engineering profession his debtor by publishing a story of railway pioneers, being an account of the inventions and works of Isaac Dodds and his son, Thomas Weatherburn Dodds, regarding their great contributions to engineering science. Major Snell's work, as a permanent record of the early achievements in this branch of the science of engineering, is highly commendable. It is to be sincerely hoped that many more such historic chronologies may be produced, in order that a record of the remarkable advances in science, made possible by the inventive genius of men of the engineering profession, may for all time be preserved as a memorial to the profession.

In the introduction, Major Snell draws attention to the tendency, under present day conditions, to overlook the vast debt owed to "the men who invented and introduced the great civilizing element, the steam locomotive". This tendency is all too apparent throughout the historic records of the stupendous advances made in scientific researches of the past century. In this respect, Major Snell's book is invaluable as providing a perpetual record of the life's work of those men, whose genius has provided us with one of the greatest necessities of modern civilization.

Preliminary Notice

of Applications for Admission and for Transfer

19th January, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in February, 1923

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements ,or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members

FOR ADMISSION

BAIN—JAMES WILLIAM, of Kingston, Ont. Born at St. Polycarpe, Soulanges, Que., Dec. 25th, 1883; Educ., B.Sc., McGill Univ., '14; active service P.P.C.L.I. 1914-19; 7 mos., asst. engr., and dftsman., Electrical Comm. of Montreal; 1919-22, senior demonstrator in electr'l. engr'g., Queen's Univ.; 1922-23, asst. Professor of electr'l. engr'g., Queen's Univ., Kingston, first session lecturer.

References: L. A. Herdt, C. V. Christie, E. G. Burr, L. M. Arkley, D. M. Jemmett.

BOWES—LEROY THORNE, of Ottawa, Ont. Born at Sackville, N.B., June 28th, 1890; Educ., B.Sc. (honours) Acadia Univ., '12; engr'g. cert., special work in physics and B.A., '13; 1907-08, chainman, rodman and field dftsman., prelim. and trial location under J. S. O'Dwyer, C.E. Moncton, N.B.; 1910-11, office and field work, Boston Maine railroad under J. L. Shanks, Divn. Engr., Fitchburg, Mass.; 1912-13, dftsman and engr., office Engr's Dept., Nat. Transc. Rly., Ottawa; 1913-15, asst. on James Bay survey, hydrographic survey, Dept. of Naval Service, Ottawa; 1916-18, asst. on Kingston Harbour and Kingston to False Ducks survey; 1918-19, in chg. office work, Kingston Harbour survey; 1919-20-22, asst., Lower St. Lawrence survey; 1921, in chg. western section Lake Melville survey in connection boundary dispute between Canada and Newfoundland, detached from "C.G.S. Acadia" under Capt. F. Anderson, M.E.I.C.; 1922, in chg. Gaspe Harbour survey, detached from "C.G.S. Cartier"; at present, asst. on Lower St. Lawrence Survey, Hydrographic Survey of Canada, Ottawa, Ont.

References: W. J. Stewart, F. Anderson, J. S. O'Dwyer, J. Murphy, J. J. Aldred, C.F. Hannigton, F. Delaute, J. L. Rannie.

CLARKE—WILFRED ERNEST, of Sydney, N.S. Born at Cobourg, Ont., Apr. 13th, 1881; Educ., pvte. tuition and evening classes, School of Practical Science; 1896-1900, 4 yrs. practical shop time, 1900-05, supt., 1905-11, mgr., and 1911-22, Vice Pres. and Genr'l. Mgr., Sydney Foundry and Machine Works, Ltd., chg. of shop and outside work and erection, designed, made drawings and estimated costs all classes of power plants, mining machinery, bridges, steel bldgs., ships, dredges with boilers and machinery, dry docks, marine rlys., salvage plants, coffer dams, etc., with Dominion Govt. on surveys and appraisals in connection with public works; to date, Vice President and General Manager, Sydney Foundry and Machine Works, Limited, Sydney, N.S.

References: G. A. Bernasconi, K. H. Marsh, C. M. Odell, A. P. Theuerkauf, F. W. Gray.

CLEATON—REINALLT EWART, of Montreal, Que. Born at London, England, May 25th, 1887; Educ., Univ. of London, (Northampton Engr'g. Coll.), 1907-08, 1904-07, appr'ticeship, John I. Thorneycroft Co., Ltd. (shops, drawing office, 1 yr. in chg. Admiralty tests); C.P.R. track constrn. six mos.; 1908-10, shop methods improvement, Angus shops; 1911, dftsman., Babcock & Wilcox, Ltd.; 1911-14, design, layout and sale of machinery, Canadian Fairbanks Morse Co., 1914 to date, Manager and President, Cleaton Company (Canada) Limited, chg. design, layout and installn. of steam plant equip'mt. during 1919, 1920 and 1921, in addition, acted as European Mgr. and Ch. Engr. for Diamond Power Specialty Co., — design and superintended installn. of Mechanical Soot Blowers, and plants of Glasgow, Blackburn, Hull, Doncaster and Dundee Corporations, etc.; similar work in equipping over 30 ships built in Canada, also design, layout and installn. of equip'mt. in over 300 power plants in Canada.

References: H. Holgate, K. B. Thornton, R. S. Kelsh, F. A. Combe, J. T. Farmer, J. H. Hunter.

ETCHES—HARRY, of Ottawa, Ont. Born at Doncaster, England, Mar. 24th, 1862; Educ., Royal Univ. of Ireland, arts and engr'g. course, 1883-85; 1878-83, student, appr'tce., dftsman. and mechanic, and 1885-89, mech. supt., blast furnaces and rolling mills, Milton Iron Works near Sheffield, Eng.; 1890-92, asst. Supt., Jos. Westwood & Co., Millwall and later with Westwood & Baillie, Ltd., Poplar, London, E., bridge and structr'l. steel contracts for Indian Govt. Rlys., and fabrication and erection, Sukkur Cantilever bridge for Euphrates Valley Rly.; 1892-96, ch. dftsman., Waterous Engine Works, Ltd., Brantford, Ont.; 1896-1903, Pittsburgh and Steelton, Pa., with Carnegie Steel Co., Westinghouse Electric and Manufacturing Co., and Pennsylvania Steel Co., engag'd., principally on layout of plant etc.; 1903-15, pvte. prtce., consltg. mech. engr., Toronto, Ont.; 1916-18, ch. engr., British Fordgings Ltd., Ashbridge Bay, Toronto; 1919-21, ch. instructr., engr'g. classes, vocational School of Dept. of Soldiers' Civil Re-establishment, Ottawa; at present research engr., Natural Resources Intelligence Branch, Dept. of the Interior, Ottawa, Ont.

References: E. E. Freeland, F. H. Kitto, A. B. Lambe, W. J. Peaker, P. Sherrin, E. W. Stedman, R. F. Uniacke.

JOHNSON—JAMES HENRY, of 513 Gilmour Street, Peterborough, Ont. Born at Manchester, England, June 14th, 1897; Educ., 4 yrs. part time student Manchester Coll. of Tech., in elec. engr'g., 1913-16; 1916-18, 2nd Lieut., R.A.F.; 1919-20, drftng. in design office, Handley Page, Ltd., aeronautical engrs., Cricklewood, London, Eng.; 1920-21, drftng., on the elec'l. installn. of C.P.O.S. "Empress of Canada", the Foster Engineering Co., Wimbledon, London; 1921, and at present dftsman., Canadian General Electric Co., Ltd., Peterborough, Ont.

References: E. Maybee, F. Bowness, B. Ottewell, E. R. Shirley, G. R. Langley.

MACKENZIE—GEORGE CLEGHORN, of Montreal, Que. Born at Kincardine, Ont., July 26th, 1878; Educ., B.Sc., Queen's Univ., '03; 1898-1900, underground mining in British Columbia; 1900-03, (summers), laboratory asst. and blast furnace helper, Canada Iron Furnace Co., Midland, Ont.; 1903-05, asst. blast furnace supt., and 1906-07, blast furnace supt., Londonderry Iron and Mining Co., Londonderry, N.S.; 1908-10, special mining reports and claim inspectn. for Ontario Bureau of Mines; 1910-18, chief of ore dressing and metallurgical divn., Mines Branch, Dept. of Mines, Ottawa, including 1915-18, secy. and commnr., Canadian Munition Resources Comm.; 1919-20, genrl. mgr., Electrical Steel and Engineering Co., Welland, Ont.; 1921 to date, general secretary, Canadian Institute of Mining and Metallurgy, Montreal, Que.

References: H. B. R. Craig, J. McEvoy, J. D. Craig, W. P. Wilgar, A. Macphail, L. W. Gill, F. S. Keith, J. B. Porter, H. E. T. Haultain.

MARTIN—ROBERT McCREADIE, of Evansburg, Alta. Born at Fargo, N.D., U.S.A., Dec. 26th, 1892; Educ., B.Sc., Univ. of Alberta, '15; 1911, C.P.R. high level bridge, Edmonton, Alta.; 1912, Canadian Bridge Co., high level bridge, Edmonton; 1913, chg. of laying out yards and spurs, G.T.P. and C.N.R., laying out of townsite and installn. of water system, Pembina Coal Co., Ltd.; 1914, with same company, chg. of works for Pembina Clay Products Co., Ltd.; 1915-18, officer in no. 1 Tunnelling Co., mining on western front; 1919-21, surveying and engineering, North American Collieries, Limited.

References: R. J. Bethune, A. W. Haddow, W. Hardy, C. N. Mitchell, J. B. Morrison.

McLEAN—CHARLES LUTHER, of Chute, Ont. Born at Lindsay, Ont., Sept. 12th, 1882; Educ., Parkdale and Jarvis Sch. Collegiate, Toronto, Junior matric.; 1904-07, chainman, rodman and topogr., leveller, and instr'man., constrn., T. and N.O. Rly.; 1909, transitman, location, Alberta and Great Waterways; 1910, res. engr., Alberta Central Rly.; 1911-12, res. engr., and 1912-14, supt. of constrn., Edmonton, Dunvegan and British Columbia Rly.; 1914-19, overseas; at present, transport officer, Temiskaming and Northern Rly., James Bay extension.

References: S. B. Clement, A. T. C. MacMaster, H. G. Dimsdale, A. L. McDougall, W. R. Maher.

MUGGAH—MORTON SAMUEL, of Sydney, N.S. Born at Sydney, N.S., Mar. 15th, 1897; Educ., Sydney Academy and I.C.S. course, civil engr'g., partly completed; 1917-18, rodman and chainman, and 1918-19, transit and levelman, Dominion Iron and Steel Co.; 1919-20, transit and level man, Prov. Highways Board; 1920 (summer), principal asst. to engr., Crandall Engr'g. Works, building slip for Sydney Foundry Co.; 1921, (summer), asst. to supt. on Bius d'oi Road, and 1922 (summer), asst. res. engr., Ben Eoin Road, Provincial Highways Board.

References: R. M. McKinnon, A. D. Jost, R. J. McNeil, H. Longley, R. L. Waycott.

PHILLIPS—CHARLES SILVESTER, of Ottawa, Ont. Born at Petrolea, Ont., Mar. 1st, 1885; Educ., civil engr'g., Univ. of Toronto, 1903-05; 1906-07, instr'man., Dominion Land Survey; 1907-09, various small engr'g. works; 1909-16, with Canadian Copper Cliff Co., Copper Cliff, Ont., as follows:—1909-12, design large smelting plant, structr'l. steel and reinforced concrete in bldgs., etc., surveys and constrn. of plant; 1912-16, triangulation survey covering about 150 sq. miles, with complete chg. field and office work, also in chg. extensive survey on power develop'mt. scheme on Spanish River, design and constrn. dams, piers, machine and engine foundations, etc., and res. engr., on constrn. town water supply system, sewage and sewage disposal plant,etc.;1916-19, C.E.F. and R.A.F., overseas; 1919-20,ch. instructr. in drawing, Vocational Br., Dept. Soldiers' Civil Re-establishment, Hamilton, Ont.; 1920 to date, hydrometric engr.,Chief Engineer's Branch,Dept. of Railways and Canals, Ottawa, Ont.

References: E. B. Jost, R. C. F. Alexander, J. M. Wilson, D. G. Kilburn, W. R. Maher, A. T. C. McMaster.

POLYBLANK—KENNETH GRAHAME, of Hornepayne, Ont. Born at Bristol, England, Aug. 17th, 1884; Educ., Technical Sch., London, Ongar Coll., Essex, England; 1905, chainman, Temiskaming and Nor. Ont. Rly.; 1906, chainman, Grand Trunk Rly., Superior Div.; 1907-09, chainman and rodman, district F., and 1909-11, dftsman., instr'man., and asst. engr., dist. F., Transcontinental Rly.; 1911-12, res. engr., C.N.R., Sudbury, Port Arthur, Ont., and 1912-14, divn. engr.; 1915-18, Canadian Infantry, Canada and France; 1918-19, forward constrn. officer in field, 2nd Tramway Coy., Canadian Engrs.; 1920-22, divn. engr., C.N.R., Nipigon Divn.; at present, engr. in chg. of constrn., Long Lake Cut Off, C.N.R.

References: H. T. Hazen, A. F. Stewart, G. P. MacLaren, C. H. N. Connell, W. T. Moodie.

SHEPPARD—ALBERT CAMPBELL TREMAIN, of Ottawa, Ont. Born at Ottawa, Ont., April 16th, 1887; Educ., B.A.Sc. (graduation with diploma '07, with degree '22) University of Toronto; D.L.S., '09; 1906, (3 mos.), rodman and chainman, C.P.R., on mtce. of way; 1907-08, (9 mos.), rodman on location and constrn., C.P.R.; 1908-09, articled asst. on Dom. Land Surveys; 1909-11, asst. on topogr'l. surveys, and 1911-22, chief of topogr'l. surveys party on topogr'l. mapping for Geological Survey, Dept. of Mines; to date, topogr'l. engr., Geological Survey, Dept. of Mines, Ottawa, Ont.

References: W. H. Boyd, K. M. Cameron, C. P. Edwards, J. L. Rannie, J. D. Craig, N. E. D. Sheppard, J. B. Challies.

SIMPSON—PHILIP, of Montreal, Que. Born at Buxton, England, Feb. 29th, 1896, Educ., 1907-11, Leeds Central High Sch., Eng., 1911-14, grad., Leeds Central Tech. Sch. (evening classes), 1920-21, courses in engr'g., estimating, etc., Regent Str. Polytech., London, England, 1911-14, fitter on machine tool constrn., Campbell and Hunter Co., Ltd., Leeds; 1914-17, fitter and engine erector, Blackburn Aeroplane and Motor Co., Ltd., Leeds; 1917-18, senr. dftsman., same firm on aircraft, detail design and detail stress work under Mr. Harris Booth, A.M.I.C.E., F.R.Ae.S. (for British Admiralty), and 1918-19, in chg. destruction tests on aircraft constrn., 1919-20, chg. modification to flying boat designs at Bognor, for Handley Page Ltd., London, and 1920, tech. repres. of engr'g. sales dept., 1921, resuming work on torpedo carrier design (aircraft); 1921 to date, manager, Montreal Branch, engr'g. sales dept., including Prov. of Quebec, Ottawa and part Ontario for Herbert Morris Crane and Hoist Co., Ltd., Niagara Falls, Ont.

References: J. T. Farmer, M. R. Meldrum, J. B. Candlish, H. C. Johnston, J. F. Brett, W. J. Armstrong, G. M. Wynn, G. R. Heckle, R. B. Jennings, J. Ferguson, E. Cormier.

TERRY—DOUGLAS PERRY, of Port Arthur, Ont. Born at Birmingham, England, July 26th, 1892; 1910-12, dftsman., instr'man., etc., city engr's dept., Port Arthur, Ont., 1912-14, chg. of layout, inspectn. of constrn., etc., portions of waterwork system, streets, etc., City of Port Arthur, overseas, Sub. Lieut. and Lieut., R.N.V.R., second in command and in command, Auxiliary patrol vessels, after armistice in command mine clearing duties, 1920 to date, designing dftsman., hull design, machinery details, estimating, etc., Port Arthur Shipbuilding Co., Ltd., Port Arthur, Ont.

References: A. G. Jeffreys, I. M. Jones, J. Antonisen, W. F. Moodie, G. H. Burbidge.

WADE—NORMAN WALTER of 1452 Wascana Str., Regina, Sask. Born at Brighton, England, Dec. 29th, 1892; Educ., Cambridge Univ. local exam., 2nd class honours, '08; Canadian Air Force Schools, Camp Borden and Royal Air Force Schools, Hastings, Denham, etc.; chg. and mtce. auxiliary power plant of telephone exchange in absence of wire chief; charge of test desk of Automatic Telephone Exchange, Regina, to date; telephone engineer, Automatic Telephone Exchange, Regina, Sask.

References: W. R. Warren, H. B. Sherman, S. R. Parker, F. H. Small, D. A. R. McCannel.

WHIDDEN—JOHN SMITH, of 9847 91st Avenue, Edmonton, Alta. Born at Bridgetown, N.S., Mar. 24th, 1893; Educ., High School, 1910; May-Dec., draughting in sub-divn., under John Francis, D.L.S.; 1911-22, under E. D. Robertson, D.L.S., as follows:—1914, Mar.-Dec., and 1920, June-Dec., draughting on road diversion work, 1915, 1921 and 1922, May-Dec.; instrumentman, 1918, July-Dec., assisted J. D. Forbes on rly. constrn., Hanna-Medicine Hat Branch, C.N.R.

References: D. W. Ritchie, J. D. Robertson, L. C. Charlesworth, J. L. Côté, R. H. Douglas.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

CHANDLER—RALPH BORTHWICK, of Port Arthur, Ont. Born at Stratford, Ont., July 15th, 1889; Educ., B.Sc., Univ. of Toronto, '12, 1907, Parks Board, Engr., City of Stratford; 1908, field engr., Hydro-Electric Commn., City of Stratford; 1909, field engr., on surveys for proposed tube system, Dept. Rlys., Bridges and Docks, City of Toronto, Ont.; 1912-14, asst. city engr., in chg. main drainage dept., Saskatoon, Sask.; 1914-17, res. field engr., on elevator constrn. for Bd. of Grain Commnrs., for Canada, at Saskatoon, Moose Jaw and Calgary; res. field engr. and designing engr., with C. D. Howe and Co., Port Arthur, Ont.:—1917, grain elevator for United Grain Growers and Grain Co., Port Arthur, 1918, grain elevator for Saskatchewan Co-operative Elevator Co., Port Arthur; 1919-21, sub-aqueous foundations, Plymouth Cordage Warehouse, Fort William, Ont., and grain elevators for C.N.Rlys., Port Arthur; Supt. of constrn. on the following:—grain elevator for Brooks Elevator Co., Fort William, 1921-22; fresh water intake for Thunder Bay Paper Co., Port Arthur, 1922-23; at present designing and field engr., with same firm, C. D. Howe and Co., Whalen Bldg., Port Arthur, Ont.

References: J. Antonisen, C. D. Howe, W. T. Moodie, G. R. Duncan, W. H. Souba.

COTE—LOUIS E., of Ottawa, Ont. Born at St. Hyacinthe, Que., Jan. 13th, 1875; Educ., C.E. and B.A.Sc., Laval Univ., '06; 1900, dftsman., Cambria Steel Co.; 1901, design'g., Phoenix Bridge and Iron Wks., Montreal; 1903, principal asst., rly. location, constrn. etc., M. and J. E. Woods, Frank, Alta.; 1904 to date, with Marine Dept., Ottawa, as follows:— 1904-10, technical officer; 1910-21, chief dftsman.; 1922 to date, assistant chief engineer.

References: K. M. Cameron, W. H. Carson, V. F. W. Forneret, B. H. Fraser, P. E. Mercier, A. St. Laurent, A. Surveyer.

NEWELL—FRED, of 297 Harvard Ave., Montreal, Que. Born at Portsmouth, England, Mar. 12th, 1878; Educ., Woolwich Polytech. and Birkbeck Inst., London, 1900-05, Whitworth Exhibition and Polytech. Bronze Medallist, '03; 1893-97, appr'tce., Royal Arsenal, Woolwich, working to 1899; 1900, in chg. erection field gun mountings, Vickers Sons and Maxim; 1901-06, inspectr., gun sights, Royal Arsenal, Woolwich; 1905-07, lecturer in engr'g. maths., Woolwich Polytech. and Erith Tech. School; 1907, dftsman., John McDougall Caledonian Iron Works; 1908-13, design'g. dftsman. and checker in mech. and structrl. depts., Dominion Bridge Co.; 1908-13, on cranes, sluice gates, swing bridges, includ'g. elec. travelling cranes for St. Malo Shops, Que., Red River, Pitt River and Kildonan C.P.R. swing spans and hydraulic regulating gates for Laurentide Co.; 1913-15, dftsman., 1915-18, asst. mech. engr., and 1918 to date, mech. engr., in chg. estimates and design mech. engr'g. work, 150-200 ton cranes for H.E.P.C. of Ontario, Queenstown develop'mt. and Shawinigan Water and Power Co., Niagara Control Gate, H.E.P.C., 100 ton crane and head sluice gates, Manitoba Power Co., and St. Charles River Swing Span machinery for Dept. of Rlys. and Canals, with Dominion Bridge Company, Ltd., Montreal, Que.

References: G. H. Duggan, H. H. Vaughan, W. J. Francis, F. P. Shearwood, H. Rolph, P. L. Pratley, D. C. Tennant.

PARKER—GUY CAMERON, of 29 Dorval Rd., Toronto, Ont. Born at Montreal, Que., June 19th, 1889; Educ., B.A.Sc., '11, M. A. Sc., '16, C. E., '19, Univ. of Toronto; 1908 (May-Sept.), John Inglis Co., Toronto; 1909 (May-Oct.), Suicliffe and Neelands, New Liskeard; 1910 (May-Oct.), hydro sub-stations, General Electric Co.; 1911-12, in chg. insular testing and asst. in testing and inspectn. of Equipment, Smith, Kerry and Chace; 1912-14, tech. editor of Motor Magazine, Toronto; 1914 to date, with Ontario Dept. of Public Highways as follows:—1914-18, asst. engr. engag'd. in inspectn. and supervisn. of constrn. of highways, making special inspectns. and reports, etc.; 1918-19, res. engr., Hamilton-Queenston Prov. Highways; 1921 to date, secretary, Ontario Dept. of Public Highways, Toronto, Ont.

References: W. A. McLean, R. C. Muir, R. O. Wynne-Roberts, G. Powell, C. R. Young, P. Gillespie.

SIMMONS—THOMAS LOCKWOOD, of Ottawa, Ont. Born at Sheffield, N.B., Jan. 17th, 1872; Educ., B.A. and diploma in civil engr'g., Univ. of New Brunswick, '93; 1892 (summer), rodman, Tobique Valley Rly.; 1893, bridge constrn., Bangor and Aroostook Rly., and re-location survey north of Houlton; 1895, asst. engr. on prelim. survey on line from Minto to Fredericton, N.B.; 1896, on location survey, Woodstock and Centreville Rly.; 1898-1901, in chg. of deepening river reaches Lake St. Francis; 1901-04, inspect'g. engr., Dept. of Rlys. and Canals; 1904-09, asst. engr., Bd. of Rly. Commnrs.; 1909 to date, asst. chief engr., Board of Railway Commissioners, Ottawa, Ont.

References: G. A. Mountain, J. M. R. Fairbairn, F. L. C. Bond, H. T. Hazen, J. Murphy, A. F. Stewart.

WILSON—LEROY ZIMMERMAN, of Montreal, Que. Born at Brampton, Ont., Sept. 18th, 1889; Educ., B.A.Sc. (grad. diploma '09, degree '11), Univ. of Toronto; 1909-10, drftng. and design'g. office, Dominion Bridge Co., Ltd.; 1911-15, engr'g. staff, on tech. studies of design ,details and constrn. of Quebec Bridge, St. Lawrence Bridge Co., Ltd.; 1915-19, C.E.F., C.O.R.C.C., and Can. Rly. Troops, Lieut. to Major, engaged on rly. and bridge constrn., design and constrn. heavy replacements large naval guns, genrl. field engr'g. etc.; 1919 to date, as follows:—1919-20, constrn. engr., Montreal office, chg. designs and estimates with tech. supervisn. erection all structural steel work in district—1921 (Jan.-Aug.), asst. to President with special tech. and genrl. duties 1921 to date, asst. ch. engr., genrl supervisn. routine of engr'g. and constrn. depts., works extension and reconstrn. etc., Dominion Bridge Co., Ltd., Montreal, Que.

References: G. H. Duggan, P. Johnson, F. P. Shearwood, G. F. Porter, C. W. P. Ramsey, P. Gillespie, D. C. Tennant.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

ALBERGA—GEORGE FREDERICK, of Clarendon, Jamaica, B.W.I. Born at Black River, Jamaica, B.W.I., April 29th, 1892; Educ., B.Sc., (C.E.), McGill Univ., '15; 1915-16, ch. inspectr., munitions plant, Canada Cement Co.; 1916-19, no. 2 Constrn. Battn., C.E.F., attached to Canadian Forestry Corps., France; 1919-20, demonstrator, McGill Univ., depts. of mech. engr'g. and descriptive geometry; 1920 (June-Dec.), dftsman., Chief Engineer's office, Bridge Dept., C.P.R.; 1921-22, demonstrator, McGill Univ., depts. descriptive geometry and surveying fieldwork, asst. McGill observatory in chg. meteorological observations; Oct. 1922 to date, supt., Parochial Roads and Works, responsible for mtce. of roads (400 miles) and upkeep of public bldgs., water supply, etc., also design and constrn., new works, Clarendon, Jamaica, B.W.I.

References: D. L. Derrom, H. M. MacKay, C. M. McKergow, J. B. Porter, P. B. Motley, A. J. Kelly, J. Weir.

BROWN—DONALD WALLACE JAMES, of Sydney, N.S. Born at Low Point, N.S., Sept. 11th, 1896; Educ., one yr. engr'g., St. Francis Xavier Coll., Antigonish, N.S., and I.C.S. mech. engr'g. course, half completed 1915; summer, chem. laboratory, N.S. Steel and Coal Co., Sydney, N.S., and Sept.-Nov. 1915, in shell manufacturing shop; 1915-19, dftg. office, N.S. Steel and Coal Co.; 1919-20, dftsman., mech. sketch room and 1920 to date, in chg. mech. sketch room, Dominion Iron and Steel Co., Ltd., Sydney, N.S.

References: K. G. Cameron, K. H. Marsh, A. W. McMaster, H. Longley, S. C. Mifflen, T. J. Brown.

COLLINS—WILLIAM HENRY, of Hamilton, Ont. Born at Toronto, Ont., Aug. 15th, 1887; Educ., B.Sc., Queen's Univ., '20; 1913-14, summers, dftsman, sewer dept., Toronto; 1916-19, active service; 1919 (Mar.-Oct.), Toronto Harbor Commission; 1920-21, estimates and survey work, Lands and Surveys Dept., Toronto Harbor Commission; Aug. 1921 to Nov. 1922, res. engr., Wellington St. Storm Sewer, sections 1 and 2, City of Hamilton; to date, res. engr., Kenilworth Ave. Storm Sewer, Section 1, City of Hamilton, Ont.

References: L. R. Gray, W. L. McFaul, W. M. Johnston, R. F. Ogilvy, N. D. Wilson, J. Mack, W. P. Wilgar, A. Macphail.

FLOOD—JOHN NASH, of 96 Cobourg Street, St. John, N.B. Born at St. John, N.B., June 6th, 1885; Educ., B.Sc., (C.E.), Univ. of New Brunswick, '16, 1915, summer, C.P.R. on mtce. of way, 1915, summer, topography, Dominion Geological Survey, Sudbury, Ont., 1916, summer, Dept. of Marine and Fisheries, St. Lawrence Ship Channel; 15 mos., grain elevator constrn., Fegles Construction Co., Fort William, Ont., 18 mos., engr. in chg., Sheffield Coal Mining Co., Minto, N.B., 1919 to date, member of firm of John Flood and Sons, Limited, general contractors, St. John, N.B.

References: A. G. Tapley, J. P. Mooney, G. G. Hare, B. Wilson, F. P. Vaughan, J. A. Stiles.

GARDNER—WILLIAM McGREGOR, of 108 Matthew Str., Montreal, Que. Born at Montreal, Que., April 15th, 1896; Educ., B.Sc., McGill Univ., '17, and Canadian Militia Cert., military engr'g., 1916, genrl. designer and dftsman., Shawinigan Water and Power Co.; 1917-19, artillery observer and Battery Commdr's. asst., on active service overseas; 1919 to date, with Montreal Tramways Co. as follows:—1919, field engr., street and track surveys and levels; 1919-22, trackwork engr., designing trackwork layouts; 1922, engr. of special trackwork, supervising design, constrn. and mtce., of special trackwork on the Montreal Tramway Company's system.

References: H. M. Mackay, A. R. Roberts, J. H. Hunter, W. T. Graves, G. R. MacLeod, K. B. Thornton, R. Bickerdike, S. Svenningson.

McKENZIE—REGINALD JAMES, of Broomhill, Man. Born at Hamilton, Ont., Sept. 25th 1889; Educ., 4 yrs., Univ. of Toronto; 1912-13, instr'man., on constrn., 1914-17, dftsman., and six mos., res. engr., Kettle Valley Rly. Co.; one year, senr. concrete inspectr., and eighteen mos., office engr., Greater Winnipeg Water district; 3 yrs., munic. engr., Rural Municipality of Alberta, in chg. all good roads constrn., to date.

References: M. A. Lyons, E. S. Kent, W. G. Chace, D. N. Sharpe, T. H. Kirby, H. R. Urie, W. D. Mackenzie.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

IBBETSON—NEALE ROBERTS, of 2351 Oakdale Ave., Detroit, Mich. Born at Hamilton, Ont., July 5th, 1900; Educ., Hamilton Collegiate 2 yrs., grad. Hamilton, Tech. and Art School, '18; 1916-17, junr. dftsman., Hamilton Bridge Co.; 1918, (6 mos.), dftsman., Dominion Steel Products, Brantford, Ont.; 1919 (9 mos.), quantity surveyor and estimator, house and small factory contracts, A. J. Cromar, genrl contr., Brantford; 1919-20 (9 mos.), quantity surveyor and dftsman., Archibald and Holmes, Toronto; 1920, asst. supt. of constrn. and eng., on Can. Cottons bldg., Yates Construction Co., Hamilton, Ont.; 1921-22, res. engr. and supt. of constrn., in chg. erection artificial ice rink, ice storage bldg., and rly. icing system, artificial ice and refrigerating plant, fruit freezing and storage plant, Grimsby, Ont.; 1922 (Aug. and Sept.), labour and reinf. foreman for Walker Linden Co., Windsor, Ont.; 1922 to date, chg. of reinf. for Cooper Wideman Construction Co., on new sewage disposal plant for town of Springwells, Mich., U.S.A.

References: A. R. Macpherson, J. A. McFarlane, W. E. Janney, J. Erskine, C. J. Madgett.

JOHNSTON—CLIFFORD MILTON, of Ottawa, Ont. Born at Parry Sound, Ont., Sept. 13th, 1896; Educ., B.Sc. (elecl.) Queen's Univ., '20; 1914, (summer), Parry Sound Municipal Elec. Stn.; 1915-16 (summers), elect'l. constrn. and mtce., Canadian Explosives, Ltd., Nobel, Ont.; 1917-19, mech. transport branch, C.E.F., overseas; 1920 to date, partner in firm of Welch and Johnston, specialized technical service to Automobile trade, elec'l. systems, storage batteries, carburation, motor tests, etc., 474, Bank Street, Ottawa, Ont.

References: L. W. Gill, A. Macphail, C. V. Putman, A. K. Hay, C. Pitts, F. G. Bird.

MACNICOL—NICOL, of 29 Woodside Ave., Toronto, Ont. Born at Bareir, Ont., May 18th, 1898; Educ., B.A.Sc., Univ. of Toronto, '19; 1917, (2 mos.), chainman, Speight and Van Nostrand, Land Surveyors, Toronto; 1918 (6 mos.), dredge inspectr., Canadian Stewart Co., Ltd., Toronto; 1919-20 (10 mos.), res. engr., Morris Knowles, Ltd., Consltg. Engrs., Windsor, Ont.; 1920 (7 mos.), structrl. designer, Smith, Hinchman and Grylls, Arch'ts. and Engrs., Detroit, on reinforced concrete and structurl. design. warehouses and factories; 1920-21, (6 mos.), rly. valuation, Grand Trunk Western Lines, Detroit; 1921 to date, res. engr., laying sewer and water mains, New Toronto, Ont., bitulithic pavement on concrete base, Orillia, Ont., laying sewer and sewer outlet to bay, Midland, Ont., and concrete pavement, Penetang, Ont., with James, Proctor and Redfern, Ltd., Consulting Engineers, Toronto, Ont.

References: M. Knowles, E. A. James, E. M. Proctor, W. B. Redfern, P. Gillespie.

PERRY—BRIAN RHODES, of 282 Addington Ave., Montreal, Que. Born at Hilton, Man., Mar. 7th, 1895; Educ., B.Sc. (civil) McGill Univ., '15; 1913 (summer), inspectn. on trestle constrn., C.N.R. in British Columbia; 1914 (summer), Mt. Royal Tunnel; 1915 (May-Nov.), mtce. survey party on Intercolonial Rly.; 1915-16, on foundation work for bldgs. and viaduct for New England Foundation Co., New York; 1916-17, drftng. and bldg., design for Shawinigan Water and Power Co., later in chg. of operation of one bldg. of their chemical plant; 1917-19, overseas; 1919-20, drftng and bldg. design for Shawinigan Water and Power Co.; 1920-21, salesman for contractors plant, Eastern Equipment Co.; 1921 to date, 3 mos. as engr., later to present time, supt. on bldg. constrn., P. Lyall and Sons, Montreal, Que.

References: E. Brown, H. M. Mackay, S. Svenningson, J. C. Smith, F. S. Keith, H. M. Scott.

WELCH—HENRY RICHARD, of Ottawa, Ont. Born at Ottawa, July 19th, 1892; Educ., B.Sc., Queen's Univ., '18; 1906, Hull Elec. Co., Deschenes, Que.; 1908, Chapleau Elec. Light and Power Co., Chapleau, Ont.; 1909-13, Ottawa Electric Co.; on graduation enlisted Canadian Engrs.—overseas; on return started business with C. M. Johnston to conduct specialized tech. service, at present restricted to automobiles and radio equip'mt.; to date, partner, Welch and Johnston, 474-6, Bank Street, Ottawa.

References: A. K. Hay, G. G. Gale, A. A. Dion, C. V. Putman, E. A. Stone.

WHELEN—MORLAND POWERS, of 40 Hazelton Ave., Toronto, Ont. Born at Ottawa, Ont., June 12th, 1896; Educ., M.A.Sc., Univ. of Toronto, '22, B.Sc., (E.E.) McGill Univ., '21; 1919 (summer), asst. inspectr. and power tester, Ottawa Electric Co.; 1920 (summer), 4 mos., timekeeper and material checker, 1 month chief clerk, Power House extension for Shawinigan Engineering Co., Shawinigan Falls, Que.; 1922 to date, junr. engr. of power sales, Toronto Hydro-Electric System, Toronto, Ont.

References: C. H. Mitchell, C. R. Young, C. V. Christie, C. M. McKergow, C. P. Creighton.

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A

ABRASIVE WHEELS

TESTING. Testing Abrasive Wheels, H. H. Lavercombe. Am. Mach., vol. 57, no. 25, Dec. 21, 1922, pp. 961-962, 2 figs. Characteristics of wheels used for different purposes; machines for testing hardness of bond and abrasive qualities of wheels.

ACCIDENT PREVENTION

EDUCATION IN. A Program of Education in Accident Prevention, with Methods and Results, E. George Payne. U. S. Bur. of Education, Bul. no. 32, 1922, 54 pp., 11 figs. History, need and method of education; method of procedure in accident prevention; necessity for analysis of accident situation in each community as basis for school instruction. Bibliography.

AIR COMPRESSORS

HIGH-SPEED. British High-Speed Air Compressors, F. Johnstone-Taylor. Iron & Coal Trades Rev., vol. 105, no. 2854, Nov. 10, 1922, pp. 683-687, 10 figs. Modern types discussed and analyzed.

HYDRAULIC. The Hydraulic Air-Compressor at Victoria Mine, Michigan, J. J. Bebeau. Mich. Technic, vol. 35, no. 4, May 1922, pp. 13-17, 3 figs. Describes installation of Taylor air compressor for supplying power from Ontonagon River; diverting dam and canal; construction, operation, capacity, efficiency and cost of plant.

TESTING. Testing Air Compressors, William Reavell. Engineer, vol. 134, no. 3492, Dec. 1, 1922, pp. 586-587, 5 figs. Also Engineering, vol. 114, no. 2970, Dec. 1, 1922, pp. 690-691, 4 figs. Points out that no test should be regarded as complete which fails to give (1) net horsepower applied at shaft; (2) volume of air actually delivered, expressed in terms of free air; (3) corrected volume by reducing it to equivalent volume when cooled down to same temperature as that of air aspired. Paper read before Instn. Mech. Engrs.

AIR CONDITIONING

COOLING OF PUBLIC BUILDINGS. Cooling of Theaters and Public Buildings, Fred Wittenmeier. Refrig. Eng., vol. 9, no. 4, Oct. 1922, pp. 115-118 and 132. Suggestions for design of air-cooling apparatus.

AIRCRAFT CONSTRUCTION MATERIALS

RUBBER. Rubber as Applied to Aircraft, James Dyer. Rubber Age, vol. 3, no. 9, Nov. 1922, pp. 432-437. Deals with main applications of rubber to heavier-than-air and lighter-than-air craft. Paper read before Instn. Rubber Industry.

AIRPLANE ENGINES

FARMAN. The Farman 18-cylinder W-type 600-Hp. Airplane Engine (Le moteur d'avion Farman 600 Hp. 18-W.D.). Aéronautique, vol. 4, no. 42, Nov. 1922, pp. 343-348, 9 figs. Detailed description of new engine having three rows of six cylinders in W-form; crank-shaft, ignition, lubrication, carburation, electric starting, etc.

AIRPLANES

AEROFOILS. The Aerodynamic Properties of Thick Aerofoils—II, F. H. Norton and D. L. Bacon. Nat. Advisory Committee for Aeronautics, Report no. 152, 1922, 15 pp., 25 figs. Investigation for purpose of studying effect of various modifications in given wing section, including changes in thickness, height of lower camber, taper in thickness, and taper in plan form with special reference to development of thick, efficient aerofoils.

CONTROLLABILITY AND MANEUVERABILITY. Controllability and Maneuverability of Airplanes, F. H. Norton and W. G. Brown. Nat. Advisory Committee for Aeronautics, Report no. 153, 1922, 18 pp., 22 figs. Investigation for purpose of studying behavior of *Jn4h* airplane in free flight under action of its controls and from this to arrive at satisfactory definitions and coefficients for controllability and maneuverability. Results are said to be of practical value.

DESIGN. Influence of Design on Cost of Operating Airplanes, Archibald Black. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 821-825 and 849, 12 figs. Curves of operating cost for varying duration, speed, reserve horsepower, etc., are developed. Calculations to illustrate impracticability of requiring twin-engined commercial airplanes to fly on one engine; initial rate of climb of 400 to 500 ft. in first minute is proposed as standard of safe performance.

GLIDERS. Three European Gliding Meets, Edmund T. Allen. Aviation, vol. 13, no. 22, Nov. 27, 1922, pp. 712-714, 1 fig. What can be learned from German, French and English meets held during summer.

HELICOPTERS. *See Helicopters.*

LANDING FIELDS. Some Errors in Landing Field Layout, Archibald Black. Aviation, vol. 13, no. 21, Nov. 20, 1922, pp. 693-694, 3 figs. Widely published sketches of assumedly ideal field layouts shown to be faulty.

RUDDER. The Elimination of Dead Centre in the Controls of Airplanes with Thick Sections, Thomas Carroll. Nat. Advisory Committee for Aeronautics, no. 119, Nov. 1922, 3 pp., 2 figs. Describes design of modification of present rudder intended to remedy condition by thickening section sufficiently to fill in zone of turbulent flow and eliminate dead centre.

SEAPLANES. *See Seaplanes.*

ALCOHOL

INDUSTRIAL. Industrial Alcohol Production and Uses in the Phillipines, Howard I. Cole. Chem. Age (N.Y.), vol. 30, no. 11, Nov. 1922, pp. 489-492. Sources of alcohol in Tropics; fermentation of molasses; alcohol mixtures as fuels; ether production.

ALLOY STEELS

CHROME-VANADIUM. The Mechanical Properties of Some Chrome-Vanadium Steels, J. S. Vanick. Am. Soc. for Steel Treating—Trans., vol. 3, no. 2, Nov. 1922, pp. 196-217, 27 figs. Investigation for purpose of obtaining information which would have practical value in design and construction of apparatus in nitrogen-fixation equipment.

FORGING. The Manufacture of Fine Forging Steels, Larry J. Barton. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 612-618, 9 figs. Electric-furnace practice; casting methods; raw materials used; heat logs for carbon, chromium and nickel-chromium steels.

IRON-BORON-CARBON. The Ternary System Iron-Boron-Carbon (Uber das ternäre System Eisen-Bor-Kohlenstoff), R. Vogel and G. Tammann. Zeit. für anorganische u. allgemeine Chemie, vol. 123, no. 4, Sept. 28, 1922, pp. 225-275, 52 figs. partly on supp. plates. Equilibrium diagrams of boron-carbon steels; crystallization; results of experiments with various alloys, their microstructure; influence of boron on hardening of steels.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

COPPER. *See Copper Alloys.*

IRON. *See Iron Alloys.*

LEAD. Binary Lead Alloys (Binäre Bleilegierungen), J. Goebel. Zeit. für Metallkunde, vol. 14, no. 10, Oct. 1922, pp. 388-394, 9 figs. Deals with head-cadmium, lead-bismuth and lead-mercury alloys.

LIGHT. Light Alloys: Their Recent Progress (Les alliages légers: Leurs récents progrès), Léon Guillet. Revue de Métallurgie, vol. 19, no. 11, Nov. 1922, pp. 688-695. Binary and complex aluminum alloys; properties and composition of magnesium and its alloys.

NON-FERROUS, CONTRACTION OF. Contraction and Shrinkage of Nonferrous Alloys as Related to Casting Practice, Robert J. Anderson. U. S. Bur. of Mines Reports of Investigations, no. 2410, Nov. 1922, 13 pp. Technical aspects of contraction in relation to foundry practice.

X-RAY EXAMINATION OF. X-rays as a Means of Determining the Composition of Alloys, T. S. Fuller. Gen. Elec. Rev., vol. 25, no. 12, Dec. 1922, pp. 746-750, 1 fig. Writer claims that by determining comparative X-ray absorption power of unknown alloy, by matching intensity of its X-ray image against intensities of certain carefully prepared standards of same thickness, and by correlating such data with that of knowledge common to metallurgists, it is possible to approximate closely composition of unknown.

ALUMINUM

POLISHING. Polishing Aluminum and Its Alloys for Metallographic Study, E. H. Dix, Jr. Chem. & Met. Eng., vol. 27, no. 25, Dec. 20, 1922, pp. 1217-1220, 7 figs. Methods employed in metallurgical laboratory of Eng. Division of U. S. Army Air Service, McCook Field.

ALUMINUM ALLOYS

ALUMINUM ZINC. The Constitution of Aluminum-Zinc Alloys (Zur Kenntnis der Konstitution der Aluminium-Zinklegierungen). W. Sander and K. L. Meissner. Zeit. für Metallkunde, vol. 14, no. 10, Oct. 1922, pp. 385-387, 11 figs. Investigation of area of concentration from 65 to 100 per cent aluminum of the aluminum-zinc alloys in comparison to the diagrams of Bauer-Vogel and Hansen-Gayler. New partial diagram is plotted.

CASTINGS. Aluminum Alloys for Casting. Brass World, vol. 18, no. 11, Nov. 1922, pp. 330-332. Aluminum copper and aluminum-zinc copper series, manganese, magnesium and nickel alloys. Tables giving densities, moduli of elasticity, tensile strengths, thermal conductivities, linear thermal expansitivities, shrinkage, melting points and specific heat.

DURALUMIN. *See Duralumin.*

AMMONIA COMPRESSORS

LOSSES. Losses in Ammonia Compressors, S. F. Smith. Refrigeration, vol. 31, no. 4, Nov. 1922, pp. 22-23. Discussion of the five ways in which losses occur in compression machines. From address before Mountain States Ice Manufacturers Assn. convention.

SELECTION. The Selection of an Ammonia Compressor, H. J. Macintire. Southern Engr., vol. 38, no. 4, Dec. 1922, pp. 38-39, 2 figs. Shows what size of compressor is required for certain tonnage of output of refrigeration.

THERMODYNAMICS OF. Thermodynamics of Ammonia Compression, W. H. Motz. Refrig. Eng., vol. 9, no. 4, Oct. 1922, pp. 119-124 and (discussion) 124-126 and 132-133, 8 figs. Writer calls attention to correct theoretical relation of pressures, temperatures, volumes, work, power and capacities of ammonia compressors.

AUTOGENOUS WELDING

EFFICIENCY. Notes on Autogenous Welding (Notes sur la soudure autogène), A. Zivy. Revue Industrielle, vol. 52, nos. 9, 10, 11, 12 and 13, July, Aug., Sept., Oct. and Nov. 1922, pp. 300-302, 331-334, 364-366, 415-417 and 458-459, 22 figs. Definition of a good weld; choice of gas and generator; blow pipes and their selection; filling metals and fluxes dor autogenous joints; importance of choice of operators and inspection of their work.

AUTOMOBILE ENGINES

EXHAUST-GAS ANALYSIS. The Sampling and Analysis of Automobile Exhaust Gas., A. C. Fieldner and G. W. Jones. Franklin Inst.—Jl., vol. 194, no. 5, nov. 1922, pp. 613-644, 7 figs. Method of sampling and analyzing exhaust gases developed and use by Bur. of Mines in connection with investigations pertaining to ventilation of vehicular tunnels and fuel economy in internal-combustion engines.

IGNITION. *See Ignition.*

LYCOMING. Five Bearing Crankshaft Important Feature of New Lycoming Engine, Donald D. Blanchard. Automotive Industries, vol. 47, no. 20, Nov. 16, 1922, pp. 968-970, 4 figs. Smooth operation obtained by use of long connecting rods and light reciprocating parts. Special-type force-feed lubrication used; bore 3½, 3⅝, or 3¾ in. and stroke 5 in.

MODERATE VS. HIGH-SPEED. Moderate vs. High Speed Passenger Car Engines. Automotive Industries, vol. 47, no. 22, Nov. 30, 1922, pp. 1079-1081. H. R. Ricardo and F. Strickland debate relative merits before Instn. Automobile Engrs.

PROPRIETARY. Proprietary Power Units. Autocar, vol. 49, no. 1413, Nov. 17, 1922, pp. 1075-1079, 12 figs. Design of some "ready-made" engines.

AUTOMOBILE FUELS

COAL AS SOURCE OF. Coal vs. Oil-Shale as Sources of Motor Fuel; High Heat, Fire-Burning Coke is Smoke Solution, Walter D. Bonner and Benjamin L. Johnson. Min. Rev., vol. 24, no. 15, Nov. 15, 1922, pp. 11-14. In author's opinion, low-temperature distillation of coal in Utah, considered as source of motor spirit as well as source of smokeless domestic fuel, presents extremely interesting possibilities.

TESTS. What Warm Weather Tests of Fuels Indicate. Automotive Industries, vol. no. 24, Dec. 14, 1922, pp. 1168-1171, 5 figs. Practically same miles per gallon consumed but greater dilution of lubricant shown by less volatile fuels. Results of tests made by Bur. of Standards.

See also Alcohol; Gasoline.

AUTOMOBILES

AIR RESISTANCE. Automobile Air Resistance Measured in Wind Tunnel. Automotive Industries, vol. 47, no. 23, Dec. 7, 1922, p. 1137, 1 fig. Tests made at Zeppelin Works show that air resistance of modern types of automobiles is materially less than would be concluded from coefficients found in engineering text books; advantages to be derived from complete steamlining of cars.

ELECTRIC EQUIPMENT STANDARDIZATION. An Executive View of Automotive Electric Standardization, G. B. Griffin. Automotive Industries, vol. 47, no. 22, Nov. 30, 1922, pp. 1072-1073. It is claimed that business men of automotive industry have not given adequate support to creation and use of standards; needless variations in detail result in higher costs and many service complications; cradle or foot-mounted generator with separate stub shaft favoured.

HEADLIGHTS. Motor-Vehicle Head-Lamps and Road-Lighting, R. C. Gowdy and J. G. Balsillie. Soc. Automotive Engrs.—Jl., vol. 11, no. 6, Dec. 1922, pp. 557-560, 3 figs. Authors state that direct solution of problem lies in modifying reflector so that light is distributed properly at its first reflection and lenses or secondary devices are rendered unnecessary. Description of light-distribution experiments; types of reflector and amount of light-distribution desirable.

POWER-WEIGHT RATIO. Power-Weight Ratio of 1923 Cars, Douglas Leechman. Autocar, vol. 49, no. 1413, Nov. 17, 1922, pp. 1082-1084. Need for further close and sympathetic consideration of subject. Table giving cylinder dimensions, and weight per cu. cm. of number of 1923 cars.

SMALL SIX-CYLINDER. Small Six-Cylinder Cars. Autocar, vol. 49, no. 1414, Nov. 24, 1922, pp. 1113-1118, 14 figs. Advantages; induction-pipe design; technical details; typical examples. Specifications of 16 six-cylinder cars under 3 liters capacity.

STANDARDIZATION OF PARTS. Reports of Divisions to Standards Committee. Soc. Automotive Engrs.—Jl., vol. 11, no. 6, Dec. 1922, pp. 529-547, 12 figs. 16 Division reports of automotive and parts and materials Divisions.

SUSPENSION. A New Suspension System. Automobile Engr., vol. 12, no. 169, Nov. 1922, pp. 343-345, 6 figs. Describes Gatti system, employing horizontal coil springs; no fixing between axle and suspension mechanism.

AVIATION

AERIAL LIGHTHOUSES. Beacons and Wind Indicators for Night Flying. Aviation, vol. 13, no. 21, Nov. 20, 1922, pp. 688-689, 3 figs. Some details of beacons in operation at Hampton Roads under supervision of Navy Bur. of Aeronautics, and ground wind indicator which is being installed by Army Air Service at Dayton, Ohio.

SAFETY. Coefficient of Safety and the Future of Aviation (Les Coefficients de Sécurité et l'Avenir de l'Aviation), Louis Blériot. Aérophile, vol. 30, nos. 19-20, Oct. 1-15, 1922, pp. 305-306. Discusses coefficient of safety from standpoint of increasing speed and increasing differences in altitude.

SOARING FLIGHT. Soaring Flight (Le vol à voile), Henri Lurette. Nature, no. 2533, Oct. 21, 1922, pp. 259-263, 9 figs. Construction of wings of birds and their action in flight.

B

BALANCING

HIGH-SPEED. High-speed Balancing. Eng. Production, vol. 5, no. 111, Nov. 16, 1922, p. 468, 2 figs. Efficient methods.

BEARINGS

BABBITTED. How to Make Babbitted Bearings That Will Last Long And Run Cool and Smoothly, Gustav H. Radebaugh. Coal Age, vol. 22, no. 21, Nov. 23, 1922, pp. 829-832, 15 figs. Metal should be poured from ladle with round spout and all dampness should be avoided; how to gage correct temperature; casting base and cap in one operation; providing oil holes and grooves.

Overcoming Difficulties in Babbitt Bearings, W. S. Standiford. Can. Machy., vol. 28, nos. 16 and 17, Oct. 19 and 26, 1922, pp. 26-27, and 20 and 23. Oct. 19: Discusses difficulties, including coarse granular structure, uneven wear, shrinkage of shells, split bearings, bronze linings, etc., and remedies. Oct. 26: Selection of babbitt and maintenance of bearings.

DESIGN AND LUBRICATION. Bearings and Bearing Metals, Christopher H. Bierbaum. Machy. (N.Y.), vol. 29, no. 4, Dec. 1922, pp. 298-300, 3 figs. Summary of practical conclusions drawn from author's experience. Analysis of action of journal in bearing; hardening and grinding of journals. Chapter of handbook to be published by Lunem Bearing Co.

BEARINGS, BALL

ROLLER AND. Ball and Roller Bearings in Metallurgy (De l'emploi des roulements à billes et à rouleaux dans l'industrie métallurgique), R. Lauret. Outillage, vol. 6, no. 48, Dec. 2, 1922, pp. 1609-1611, 8 figs. Comparison of journal, ball and roller bearings, and advantages of latter; coefficients of friction; various applications of ball bearings in machine tools.

BEARINGS, ROLLER

MILL MOTORS, APPLICATION TO. Roller Bearings Applied to Mill Motors, L. J. Hess. Assn. Iron & Steel Elec. Engrs., vol. 4, no. 11, Nov. 1922, pp. 739-746 and (discussion) 747-763, 7 figs. Author's experience with particular type of roller bearings.

BEARINGS, THRUST

PROPELLER. Friction Tests of Propeller Thrust Bearings, H. A. Stevens Howarth and Nelson Ogden. Am. Soc. Nav. Engrs.—Jl., vol. 34, no. 4, Nov. 1922, pp. 564-578, 11 figs. Kingsbury and horseshoe types compared.

BELT DRIVE

CALCULATIONS. Belt Drive (Essai d'une théorie du fonctionnement des courroies), M. Auclair. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 75, no. 7-9, July-Sept. 1922, pp. 496-523, 23 figs. Discusses Rankine and other formulas, coefficient of friction, elasticity of belt, and makes calculations.

BLASTING

LIQUID-OXYGEN. Practical Manufacture and Use of Liquid Oxygen Explosive for Breaking Ore, A. D. Akin. Eng. & Min. Jl.-Press, vol. 114, no. 23, Dec. 2, 1922, pp. 978-980. Much of Real del Monte Co.'s tonnage at Pachuca, Mexico, broken with new explosive made on spot; Linde oxygen process employed; lampblock carbon as absorbent.

BLAST FURNACES

CLAIRE. New Claire Furnace, George F. Tegan. Iron Age, vol. 110, no. 22, Nov. 30, 1922, pp. 1422-1423, 3 figs. Example of modern standard blast-furnace practice, with unusual methods of disposing of slag.

FORD RIVER ROUGE PLANT. Ford Principles and Practice at River Rouge, John H. Van Deventer. Indus. Management (N.Y.), vol. 64, no. 6, Dec. 1922, pp. 321-328, 9 figs. How blast-furnace unit fits into Ford industrial chain.

MAGNETIC ORE IN. Use of Magnetic Ore in the Blast Furnace, G. P. Pilling. Am. Inst. Min. & Met. Engrs.—Trans., no. 1199-S, Dec. 1922, 13 pp.; also (abstract) in Min. & Metallurgy, no. 192, Dec. 1922, pp. 32-33. Comment as to design and difficulties encountered, with particular reference to ores of Eastern Pennsylvania and Adirondack region.

BOILER FEEDWATER

TREATMENT. Boiler Feed Water—As it Ought to Be—Zero Soft, Ernest Rowe. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 647-648, 2 figs. Permutit zeolite water-softening system, installed as auxiliary to feedwater system at plant of Curtice & Co., Bergen, N. Y., is said to have overcome all troubles due to boiler water.

Getting Rid of Boiler Scale, Ernest M. Rowe. Brick & Clay Rec., vol. 61, no. 11, Nov. 28, 1922, pp. 797-798, 2 figs. Describes Permutit system of water softening; saves 6 to 30 per cent in fuel.

The Chemical Treatment of Feed Water. Power, vol. 56, no. 25, Dec. 19, 1922, pp. 984-986, 2 figs. Explains meaning of hardness and shows how it may be eliminated by "lime-and-soda" treatment.

BOILER FIRING

See Pulverized Coal, Boiler Firing.

BOILER OPERATION

EFFICIENCY. Practical Operation of Steam Generation (La pratique de la conduite des générateurs de vapeur), Henri Itier. Revue Industrielle, vol. 52, no. 13, Nov. 1922, pp. 454-457. Choice of fuel; combustion; natural and forced draft; heat transmission; feedwater; etc.

BOILER PLANTS

LIGNITE-BURNING. Power Plant of the Provincial Hospital, Weyburn, Sask., Canada. Power, vol. 56, no. 25, Dec. 19, 1922, pp. 966-968, 3 figs. Plant about 30 mi. from lignite coal fields burns this fuel on chain-grate stokers under water-tube boiler; main units, vertical high-speed engines with direct-connected generator and exciter.

BOILER TUBES

SLAG FORMATION. An Investigation and Discussion of Slag Formation on Boiler Tubes, Harry H. Bates. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 642-646, 7 figs. Conclusions arrived at after extensive tests; boiler operation and methods of preventing slag formation on boiler tubes. See also Southern Engr., vol. 38, no. 4, Dec. 1922, pp. 53-57, 6 figs.

BOILERS

CODE, A.S.M.E. Second Revision of A.S.M.E. Boiler Code, 1922. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 850-857, 5 figs. Revisions which have met approval of Boiler Code Committee.

HEAT-BALANCE CALCULATION. What Is a Heat Balance and How Is It Calculated? Power Plant Eng , vol. 26, no. 23, Dec. 1, 1922, pp. 1162-1165. J. R. Darnell points to inaccuracies of method of calculating described by A. W. Binns, whose reply gives authorities for formulas and constants.

SEAMS, CRUSHING STRENGTH. Determining the Crushing Strength of Boiler Seams, Thomas H. Walker. Boiler Maker, vol. 22, no. 11, Nov. 1922, pp. 312-314, 3 figs. Results of tests indicate proportions for lap seams subjected to double shear loads.

BORING TOOLS

DIAMOND. Details of Diamond Boring Tools, G. T. Linting. Am. Mach., vol. 57, no. 25, Dec. 21, 1922, pp. 949-950, 2 figs. Recommended sizes of boring bar; angle for setting tools; methods of sharpening; kind of diamonds and how they are inserted in tools.

BRIDGE PIERS

DESIGN. Delaware River Bridge Piers. Pub. Works, vol. 53, no. 9, Nov. 1922, pp. 211-217, 7 figs. Design of river piers and their pneumatic caissons for bridge between Philadelphia and Camden: longest suspended span yet constructed.

BRIDGES, CONCRETE

CONTINUOUS-TRUSS. Concrete Continuous-Truss Bridge Without Diagonals. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, p. 926, 3 figs. French structure, 135½ ft. long, has steel X-frames in posts and gussets instead of usual diagonal members.

ERECTION AROUND OLD BRIDGE. Building Concrete Bridge Around An Old Steel Bridge, Searcy B. Black. Eng. News-Rec., vol. 89, no. 21, Nov. 23, 1922, pp. 870-872, 5 figs. Old piers utilized and new ones placed midway of old spans in bridge across Chattahoochee River in Georgia; steel trusses in service during construction.

BRIDGES, HIGHWAY

RECONSTRUCTION. Broughdale Provincial Highway Bridge, London (Ont.), A. B. Crealock. Can. Engr., vol. 43, no. 22, Nov. 28, 1922, pp. 569-571, 8 figs. Pratt truss type bridge over Thames river; length 194 ft. centre to centre of bearings; standard U-type concrete abutments; reinforced-concrete deck; longest single span in Ontario Provincial Highway system.

STEEL. Steel Highway Bridge Over the Batiscan River (Canada), F. B. Painchaud. Can. Engr., vol. 43, no. 20, Nov. 14, 1922, pp. 530, 6 figs. Replaces old wooden structure; three Pratt spans on concrete piers and abutments; total length 1,015 ft. including approaches; cofferdams of steel sheet piling; concrete mixtures.

BRIDGES, RAILWAY

ARCH Philadelphia & Reading Builds 46-Arch Bridge, Charles H Hitchcock. Ry. Age, vol. 73, no. 23, Dec. 2, 1922, pp. 1035-1038, 5 figs. Steel centres shifted by floating adjustable traveler at Susquehanna River crossing at Harrisburg, Pa.

RECONSTRUCTION. Steel and Wrought-Iron Trusses Efficiently Combined in Railway Bridge Reconstruction. Eng. News-Rec., vol. 89, no. 23, Dec. 7, 1922, pp. 973-978, 7 figs. Thirty-four-year-old Newburyport bridge strengthened from E20 to E55 capacity by adding two steel trusses in such manner as to develop full strength of both materials. Work carried on while traffic over bridge was maintained.

STRESS UNDER MOVING LOAD. The Subibach Bridge Tests Ry Engr , vol. 43, no. 515, Dec. 1922, pp. 467-471, 12 figs. Preliminary consideration of tests made of effect of moving load passing over railway bridge in Switzerland. Tests included 45,000 measurements of strains and deflection and inclination of various parts of structure under load of 27,400 lb. on each wheel.

BRIDGES, STEEL

PROTECTION FROM LOCOMOTIVE BLAST. Protecting Steel Bridges from Locomotive Blast. Eng. News-Rec , vol. 89, no 23, Dec 7, 1922, pp. 968-969, 4 figs. Protection of underside of steel bridges exposed to blast, smoke and gases from locomotives; examination of gunite and reinforced-concrete casing of floor system of railway and street bridges in Chicago.

BRIDGES, SUSPENSION

MINES. The Design of Light Suspension Bridges, C. H McL. Burns Coal Industry, vol. 8, no. 11, Nov. 1922, pp. 477-482, 8 figs. Practical and theoretical conditions governing construction of light suspension bridges for transporting product of mine to railway or other point of disposal when mine does not warrant construction of standard gage bridge or trestle to bring railway across river or valley to mine opening.

C

CABLES, ELECTRIC

CORROSION OF LEAD SHEATHS. The Corrosion of the Lead Sheaths of Cables by Water Seeping Through Concrete, George C. Bunker. Worcester Polytechnic Inst.—Jl., vol. 26, no. 1, Nov. 1922, pp. 12-21, 4 figs. Discusses breakdowns of control cables on Locks of Panama Canal and experiments carried out to prove that water would attack lead and to measure rate of erosion of lead by water dripping through duct lines, calling attention to damages liable to result to unprotected cables installed in damp locations in concrete-covered duct lines.

CABLEWAYS

CONSTRUCTION. Cableways (Ueber die Bedeutung der Drahtseilbahnen), Krause. Glasers Annalen, vol. 91, no. 8, Oct. 15, 1922, pp. 121-125, 10 figs. Application for transportation of freight generally, loading of ships, ore handling, conveying passengers, conveying in workshops; examples in various countries.

COAL MINES. The Aerial Wire Ropeway at Trimdon Grange Colliery, R. S. Tate. Instn. Min. Engrs.—Trans., vol. 64, part 1, Oct. 1922, pp. 30-44 and (discussion) 44-46, 11 figs. Bi-cable ropeway, 1040 ft. long with carrying capacity of 40 tons per hr.

TYPES. Various Systems of Aerial Cableways (Sui diversi sistemi di Ferrovie aeree). Rivista Tecnica della Svizzera Italiana, vol. 11, no. 10, Oct. 1922, pp. 110-112. Compares three-cable and one-cable systems for aerial conveying, their operation, cost and upkeep.

CAMS

USES. Methods of Machine Tool Design, A. L. DeLeeuw. Am. Mach., vol. 57, no. 25, Dec. 21, 1922, pp. 963-967, 4 figs. Principal uses of cams; cams for holding and clamping devices, and as feed rate variators; contour milling.

CANALS

LOCKS. Construction Methods and Plant on the Marseilles Lock. Eng. News-Rec., vol. 89, no. 23, Dec. 7, 1922, pp. 962-965, 6 figs. Construction problems in building lock of new Illinois waterway near Lockport, Ill. River between mixer and lock crossed by cableway, movable bridge and ferry boats; excavation kept just ahead of concrete to avoid disintegration of shale foundation.

CAR WHEELS

CHILLED-IRON. A Call for Better Chilled Cast Iron Wheels, P. H. Griffin. Iron Age, vol. 110, no. 22, Nov. 30, 1922, pp. 1419-1420. Problem presented by failures in service is said to be not in difficulty of making wheels, but in existing replacement practice.

CARBURETORS

ORIFICES. Research on Small Drilled Orifices, W. S. von Bernuth. Automotive Manufacturer, vol. 64, no. 8, Nov. 1922, pp. 7-8, 4 figs. With special reference to extremely small holes needed in carburetors and vaporizing devices—being part of work conducted by Purdue Eng. Experiment Station; special apparatus designed for testing.

CARS, FREIGHT

CONTAINER. Container Car Freight Service on the New York Central, F. S. Gallagher. Ry. & Locomotive Eng., vol. 35, no. 12, Dec. 1922, pp. 315-317, 2 figs. Description of operations and savings effected with new container system of handling less-than-carload freight. Abstract of paper read before Soc. Terminal Engrs.

CARS, REFRIGERATOR

MECHANICALLY COOLED. Mechanically Cooled Railway Cars (Maschinell gehühlte Eisenbahnwagen), M. Hirsch. Zeit. für die gesamte Kälte-Industrie, vol. 29, no. 10, Oct. 1922, pp. 183-189, 5 figs. Describes a few typical examples and discusses desiderata for design of such cars.

CAST IRON

GROWTH AND DETERIORATION. Growth and Deterioration of Grey Cast Irons under Repeated Heatings, Thos. E. Hull. Foundry Trade Jl., vol. 26, no. 326, Nov. 16, 1922, pp. 412-414. Constitutional, chemical and physical properties of normal gray cast iron; effect of phosphorus; Outerbridge's experiments; Moissan's conclusions; influences of gases on growth.

CENTRAL STATIONS

STEAM-ENGINEERING PROBLEMS. Steam Engineering Practice in Modern Central Stations, T. E. Keating. Elec. Jl., vol. 19, no. 12, Dec. 1922, pp. 490-496. Thermal and operating problems at present under consideration by central-station engineers, and their influence on economic generation of power in modern steam stations.

SUPERPOWER. Superpower Study in Pittsburgh District, William W. Handy. Elec World, vol. 80, no. 24, Dec. 9, 1922, pp. 1263-1267, 1 fig. Selection of type and location of generating stations; economics of bulk-power production and distribution; comparative data and solutions of problems encountered in course of investigation.

CENTRAL STATIONS

CHANGING FROM D.C. TO A.C. Commercial Aspects of "Change-Overs", F. S. Root. Elec. World, vol. 20, no. 23, Dec. 2, 1922, pp. 1213-1214. Replacement of D.C. with A.C. equipment should be thoroughly planned and carefully executed to minimize cost and avoid misunderstandings with customers.

CENTRIFUGALS

STEAM-TURBINE DRIVEN. Steam Turbine Driven Centrifugals Int. Sugar Jl., vol. 24, no. 287, Nov. 1922, pp. 596-598, 3 figs. Terry vertical turbine attached to Cresson-Morris centrifugal handles final speeds of 720 to 1150 r.p.m.

CHLORINE

BLEACH LIQUORS FROM LIQUID. The Mathieson System for Preparing Bleach Liquors from Liquid Chlorine, J. H. MacMahon. Paper Mill, vol. 46, no. 47, Dec. 2, 1922, pp. 6-14, 16 and (Discussion) 16 and 17, 3 figs. Principles and advantages of system.

CHROME-NICKEL STEEL

AIRPLANE SHAFTS. Manufacture of Alloy Steel for Airplane Shafts, E. Kothny. Chem. & Met. Eng., vol. 27, no. 21, Nov. 22, 1922, pp. 1020-1024. Experiments on manufacture of nickel-chromium steel in basic Heroult furnace, to produce airplane shafting with no trace of transverse structure. It is necessary to use very good raw material and refine with two oxidizing slags as well as with carbide slag. Translated from Stahl u. Eisen, Jan. 8 and May 20, 1920.

CHUCKS

MULTI-SPINDLE. New Multi-Spindle Chucking Machine for Automatic Production, P. M. Herdt. Automotive Industries, vol. 47, no. 22, Nov. 30, 1922, pp. 1074-1076, 4 figs. Six-spindle model designed by Baird Machine Co., adapted to pieces up to 6 in. in diam. and 6 in. in length; equipped with 8 tool slides.

CIRCUIT BREAKERS

OIL. Oil Circuit Breaker Tests. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp. 990-997, 1 figs. Discussion of following papers: Discussion on Baltimore Oil Circuit Breaker, M. Louis and A. F. Bang; Tests on General Electric Oil Circuit Breakers at Baltimore, J. D. Hilliard; Tests on Westinghouse Oil Circuit Breakers at Baltimore, J. B. MacNeill.

COAL

CARBONIZATION, LOW TEMPERATURE. Low-Temperature Carnobization and the Economics of Manufacture, George Evetts. Gas Jl., vol. 160, no. 3105, Nov. 15, 1922, pp. 427-428. Criticism of figures and comments on principles involved in article by Walter Chaney in same journal, (Nov. 8).

SAMPLING AND ANALYSIS. Sampling and Analyzing Coal, Joseph R. Darnell. Power, vol. 56, no. 23, Dec. 5, 1922, pp. 887-888. Correct method of sampling; figuring ultimate analysis from proximate; estimating hydrogen from volatile combustible matter; estimating total carbon from fixed carbon and volatile combustible matter.

COAL HANDLING

PLANTS. Handling Plant of the Super Power Station at Golpa, George F. Zimmer. Indus. Management (Lond.), vol. 8, no. 9, Nov. 16, 1922, pp. 291-296, 14 figs. Account of handling plant for lignite from natural deposit to boilers.

COKE

STRUCTURE. The Structure of Coke; Its Origin and Development, George Beilby. Soc. Chem. Industry—Jl., vol. 41, no. 21, Nov. 15, 1922, pp. 341T-347T, 17 figs. Results of experimental observations carried out on average samples taken from bulk deliveries of different coals received at H.M. Fuel Research Station. Study of microstructure of coke and charcoal. Photomicrographs.

COKE-OVEN GAS

OPEN-HEARTH FURNACES. Coke-Oven Gas for Open-Hearth Furnaces. Iron & Coal Trades Rev., vol. 105, no. 2856, Nov. 24, 1922, p. 775. Results of laboratory experiments at Usines Saint Jacques. Review of paper by Jean Dupuis before Congress at Liége.

Coke Oven Gas in Open-Hearth Furnaces, Jean Dupuis. Iron Age, vol. 110, no. 24, Dec. 14, 1922, pp. 1561-1562. French discussion of various methods of using gas; effect of heating; use of mixed gases. Translated from Revue de Métallurgie, Oct. 1922.

COKE OVENS

BY-PRODUCT. Modern By-Product Coking, Joseph Becker. Gas Age-Rec., vol. 50, no. 20, Nov. 11, 1922, pp. 653-656 and 671-675, 18 figs. European practice; reasons for superior American results; new ovens tried out by Koppers Co. at plant of Chicago By-Product Co. Paper read before Eastern States Blast Furnace & Coke Oven Assn. See also Coal Industry, vol. 8, no. 11, Nov. 1922, pp. 489-494, 12 figs.

PUSHING SERIES. By-Product Coke Oven Operation "10" Pushing Series, A. Coe. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 619-622, 5 figs. Uniformity of products depends upon correct series. Consideration of "10" pushing series; diagrammatical demonstration.

COLD STORAGE

PLANTS. Bucyrus Ice and Cold-Storage Plant. Southern Engr., vol. 38, no. 4, Dec. 1922, pp. 35-37, 6 figs. By installation of a 150-hp. Diesel engine and a 220-volt, three-phase, 60-cycle direct-connected generator, in plant at Bucyrus, Ohio, operating cost was reduced from average of $42 per day to $17.15; saving over purchased power.

COMPRESSED AIR

APPLICATIONS. Some Modern Applications of Compressed Air, F. A. McLean. Can. Engr., vol. 43, no. 20, Nov. 14, 1922, pp. 539-541, 5 figs. Relative merits of pneumatic versus hand calking and ramming, pneumatic hoists and use of air tools in connection with installation of service pipes.

CONCRETE

ALKALI ACTION. Durability of Concrete in Alkali Soils, G. M. Williams. Can. Engr., vol. 43, no. 20, Nov. 14, 1922, pp. 533-534. Field and chemical investigations and conclusions arrived at.

MIXING. Promoting the Art of Making Good Concrete, D. A. Tomlinson. Ry. Maintenance Engr., vol. 18, no. 10, Oct. 1922, pp. 349-351, 6 figs. Practical summary of approved practices as determined by exhaustive investigation.

CONCRETE CONSTRUCTION, REINFORCED

MARINE STRUCTURES. Reinforced Concrete Piers and Marine Borers, Noble W. Twelvetrees. Can. Engr., vol. 43, no. 22, Nov. 28, 1922, pp. 574-576. Development in use of concrete for marine works; application in construction of wharves and piers, jetties, dock extensions, groynes, sea walls, etc., construction methods employed. (Abstract.) Paper read before Concrete Inst.

CONCRETING

CANAL LINING. Lining Queenston-Chippawa Power Canal, Roderick B. Young. Concrete, vol. 21, no. 5, Nov. 1922, pp. 141-143, 7 figs. Operations in lining hydraulic canal, for which over 540,000 sq. yd. of concrete lining were required.

CONDENSERS, STEAM

LOVEKIN AND NAVY-TYPE. Test of Main Condensers of Battleships Tennessee and Maryland, Joseph B. Lincoln and O. A. Van Denburgh, Jr. Am. Soc. Nav. Engrs.—Jl., vol. 34, no. 4, Nov. 1922, pp. 579-591, 6 figs. Results of tests of Lovekin and Navy type condensers shows that cooling surface of former is from 15 to 35 per cent more efficient; air-cooling arrangements are equally effective.

SURFACE. Surface Condensers, Charles L. Hubbard. Southern Engr., vol. 38, no. 4, Dec. 1922, pp. 44-48, 13 figs. Advantages for certain kinds of work, types of condensers, computing tube or cooling surface.

CONNECTING RODS

FORGED ALUMINUM VS STEEL. Forged Aluminum vs. Steel for Connecting Rods, Laurence H. Pomeroy. Automotive Industries, vol. 47, no. 20, Nov. 16, 1922, pp. 978-980. Author claims reduction in weight, obtained by use of aluminum, results in reduced inertia and reduced bearing pressures, smaller bearings can be used or engines can be run at higher speeds.

MACHINING. Making Wills Sainte Claire Connecting-rods, Fred R. Daniels. Machy. (N.Y.), vol. 29, nos. 3 and 4, Nov. and Dec. 1922, pp. 196-200, and 293-297, 20 figs. Methods employed in plant of Taft-Pierce Mfg. Co., Woonsocket, R.I., for machining high-grade automobile connecting rods.

CONTRACTS

STANDARD FORMS. Canadian Contractors now Have Standard Form of Contract. Contract Rec., vol. 33, no. 46, Nov. 15, 1922, pp. 1099-1104. Contract form, including set of general conditions, developed by Assn. of Can. Bldg. & Constr. Industries.

COST ACCOUNTING

CONSTRUCTION WORK. Cost Accounting for Construction Work, W. N. Connor. Eng. & Contracting (Buildings), vol. 58, no. 1, Oct. 25, 1922, pp. 27-31. System employed by Aberthaw Constr. Co., Boston. Paper presented at Constr. Industries Conference, Hamilton, Ont.

CONVERTERS

OPERATION. Converter Produces Better Steel, Ralph Burke. Iron Trade Rev., vol. 71, no. 23, Dec. 7, 1922, pp. 1555-1556 and 1563. Attention to melting and blowing adds to quality of metal; cupola operations different from those in gray-iron melting; ferromanganese and ferrosilicon principal deoxidizers; aluminum not essential.

CONVEYORS

WORKSHOP. Methods of Conveying in the Workshop. Machy. (Lond.), vol. 21, nos. 525, 526 and 527, Oct. 19, 26 and Nov. 2, 1922, pp. 67-72, 97-102 and 129-134, 21 figs. Oct. 19: Handling work between machining operations; gravity roller conveyors; progressive or truck jigs; conveyors for moving materials vertically; conveyor belts and platforms. Oct. 26: Conveyors and auxiliary equipment used in number of up-to-date factories. Nov. 2: Automatic washing machine; power-driven conveyors for engine assembly; hand-operated conveyors for gear-box and rear-axle assembly; travelling platform for chassis assembly.

COPPER

CASTINGS. Copper Castings for Electrical Purposes, Francis W. Rowe. Metal Industry (Lond.), vol. 21, no. 19, Nov. 10, 1922, pp. 433-434, 5 figs. Conductivity of copper and effect of impurities on its conductivity; results of silicon copper.

CORROSION

PIPES AND CABLES. Rules Concerning Protective Measures for Diminishing Corrosion of Pipes and Cables Due to Ground Currents of Electric Railways (Leitsätze betreffend Schutzmassnahmen zur Verminderung der Korrosion an Rohren und Kabeln durch Erdströme elektrischer Bahnen). Schweiz. Elektrotechnischer Verein Bul., vol. 13, no. 11, Nov. 1922, pp. 485-489. Decision of joint commission of Swiss Assn. of Gas & Hydraulic Engrs., Assn. Swiss Secondary Railways, and Swiss Assn. Elec. Engrs. See also Examples of Application of Rules, by H. F. Zangger, pp. 490-503, 8 figs.

PREVENTION. Corrosion—Apparatus to Prevent It. Power, vol. 56, no. 17, Oct. 24, 1922, pp. 645-648, 6 figs. Types of apparatus for preventing corrosion used in United States. In every case object is accomplished by removing dissolved oxygen either with or without other gases.

CRANES

BREAKDOWN. 40-Ton Breakdown Crane for Jamaica. Engineer, vol. 134, no. 3494, Dec. 8, 1922, p. 616, 2 figs. Special features of crane built by Cowans, Sheldon & Co., Ltd., Carlisle.

CRANKSHAFTS

POWER-PRESS. Designing Power Press Crankshafts, P. A. Friedell. Machy. (N.Y.), vol. 29, no. 4, Dec. 1922, pp. 284-286, 4 figs. Method for calculating strength of crankshafts and eccentric shafts used by writer and found to be very reliable.

CYLINDERS

MACHINING AND LAPPING HOLES. Machining and Lapping Very Deep Holes, John B. Rose. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 807-812, 17 figs. Shop operations in forming of very accurate and highly finished cylindrical holes; drilling, boring, reaming and lapping operations, with especial emphasis on lapping. (Abridged.)

D

DAMS

ARCH. Arch Dam Temperature Changes and Deflection Measurements, Fred. A. Noetzli. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 930-932, 5 figs. Suggested method of experimentation with full-size structures which may give information useful in design.

CONCRETE, FLOATING. Floating Concrete Dam Built on the Gila River, C. J. Blanchard. Eng. News-Rec., vol. 89, no. 20, Nov. 15, 1922, pp. 824-828, 6 figs. Porous foundations require spread footings for low diversion dam; built by Indian Service under force account, special construction details to avoid floods.

CORE-WALL. The Deep Core-Wall of the Wanaque Dam, Arthur H. Pratt. N.E. Water Works Assn.—Jl., vol. 36, no. 3, Sept. 1922, pp. 457-466, 10 figs. Method adopted for constructing core wall was to drive two walls of steel sheet piling across valley, excavate between them, meanwhile bracing steel sheeting with timber, and then filling trench with concrete.

MASONRY. Construction of Masonry Dams (Construccion de presas de Albanileria), Edward Wegmann. Ingenieria Internacional, vol. 8, no. 6, Dec. 1922, pp. 303-308, 7 figs. Historic review of developments; discusses formula of Rankine and others and their application.

DIESEL ENGINES

CENTRAL-STATION. Marine Diesel Engine Builder Enters Stationary Power-Plant Field. Power, vol. 56, no. 22, Nov. 28, 1922, pp. 838-839, 4 figs. Builds 600-hp. stationary Diesel, equipped with special governing device, extended shaft and outboard bearing to meet requirements of industrial or electric power plants.

MARINE. Buffalo Builder Enters Diesel Field. Mar. Rev., vol. 52, no. 12, Dec. 1922, pp. 490-491, 3 figs. New Marine Diesel engines built by H. G. Trout Co. for smaller sizes of boats.

Testing a 1000 Shaft Hp. Marine Oil Engine. Motorship, vol. 7, nos. 9, 10 and 12, Sept., Oct. and Dec. 1922, pp. 693, 772-773 and 938-939, 7 figs. Account of tests carried out by Cammell Laird & Co. in order to obtain data on (1) endurance and reliability of engine; (2) fuel consumption and thermodynamic conditions in engine under varying conditions; (3) ability of engine to operate under conditions usually found in tropical seas; and (4) ability of engine to operate successfully on ordinary boiler-fuel oils. See also Engineer, vol. 134, no. 3476, Aug. 11, 1922, pp. 140-142, 4 figs.

SOLID-INJECTION. Using Tar Oil in Solid Injection Engines, H. F. Shepherd. Power, vol. 56, no. 24, Dec. 12, 1922, p. 939, 2 figs. Details of Crossley cold starting airless injection engine fitted for burning tar oils.

STEPHEN-SULZER. The Stephen Sulzer Two-Cycle Marine Diesel Engine. Mar. Engr. & Naval Architect, vol. 45, no. 542, Nov. 1922, pp. 423-425 and 436, 4 figs. partly on p. 422. Constructional features of 4-cylinder marine engine; two 400-b.hp. auxiliary generating engines; particulars of seven days' shop trials.

DISTILLATION

DISTILLED WATER. An Improved Still for Producing Pure Water, Charles A. Kraus and Wilbur B. Dexter. Am. Chem. Soc. Jl., vol. 44, no. 11, Nov. 1922, pp. 268-2471, 1 fig. Describes experiments in which water having specific conductance of 0.12 x 10-6 is obtained by direct distillation of ordinary distilled water from an alkaline permanganat solution. Describes simple form of still, principle of operation of which depends on fractional condensation.

DRAWINGS

TOOL PARTS. Part Drawings and Organization, Fred. Hermon. Machy. (Lond.), vol. 21, no. 529, Nov. 16, 1922, pp. 198-199, 3 figs. Description of well-organized part system, with notes on laying out of part drawings in concise and easily readable form.

DREDGES

SEAGOING. New U. S. Army Dredges to Be Completely Electrified. Mar. Eng., vol. 27, no. 12, Dec. 1922, pp. 781-782, 1 fig. Power for propulsion, dredging and auxiliary purposes on U. S. hopper dredges provided by three 1000-hp. Diesel-electric generator sets.

DROP FORGING

PLANTS. An American Drop Forging Plant. Eng. Production, vol. 5, no. 112, Nov. 23, 1922, pp. 492-497, 18 figs. Works and methods employed by J. H. Williams & Co., Brooklyn.

DURALUMIN

AUTOMOTIVE APPLICATIONS. Duralumin, R. W. Daniels. Soc. Automotive Engrs.—Jl., vol. 11, no. 6, Dec. 1922, pp. 477-480 and 490. History and general description of duralumin; Navy specification of its physical properties as drawn by Naval Aircraft Factory; manufacture; physical properties for annealed, heat-treated and hard-rolled duralumin and possible automotive applications, including worm-wheels, bearings, gears, connecting rods, rims and wheel parts and chassis and body trimming. Includes report of research department of Fifth Ave Coach Co. on results of test made on duralumin worm-wheels.

PROPERTIES. Duralumin—Its Properties and Commercial Possibilities, William B. Stout. Am. Soc. for Steel Treating—Trans., vol. 3, no. 2, Nov. 1922, pp. 226-230. Composition and physical properties; some of its drawbacks, which must be overcome

E

EDUCATION, ENGINEERING

CO-OPERATIVE. Co-operative Engineering Education, K. C. Matheson. Engrs. & Eng., vol. 39, no. 11, Nov. 1922, pp. 384-385. Plan is for two men to enroll together, one for student working for stated period in shop or factory, his partner, in meantime, assuming his studies in college; at end of period, they alternate. Plan is adopted in various colleges

ELECTRIC DISTRIBUTION

INDUSTRIAL PLANTS. Factors in Industrial Plant Distribution, Roger B. Stevens. Elec. World, vol. 80, no. 24, Dec. 9, 1922, pp. 1259-1262, 5 figs. Operation at minimum cost and with greatest continuity of service obtainable with small and inexpensive force was major consideration in designing Am. Sugar Refining Co.'s new plant

POWER LOOPS. Power Loops Assure Reliable Service to Industries, P. O. Reyneau. Elec. World, vol. 80, no. 25, Dec. 16, 1922, p. 1329. They provide means of carrying greatly increased loads with existing system, and virtually bring generating station to load

ELECTRIC FURNACES

HAWLEY. Hawley Electric Furnace. Metal Industry, (N.Y.), vol. 20, no. 11, Nov. 1922, p. 425, 2 figs. New furnace based on use of indirect arc in body of oil-burning furnace body

PILOT-LIGHT CONTROL. Arc Regulation in Electric Furnaces and Pilot Light Control, C. E. Sims. U. S. Bur. of Mines Reports of Investigations, no. 2411, Nov. 1922, 2 pp., 1 fig. Describes apparatus used during experimental work in 300-lb. single-phase furnace of Heroult type used for melting iron and steel.

ELECTRIC GENERATORS, D.C.

ECONOMICAL TYPE. A New Type of Direct Current Machine, Alexander Rothert. Elecn., vol. 89, no. 2332, Nov. 17, 1922, pp. 560-562, 9 figs. New design by author for which great saving in active material is claimed; other advantages are reduction in voltage per commutator bar, increase in number of bars, and lower minimum voltage. Full data sheet for 100-kw. turbo-generator is given.

ELECTRIC LOCOMOTIVES

O-4-4-O-TYPE. Electric Locomotives on the Metropolitan Railway. Ry. Engr., vol. 43, no. 515, Dec. 1922, pp. 457-462, 11 figs. 1200-hp. O-4-4-O-type locomotives for heavy passenger traffic between Aldgate and Harrow.

SINGLE-PHASE. Single-Phase Express Passenger Locomotives with Individual Axle Drive. Ry. Gaz., vol. 37, no. 22, Dec. 1, 1922, pp. 707-709, 6 figs. Designed and built by Brown, Boveri & Co., Baden, for Swiss Federal Railways.

ELECTRIC MOTORS

SERIES. The Neutralized Series Conduction Motor on A-C. and D-C. Circuits, Val. A. Fynn. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp. 915-923, 18 figs. Deals with series motors without defined polar projections, of which there are three main forms.

ELECTRIC MOTORS, D.C.

CONTROLLERS. Starting Direct-Current Motors—Time-Limit Type Controller, Charles A. Armstrong. Power, vol. 56, no. 23, Dec. 5, 1922, pp. 882-883, 6 figs. What time-limit principle is and how controller operates; operation of type of controller working on counter-electromotive-force principle.

ELECTRIC TRANSMISSION LINES

CALCULATION. Transmission Lines. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp. 1026-1030, 3 figs. Discussion of following papers: A Graphic Method for the Exact Solution of Transmission Lines, M. Holladay; The Electrical Characteristics of Transmission Systems, H. B. Dwight.

HIGH-VOLTAGE. Present Status of High Voltage Transmission of Power, W. W. Lewis. Gen. Elec. Rev., vol. 25, nos. 10 and 11, Oct. and Nov. 1922, pp. 628-643 and 674-686, 46 figs. Present limit of transmission voltage; line insulation; corona; grounded neutral; protection; charging line; synchronous condensers; characteristics of long lines; transformers; oil circuit breakers; bushings. Tabulated data on 160 transmission systems whose circuit voltages are 66,000 or above.

HIGH-VOLTAGE PHENOMENA. High-Voltage Phenomena Encountered in Power Transmission; Harris J. Ryan. Am. Soc. Civ. Engrs.—Proc., vol. 48, no. 10, Dec. 1922, pp. 1859-1864, 1 fig. Discussion of more important of useful and predatory high-voltage actions found in electric-power industry.

PROBLEMS. Overhead Electric Power Transmission, William T. Taylor. Elec. Rev., vol. 91, no. 2347, Nov. 17, 1922, pp. 732-734. Future problems of bulk power supply; line supports; relationship between span and sag; maximum loading, weight of line insulators, etc.

PROTECTION, RELAY. Relay Protection for Radial Transmission and Distribution Systems, P. Ackerman. Eng. Jl. (Eng. Inst. of Canada Jl.), vol. 5, no' 12, Dec. 1922, pp. 571-576, 9 figs. Weaknesses of excess current principle and description of new principle of protection developed for 50,000-volt 30-cycle transmission system of Shawinigan Water & Power Co.

ELECTRICAL MACHINERY

LOAD DISTRIBUTION. New Method for the Electrical Machine Design and the Mechanical Device Determining Distribution of Loadings, J. T. Takeuchi. Denki Gakkwai Zasshi (Jl. Inst. Elec. Engrs. of Japan), no. 411, Oct. 1922, pp. 711-744, 16 figs. Author suggests new method of proportional increment for distribution of loadings and describes mechanical device therefor known as designograph.

OVERLOAD. The Relation of Overload to the Inner Temperature of Machines, Guido Semenza. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp 1031-1032, 3 figs. Writer shows, in elementary way, process of heating going on in electrical machines and considers what is fundamental difference between single rating (no overload allowed) and double rating (overloads allowed).

RATING, STANDARDS OF. Questions Relating to Standards of Rating. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp. 958-965, 14 figs. Discussion of following papers: Probable Values of Conventional Allowance for A-C Generator Stator Windings, by F. D. Newbury; and Temperature Limits in Large Machines, by P. Torchio.

ELECTROMAGNETS

CALCULATION. On the Calculation of Electromagnets (Sur le calcul de l'attraction des électro-aimants), André Guilbert. Revue Générale de l'Électricité, vol. 12, no. 19, Nov. 11, 1922, pp. 714-718, 5 figs. Discusses the Perot-Picou formula and suggests improvements

ELECTRIC WELDING, ARC

QUASI-ARC PROCESS. Electric Welding in Structural Work. Times Trade & Eng. Supp., vol. 11, no. 228, Nov. 18, 1922, p. 235, 1 fig. Substitution of welding by Quasi-Arc process for riveting in construction of three gas holders at Melbourne.

ELEVATORS

ELECTRIFICATION. Economic Value of Elevator Electrification, W. H. Whitton. Elec. World, vol. 80, no. 25, Dec. 16, 1922, pp. 1325-1328, 4 figs. Importance to user and central station, economy of change-over, greater safety, speed, smoothness and average mileage claimed.

EMPLOYEES' REPRESENTATION

PA. R.R. PLAN. How Pennsylvania Railroad Keeps Peace With Its Employees, H. A. Enochs. Ry. Rev., vol. 71, no. 23, Dec. 2, 1922, pp. 787-789. Investigation putting responsibility where it belongs under equitable plan of rule averts strife

EMPLOYMENT MANAGEMENT

LABOUR PERFORMANCE SHEET. A Labour Performance Sheet That Serves a Four-fold Purpose. Factory, vol 29, no 3, Sept 1922, pp 251-252, 1 fig Reproduces simple sheet for keeping of individual production records

ENGINEERING SOCIETIES

RESEARCH. Research for Engineering Societies, Alfred D Flinn Am Soc for Steel Treating—Trans., vol 3, no 2, Nov 1922, pp 218-225 Aims and agencies Describe co-operation of Engineering Foundation and National Research Council.

EVAPORATORS

TRIPLE-EFFECT. Evaporation—A Study of the Various Operating Cycles In Triple Effect Units, A. L. Weber. Chem. & Met. Eng., vol. 27, no. 22, Nov. 29, 1922, pp. 1073-1078, 10 figs. General method of discovering best operating cycle for triple-effect evaporators. "Heat balance" worked out for sample case.

EXHAUST STEAM

UTILIZATION. Calculations for Waste-Steam Utilization Plants (Zur Berechnung von Abdampfverwertungsanlagen), Otto Ginsberg. Gesundheits-Ingenieur, vol. 45, no. 44, Nov. 4, 1922, pp. 545-547. Gives table of entropy values and examples of calculation.

EXPLOSIVES

SAFE. Safe Explosives, John Moffat. Can. Min. Jl., vol. 43, no. 47, Nov. 24, 1922, pp. 801-803. Evolution of explosives practice in coal mines of Cape Breton, including systems of shotfiring, selecting explosives, tamping, electric detonation, etc.

TRINITROBENZENE. The Manufacture of 1.3.5.-Trinitrobenzene, Alan A. Drummond. Soc. Chem. Industry—Jl., vol. 41, no. 20, Oct. 31, 1922. pp. 338T-340T. Account of investigation of methods for economical production of trinitrobenzene with view to large-scale manufacture.

F

FATIGUE

INDUSTRIAL. The Relation of Fatigue Elimination to Other Activities, Frank B. and L. M. Gilbreth. Indus. Management (Lond.), vol. 8, no. 10, Nov. 30, 1922, pp. 311-312, 1 fig. Application of "Magster" three-dimension daylight kinematograph to motion study. (Abstract.) Paper presented before Soc. Indus. Engrs.

FERROCHROMIUM

DECARBURIZING BY HYDROGEN. Decarburizing Ferro-chromium by Hydrogen, Louis Jordan and F. E. Swindells. Chem. & Met. Eng., vol. 27, no. 22, Nov. 29, 1922, pp. 1071-1072. Preliminary tests indicate that most promising condition for refining high-carbon alloy by this method is probably by blowing molten alloy with blast of hydrogen in a converter.

FILTERS

SPRINKLING, TESTING STONE OF. Testing Sprinkling Filter Stone by Freezing and Thawing. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 938-939, 5 figs. Limestones practically all disintegrated rapidly afer 34 alterations in temperature; granite unharmed.

FLOW OF GASES

PIPES. The Flow of Gases in Pipes (Ueber das Strömen von Gasen in Röhren), R. Seeliger and G. Mierdel. Gas- u. Wasserfach, vol. 65, nos. 39 and 40, Sept. 30, and Oct. 7, 1922, pp. 618-621 and 635-640, 4 figs. Explanation of internal friction; the Poiseuille law for laminary flow; measurement of friction coefficients of gases; turbulent flow; formulas.

FLOW OF WATER

MEASUREMENT. Gaging Rivers of Medium Flow (Aforos de rios de caudal pequeno), E. Gallego. Energia Eléctrica, vol. 24, nos. 8, 9 and 10, Apr. 25, May 10 and 25, 1922, pp. 85-90, 101-107 and 117-123, 19 figs. Discusses gaging of open flow by means of orifices and weirs, and formulas for each type; gives tables of values for calculations. Details of work of Spanish commission appointed by Ministry of Public Works to report on water resources and hydraulic conditions of rivers in Spain.

PIPE LOSSES. A New Formula for Computing Pipe Losses, Charles I. Corp. Wisconsin Engr., vol. 27, no. 2, Nov. 1922, pp. 25-27 and 37, 6 figs. Data on experiments conducted at Hydraulic Laboratory of Univ. of Wisconsin on loss due to flow in wrought-iron pipes to determine loss of head caused by valves; effect of diameter on loss of head.

FLUE-GAS ANALYSIS

TESTING APPARATUS. An Electric Measuring Apparatus for Determining Carbonic-Acid Content of Flue Gases (Ein elektrisches Betriebs-Massgerät für den Kohlensauregahlt von Rauchgasen), G. Quaink. Dinglers Polytechnisches Jl., vol. 337, no. 19, Sept. 23, 1922, pp. 197-198, 5 figs. New flue-gas tester put on market by Siemens & Halske, which, like manometer, is attached to front wall of boiler, and with which CO_2 content can be read at a glance.

FLYWHEELS

CALCULATION. Calculation of Flywheels (Berekening van vliegwielen), D. Dresden. Ingenieur, vol. 37, no. 41, Oct. 14, 1922, pp. 812-814, 3 figs. Peripheral velocities and pressures; coupled flywheels; belt tensions; etc.

Calculation of Flywheels (Le calcul des Volants). Métallurgie, vol. 54, nos. 47 and 48, Nov. 23 and 30, 1922, pp. 1747-1749 and 1785-1786. Function of flywheels and formulas for their calculation, determination of coefficient of uniformity; flywheels for 4-stroke gas engines.

FORGING

HYDRAULIC PRESSES. Types of Hydraulic Presses, W. R. Ward. Forging & Heat Treating, vol. 8, no. 11, Nov. 1922, pp. 511-516, 7 figs. Grouped into two main classes, those used in making die forgings and those that do general forge work similar to that done by hammers.

FOUNDRIES

CORE STOVES. The "Hestia" Core Stove, J. M. Lockhart. Foundry Trade Jl., vol. 26, no. 325, Nov. 9, 1922, p. 375, 1 fig. New core and mold-drying stove, object of which is to do away with large volumes of black, sulphurous smoke and soot which pour into foundry whenever stove doors are opened.

TECHNICAL CONTROL. Technical Control of the McCook Field Foundry, E. H. Dix. Metal Industry (N.Y.), vol. 20, no. 11, Nov. 1922, pp. 426-429, 6 figs. System of control for foundry making aircraft castings. Paper read before Am. Foundrymen's Assn.

TOOL-CHECKING SYSTEM. Tool Checking Systems in Foundries, W. J. Salsom. Am. Mach., vol. 57, no. 21, Nov. 23, 1922, pp. 795-796, 2 figs. Identification numbers for patterns, loose parts, and core boxes, designating regular and special patterns; shelving and card indexes.

FOUNDRY MATERIALS

IRON-PERCENTAGE ESTIMATION. Estimation of Minute Percentages of Iron in Foundry Materials. Foundry Trade Jl., vol. 26, no. 325, Nov. 9, 1922, p. 383. Investigations of sulphocyanide colorimetric method, usual method and method advocated.

FRICTION

STATIC. The Theory of Static Friction, R. M. Deeley. Engineer, vol. 134, no. 3493, Dec. 8, 1922, pp. 610-611. Outline of tentative theory which may account for phenomena met with.

FUELS

BITUMINOUS COAL. Economical Use of Bituminous Fuels, John B. C. Kershaw. Elec. World, vol. 80, no. 25, Dec. 16, 1922, pp. 1317-1324, 16 figs. Conditions essential to insure high degree of efficiency and absence of smoke and unconsumed gas; choice of boilers; inclined and stepped grates; gas and coal-dust firing.

ECONOMICAL USE. Saving of Fuel in the Industries (Sur l'organisation des économies de combustibles dans l'industrie), P. Mahler. Revue Générale de l'Électricité, vol. 12, nos. 18 and 19, Nov. 4 and 11, 1922, pp. 688-693 and 734-740. Seventh report of Committee for Fuel Utilization. Difficulties encountered in introducing improvements; efforts made in France and foreign countries in coal saving, by improving furnace construction, etc.

Work of the Fuel Utilization Committee. Minister of Public Works. 7th Report (Travaux de la Commission d'Utilisation du Combustible), P. Mahler. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 134, no. 8, Aug.-Oct. 1922, pp. 817-838. Discusses fuel saving in various French industries and establishments, and activities of French and foreign organizations in same field.

LOW-GRADE. Using Low-Grade Fuel at the Montrambert and Beraudiere Collieries [Note sur l'utilisation des combustibles de faible valeur aux houillères de Montrambert et de la Béraudière (Saint-Etienne)], André Pigot and François Blache. Revue de Métallurgie, vol. 19, no. 11, Nov. 1922, pp. 665-671, 2 figs. Results of experiments showing advantage of coking followed by gas production in gas producers for gas engines.

See also Coal; Pulverized Coal.

FURNACES, BOILER

EXCESS-AIR LOSSES. Modern Management Methods in the Power Plant, Browning Robinson. Indus. Management (N.Y.), vol. 64, no. 6, Dec. 1922, pp. 346-349. Excess air said to be principal cause of heaviest losses.

OIL-FIRED. The New Körting Oil Furnaces and Their Use for Mine Locomotives (Die neuen Körting-Oelfeuerungen auch für Grubenlokomotiven), H. Pradel. Braunkohle, vol. 21, no. 33, Nov. 18, 1922, pp. 573-578, 8 figs. Oil furnaces with steam-jet or compressed-air centrifugal spraying; steam-jet sprayer as additional firing.

FURNACES, HOT-AIR

ECONOMIC DESIGN. Economy in Modern Furnace Practice. Sheet Metal Worker, vol. 13, no. 23, Dec. 8, 1922, pp. 757-759, 3 figs. Method by which requirements may be quickly calculated on sound engineering basis and outfit ordered complete in one shipment. Furnace system designated by Haynes-Langenberg Mfg. Co. for heating double residence.

FURNACES, INDUSTRIAL

FIRING. Industrial Heating (La Science du Chauffage industriel), C.-M. Stein. Revue de Métallurgie, vol. 19, no. 10, Oct. 1922, pp. 579-589. Temperature measurement; pyrometry and types of pyrometers; gasification of fuel; combustion; heat transmission and radiation; refractories.

FURNACES, METALLURGICAL

COPPER AND BRASS-MELTING. Fuels and Furnaces for Melting Copper and Brass Alloys, T. H. A. Eastick. Brass World, vol. 18, no. 11, Nov. 1922, pp. 340-341. Economic value of fuels; types and selection of furnaces. Paper read before Am. Foundrymen's Assn.

MALLEABLE-IRON. Builds New Type Malleable Furnaces. Herbert R. Simonds. Iron Trade Rev., vol. 57, no. 22, Nov. 30, 1922, pp. 1493-1495, 3 figs. Describes 18-ton furnaces built at plant of Arcade Malleable Iron Co., Worcester, Mass.

FURNACES, REVERBERATORY

NON-FERROUS METALS. Reverberatory Furnace for Non-Ferrous Metals. Foundry Trade Jl., vol. 26, no. 325, Nov. 9, 1922, pp. 384-385, 1 fig. Details of air-blast reverberatory furnace installed by Worthington-Simpson, Ltd., in their Newark works. Advantages and demonstration results.

G

GAGES

LIMIT. The Theory of Limit Gages (Teoria de los calibres limites), José M. Fernandez de Castro y Alonso. Asociacion de Ingenieros del Instituto Catolico de Artes e Industrias—Annales, vol. 1, no. 4, 1922, pp. 273-280, 5 figs. Discusses limit gages in connection with manufacture in quantity, tolerances, and errors in calculations.

GARBAGE DISPOSAL

TROUBLES. Troubles Experienced in Modern Methods of Garbage Disposal. Samuel A. Greeley. Municipal & County Eng., vol. 53, no. 5, Nov. 1922, pp. 192-197. Review of refuse-disposal practice, including mistakes which have been made, indicates need for broader development in solution of problem. Fundamental considerations.

GAS CLEANING

ELECTRICAL AND CENTRIFUGAL. Removal of Solid and Liquid Particles From Gases, A. F. Nesbitt. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 637-641, 6 figs. Experiments in removing dust from blast-furnace gas, and pitchy and tarry particles from combustion gases; types of combined electrical and centrifugal, and of centrifugal gas cleaners.

GAS ENGINES

SMALL NAVAL BOATS. Navy Yard Makes Gas Engines, S. W. Brinson. Foundry, vol. 50, no. 24, Dec. 15, 1922, pp. 984-986, 7 figs. To meet increased demand for this type of engine designed for use in all smaller naval boats equipment was provided for pouring 60 cylinders a day.

SUCTION-GAS PLANT. Suction-Gas Plant. Indian & East. Engr., vol. 50, no. 6, June 1922, pp. 300-303, 3 figs. A gas engine, gas being produced in generator alongside engine. Fuel for suction-gas plant; describes steam plant, principle on which suction gas is made, generator, various methods for supplying steam, scrubbers, starting and running, leakages and firebrick blocks.

GAS PRODUCERS

CENTRAL VS. INDIVIDUAL. Single Producers vs. Central-Type Producers (Einzel-generator oder Zentralgenerator), L. Litinsky. Gas- u. Wasserfach, vol. 65, no. 39, Sept. 30, 1922, pp. 621-626, 3 figs. Advantages and disadvantages of both systems are given in tabular form. Relative efficiency with regard to waste-heat recovery, quality of gas, combustion temperatures, use of low-grade fuels and lignite, dust content, space requirement and wages.

OPERATION. Gas Producers at the Breuil Works of Schneider & Co. (Gazogènes de l'usine de Breuil de MM. Schneider & Cie.), J. Cohade. Revue de l'Industrie Minérale, no. 45, Nov. 1, 1922, pp. 573-586, 6 figs. Describes gas producer plants at Breuil, near Creusot (France), for supplying Martin steel works, containing 6 furnaces of 60 tons and two of 30 tons; their operation and results obtained.

PREHEATED-AIR. Using Ash-Fusing Gas Producers Supplied With Preheated Air (L'utilisation des combustibles dans les gazogènes à fusion de cendres soufflés au vent chaud), Auguste Dessemond. Revue de Métallurgie, vol. 19, no. 11, Nov. 1922, pp. 656-664, 5 figs. Operated by Société des Houillères de Saint-Etienne, for burning coal waste containing over 50 per cent ash; result of working.

REFUSE-BURNING. British Practice in Deriving Gas Power from Wood Refuse, C. H. S. Tupholme. Power Plant Eng., vol. 26, no. 24, Dec. 15, 1922, pp. 1206-1208, 2 figs. Describes number of leading makes of gas producers which use wood or vegetable refuse for fuel.

GASOLINE

NATURAL-GAS. Some Recent Developments in the Manufacture of Natural Gas Gasoline, F. E. Hosmer and F. M. Seibert. Jl. Indus. & Eng. Chem., vol. 14, no. 12, Dec. 1922, pp. 1106-1111, 4 figs. Methods for recovering gasoline from casinghead gas; absorption methods are believed to be most practical.

GEAR CUTTING

BEVEL GEARS. Roughing Bevel Gears and Pinions, Franklin D. Jones. Machy. (N.Y.), vol. 29, no. 4, Dec. 1922, pp. 287-292, 14 figs. Describes several types of Gould & Eberhardt roughing machines, and methods of roughing.

HOBBING. Hobbing Silent Timing Gears of Condesite Celoron, M. E. Dalton. Can. Mfr., vol. 42, no. 11, Nov. 1922, pp. 25-26. Hints and practical information on gear hobbing. Condesite Celoron is non-metallic gear-cutting material which is practically water, oil and grease-proof and produces silent gears.

SPIRAL-TYPE BEVEL GEARS. Cutting Spiral-type Bevel Gears. Machy. (Lond.), vol. 21, no. 530, Nov. 23, 1922, pp. 242-247, 8 figs. Principles of cutting; operation and adjustment of generators designed for cutting gears of different sizes.

GEARS

HELICAL. A New System of Helical Involute Gearing for Use on Metal Planers, Forrest E. Cardullo. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 816-817 and 873, 2 figs. Particulars of system of helical gearing designed by author, in which directions of rotation and helical angles of several gears are so chosen as to counterbalance and minimize end thrust; advantages. (Abridged.)

TANGENT-RACK. The Hotchkiss-Taylor System of Gearing. Machy. (Lond.), vol. 21, no. 531, Nov. 30, 1922, pp. 276-278, 5 figs. Details of machine for generating tangent-rack gears.

TESTING TEETH. A New Method for Determining the Effect of Speed upon the Strength of Gear Teeth, Wilfred Lewis. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 813-815, 4 figs. Apparatus devised by C. H. Logue in 1920 to measure differentials in velocity ties and increment loads as related to mass and speed computed by him. Gear tester develops capabilities not originally contemplated and proves valuable both as instrument for describing diagrams and for measuring exactly relation of speed to pressure in loss of initial load.

GOLD DEPOSITS

BRITISH COLUMBIA. Placer Deposits of Cedar Creek Area, Cariboo District, British Columbia, W. A. Johnston. Can. Min. Jl., vol. 43, no. 45, Nov. 10, 1922, pp. 762-765, 2 figs. Results of writer's examination and mapping of area in September 1922. Notes on accessibility of area, physical features, mining operations and placer gold deposits. Published by permission of Director, Geol. Survey Canada.

CANADA. The Shear Zones of Porcupine, J. C. Murray. Can. Min. Jl., vol. 43, no. 49, Dec. 3, 1922, pp. 834-836. Author seeks to correlate certain geological facts, some of which have not yet, in his belief, been assigned their rightful places in written history of gold deposits of Porcupine, Ont. Deals with process of ore making; differentiation of vein matter and schist; structure and vein system; segregation of gold.

GRINDING MACHINES

HEAVY-DUTY. Grinder Finishes Machine Ways, A. R. Ludewigs. Iron Trade Rev., vol. 57, no. 21, Nov. 23, 1922, pp. 1415-1416, 5 figs. Flat bearing surfaces on machine-tool beds are generated accurately on special heavy-duty grinding machine, making scraping unnecessary; details of method.

PACKAGE CONVEYORS. What It Pays to Know About Material Handling, W. T. Spivey. Factory, vol. 29, no. 3, Sept. 1922, pp. 244-247 and 284-286, 8 figs. Power-driven conveyors best suited to handling of packages, boxes, or pieces.

H

HANDLING MATERIALS

OVERHEAD RUNWAYS. The Louden-King Overhead Runway System. Engineer, vol. 134, no. 3492, Dec. 1, 1922, p. 588, 5 figs. Describes installation at works of Brit. Tabulating Machine Co., designed to handle rolls of paper received at works for cutting up into tabulating cards.

HEAT TRANSMISSION

CONDUCTION AND CONVECTION. Heat Transfer by Conduction and Convection, W. H. McAdams and T. H. Frost. Jl. Indus. & Eng. Chem., vol. 14, no. 12, Dec. 1922, pp. 1101-1105, 3 figs. Liquids flowing through pipes. Review of literature, including Reynolds' analogy between heat transfer and friction; simplified form of theoretical Boussinesq equation is proposed; fouling of pipes is discussed and factor of safety suggested.

DETERMINATION. Modern Methods and Investigation Results for Determination of Heat Transmission (Neuere Methoden und Forschungsernebnisse zur Bestimmung des Wärmedurchganges), Oscar Knoblauch. Zeit. für die gesamte Kälte-Industrie, vol. 29, no. 10, Oct. 1922, pp. 177-183, 7 figs. Research methods and results of observations in the Munich Laboratory for Technical Physics.

RADIATION AND CONVECTION. Transmission of Heat by Radiation and Convection. Engineering, vol. 114, no. 2970, Dec. 1, 1922, pp. 672-673, 6 figs. Results of investigation by Ezer Griffiths and A. H. Davis of cold-storage problems, conducted on behalf of Food Investigation Board and Nat. Physical Laboratory.

HEATING AND VENTILATION

INVESTIGATIVE WORK. Investigative Work at the A. S. H.-V. E. Research Laboratory, F. Paul Anderson. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 28, no. 8, Nov. 1922, pp. 773-787, 18 figs. Critical velocity tests. Comfort and physiological effects of air conditions. Development of the Anderson and Armspach dust determinator.

HEATING, ELECTRIC

STEEL INDUSTRY. Electric Heating Applied to the Steel Industry, F. A. Hansen. Assn. Iron & Steel Elec. Engrs., vol. 4, no. 11, Nov. 1922, pp. 765-777. Deals with resistance type of electric heaters. Industrial heating appliances; low-temperature ovens; electric furnaces.

HEATING, HOUSE

FRANCE. Central House Heating (Du chauffage central), E. Allar. Associations Françaises de Propriétaires d'Appareils à Vapeur—Bul., vol. 3, no. 10, Oct. 1922, pp. 185-201, 9 figs. Describes different systems, including steam heating and hot-water heating; boilers and combustion; fuel consumption and temperature.

HEATING, STEAM

VACUUM. Vapor Heating Systems, E. R. Pierce. Domestic Eng., vol. 101, nos. 5, 7, and 9, Nov. 4, 18 and Dec. 2, 1922, pp. 173-175, 272-275, 365-367 and 402, 8 figs. Treatise on vapor and vacuum heating. Describes Gorton, Moline, Dunham vapor, McLear air-line vacuum, and vacuum-pump heating systems.

HELICOPTERS

THEORY. Helicopters, John Case. Aeronautical Jl., vol. 26, nos. 142 and 143, Oct. and Nov. 1922, pp. 390-407 and 435-447, 20 figs. Results of attempt to investigate theoretical possibilities and to develop some branches of theory of helicopters. Notes on airscrews for helicopters; consideration of dynamics of helicopter flight and development of stability equations.

HYDRAULIC TURBINES

EFFICIENCY. Thermometric Methods of Measuring the Efficiency of Hydraulic Turbines (Méthode thermométrique de Mesure de Rendement des Turbines hydrauliques), E. Poirson. Houille Blanche, vol. 21, no. 69-70, Sept.-Oct. 1922, pp. 155-157, 1 fig. Discusses system of Barbillion and Poirson; causes of errors in its application; variation of temperature of water; etc.

TESTING STATION. A New Hydraulic-Turbine Experimental Station (Die neue Wasserturbinen-Versuchanstalt der A.-G. der Maschinenfabriken von Escher Wyss & Cie), Robert Dubs. Schweizerische Bauzeitung, vol. 80 no. 21, Nov. 18, 1922, pp. 235-241, 10 figs. New testing station erected by Escher Wyss & Cie at Zurich, Switzerland, with artificial water power for examination of rotors, guide apparatus, draft tubes, etc.

TYPES. Water Power and Hydraulic Turbines. Indian & East. Engr., vol. 50, nos. 3, 4, 5 and 6, Mar., Apr., May and June 1922, pp. 118-120, 185-186, 219-222 and 279-285, 21 figs. Possibilities of water-power as commercial proposition; notes on power houses, sluices and controls, supply canals, pipe lines, anchorages, high and low pressure turbines, selection of types of turbines, reaction and impulse types, Pelton wheels, Francis turbines, stock pattern turbines, governors, gates, etc.

HYDRO-ELECTRIC DEVELOPMENTS

CANADA. Hydro-Electric Power Development in Canada. Engineering, vol. 114, no. 2968, Nov. 17, 1922, pp. 607-609. Review of new power units, indicating progress made.

HYDRO-ELECTRIC PLANTS

Low Head. The Development of Small Water Powers and Low Falls, A. H. Gibson. Elec. Rev., vol. 91, no. 2347, Nov. 17, 1922, pp. 730-732. Development of water powers from 10 to 200 hp. Points out that to make best use of average small water-power scheme, it should be used in combination with steam, gas, or oil fuel plant, operation and economy of such combined plant.

New England. Building a 6,500 Hp. Water Power Plant in New England, J. Arthur Garrod. Eng. News-Rec., vol. 89, no. 24, Dec. 14, 1922, pp. 1017-1020, 4 figs. Work on Searsburg development of Deerfield River involved earth dam and 4-mi. wood-stave pipe line.

Norway. A Low-Head Hydro-Electric Plant of 84,000 Hp. in Norway, W. Frances Lloyd. Eng. News-Rec., vol. 89, no. 21, Nov. 23, 1922, pp. 873-874, 4 figs. Development at Raanaasfos, on Glommen River, illustrative of modern European practice, involves large roller dam and novel timber chute.

Operating Instructions. Operating Instructions for Hydro-Electric Stations, Ralph Brown. Power, vol. 56, no. 22, Nov. 28, 1922, pp. 830-832. Writing operating instructions; methods of operation; putting main units on system; on hand control a 12,000-kva. unit has been started and paralleled with other machines in 45 sec.

Small, Remote Control of. Remote Control for Small Plants, E. S. Lincoln. Elec. World, vol. 80, no. 23, Dec. 2, 1922, pp. 1201-1204, 5 figs. How parallel operation of two small hydraulic plants was made possible without excessive cost to take care of load suddenly increased by war requirements.

I

ICE MANUFACTURE

Freezing Methods. Methods of Freezing Raw Water, Halbert Paul Hill. Refrig. Eng., vol. 9, no. 4, Oct. 1922, pp. 127-131 and (discussion) 131-132, 11 figs. Author makes following suggestions; (1) Extraction of heat through water and not through ice as means of manufacturing ice; (2) mechanical instead of air agitation. Ice-freezing system using supercooled water.

ICE PLANTS

Electrification. Advantages To Be Gained by Electrification of Ice Plants, W. H. Feldmann. Universal Engr., vol. 36, no. 5, Nov. 1922, pp. 22-26. Economic and operating advantages gained. Coal cost for steam and for producer-gas operation, and cost of electric service; increased output; saving in ammonia; etc.

Raw-Water, Electrically-Driven. An Impressive Example of Progress in the Manufacture of Ice, Sidney Mornington. Compressed Air Mag., vol. 27, no. 12, Dec. 1922, pp. 347-350, 13 figs. Description of 60-ton electric-driven plant of City Ice Co., Easton, Pa., for raw-water ice production; compound compression for manufacture of ice alone.

INDUSTRIAL MANAGEMENT

Budget Control. Expense Control Through Budgeting, Park Mathewson. Indus. Management, vol. 64, nos. 4, 5 and 6, Oct., Nov. and Dec. 1922, pp. 202-206, 3 figs., 301-304 and 1 fig., 372-375, 2 figs. Oct.: Description of production, marketing and administrative budgets and sub-budgets. Nov.: Checking up record of accomplishment. Dec. Quota-budget summary.

Costs, Standardizing. Working Plans for Standard Costs, G. Charter Harrison. Management Eng., vol. 2, no. 6, June 1922, pp. 331-336, 2 figs.; and vol. 3, nos. 1, 2, 3, 4, 5 and 6, July, Aug., Sept., Oct., Nov. and Dec. 1922, pp. 5-10, 3 figs., 97-101, 1 fig., 161-166, 1 fig., 227-231, 1 fig., 289-294, 3 figs. and 353-357, 1 fig. June: How to determine machine rates. July: Compilation of standard cost of parts and assemblies. Aug.: Obtaining real value from cost system. Sept.: Use of formulas in determination and analysis of cost variations. Nov.: Charting cost variation data and controlling inventories. Dec.: Current costs and monthly profit and loss statement.

Engineering Department. The Successful Operation of an Engineering Department, W. E. Irish. Indus. Management (N.Y.), vol. 64, nos. 5 and 6, Nov. and Dec. 1922, pp. 265-270 and 329-334. Nov.: Engineering contacts with outside companies and purchased products or service. Dec.: What real selling means and how it affects purchasing.

Fluctuations in Industry and. The Broader Industrial Movements, Ernest S. Bradford. Management Eng., vol. 3, no. 6, Dec. 1922, pp. 327-332, 11 figs. How changes in demand for materials and products affect management.

Idleness and Waste Reduction. Relieving Industry of Burden, Wallace Clark. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 819-820. General plan for lifting burden of idleness and waste in manufacturing plants whose capacity, increased during the war and period immediately following, is in excess of present demands. Distribution overhead expenses by machine-rate method; keeping all equipment in use, even though it is necessary to reduce prices to secure orders; reducing manufacturing time; and lowering production costs.

Plant Maintenance. Organized Plant Maintenance, N. W. Dundore. Iron Trade Rev., vol. 71, no. 24, Dec. 14, 1922, pp. 1625-1630, 4 figs. Typical maintenance organization required by average industrial plant is given as example.

Thrift in. Thrift in Industrial Materials, M. F. Simmons. Management Eng., vol. 3, no. 6, Dec. 1922, pp. 349-352. Discuss several phases of manufacturing and departmental operation. Salvaging industrial wastes; conservation of human labour. (Abstract.) Paper read before Indus. Commission of State of New York.

Time Study. *See Time Study.*

Improvement in. How Can Employee Relations Be Improved? Roy V. Wright. Ry. Age, vol. 73, no. 24, Dec. 9, 1922, pp. 1079-1081. Catechism that develops certain truths which must be recognized if conditions are to be bettered. Presented in discussion of paper read before Central Ry. Club by F. W. Brazier.

INDUSTRIAL RELATIONS

Committee Meetings. Industrial Relations at Tennessee Copper Company, J. N. Houser. Min. & Metallurgy, no. 192, Dec. 1922, pp. 19-20. Meetings with committee of employees consisting of 40 or 50 men out of 700. Work of service department.

INSULATING MATERIALS

Temperature, Influence of. Influence of Temperature on Insulating Materials Used in Electrical Machinery, Ernesto Vannotti. Am. Inst. Elec. Engrs. Jl., vol. 41, no. 12, Dec. 1922, pp. 933-934, 1 fig. It has been shown that temperatures that can be withstood without damage to insulating materials are considerably higher than those prescribed by international rules.

INSULATORS, ELECTRIC

High-Tension. Tests and Investigations on High-Tension Insulators. Am. Inst. Elec. Engrs. Jl., vol. 41, no. 12, Dec. 1922, pp. 1014-1021. Discussion of following papers: Tests and Investigations of Extra High-Tension Insulators, Farr and Philpott. Failure of Disk Insulator on High-Tension Transmission, H. D. Panton. An Overpotential Test for Insulators, G. W. Lapp.

IRRIGATION

Silt, Effect of. Skimming Rivers for Irrigation Water. Engineer, vol. 134, no. 3489, Nov. 10, 1922, pp. 485-486, 2 figs. Review of work by F. V. Elsden, dealing with effect of silt on irrigation works and with possibilities of its exclusion from canals.

Standardized Appliances. Standardized Appliances for Irrigation Structures, J. L. Savage. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 923-926, 4 figs. Designs for gates, lifts, hoists, radial gates, stem, couplings and guides as standardized by U. S. Reclamation Service.

INTERNAL-COMBUSTION ENGINES

Carburation. Carburation in Explosion Engines (Note sur la carburation dans les moteurs à explosion), D. Perrer. Arts et Métiers, vol. 75, no. 18, Mar. 1922, pp. 74-78, 6 figs. Discusses carburetors, atomizing, air injection, etc.

Combustion Velocity in. Velocity of Combustion of Working Mixtures in Internal-Combustion Engines, E. A. Chudacoff. Eng. Jl. (Russian), nos. 1-3, Jan.-Mar. 1922, pp. 20-35, 18 figs. Theoretical and experimental data expressed in formular tables and curves.

Heavy-Oil Utilization. Some Factors Affecting the Utilization of Heavy Fuel Oils in Internal-Combustion Engines, Harold Moore. North-East Coast Instn. Engrs. & Shipbldrs., advance paper no. 2378Q, for meeting Dec. 1, 1922, 10 pp., 7 figs. Deals with ignition difficulties; difficulties in burning oil after ignition has taken place; and difficulties caused by presence of comparatively small quantities of impurities.

See also Airplane Engines; Airships, Engines; Automobile Engines; Diesel Engines; Gas Engines; Ignition; Oil Engines.

IRON ALLOYS

Chromium-Iron. Duraloy, a New Heat-Resisting Metal. Automotive Industries, vol. 47, no. 24, Dec. 24, 1922, p. 1165. Alloy of chromium and iron developed by Cutler Steel Co. for various industrial uses; it is non-corrosive, retains good mechanical properties at high temperatures, and has great resistance to abrasion. See also Iron Age, vol. 110, no. 24, Dec. 14, 1922, p. 1567.

IRON, PIG

European. Foreign Pig Iron Generally Satisfactory, W. A. Barrows. Iron Age, vol. 110, no. 25, Dec. 21, 1922, pp. 1631-1632. Analyses of results obtained from employment of various grades of imported metal in American melting practice indicate uniformly successful application.

L

LABOUR

Eight-Hour Law. The Eight-Hour Law From the Practical Standpoint (La loi de 8 heures jugée par les faits), Paul Schlumberger. Société Industrielle de Mullhouse—Bul., vol. 88, no. 7, Sept. 1922, pp. 485-491. Discusses eight-hour law of Treaty of Versailles and French legislation based on it, and produces evidence against it. From Revue des Deux Mondes, Feb. 1, 1922.

LABOUR TURNOVER

Calculation of. The Labour Turnover Chaos, J. D. Hackett. Management Eng., vol. 3, no. 6, Dec. 1922, pp. 347-348. Plea for system of accounting for flow of labour.

LATCHES

Center. The Modern Centre Lathe, Louis Watkins. Machy. (Lond.), vol. 21, no. 530, Nov. 23, 1922, pp. 225-231, 15 figs. Post-war design of sliding, surfacing and screw-cutting lathes of John Lank & Son.

Turret. Using the Turret Lathe for Small Lots, Albert A. Dowd and Frank W. Curtis. Machy. (N.Y.), vol. 29, no. 4, Dec. 1922, pp. 266-270, 12 figs. Examples showing how small quantities of bar stock parts can be economically produced on turret lathe.

LIGHTING

Cotton Mills. Cotton Mill Lighting, James M. Metch. Illuminating Eng. Soc.—Trans., vol. 17, no. 8, Oct. 1922, pp. 577-599, 21 figs. Discusses number of standard group lighting designs which fill requirements for practically all cotton-mill processes.

LIGNITE

Steaming Tests. Comparative Steaming Tests of Nenana Lignite and Matanuska Bituminous Coals, John A. Davis and Paul Hopkins. U. S. Bur. of Mines Reports of Investigations, no. 2412, Nov. 1922, 9 pp. Summary of results obtained from series of fuel tests conducted by Alaska Experiment Station of Bur. of Mines.

LIME

Properties. Fundamental Properties of Commercial Limes, M. E. Holmes, G. J. Fink and F. C. Mathers. Chem. & Met. Eng., vol. 27, no. 25, Dec. 20, 1922, pp. 1212-1216, 2 figs. Settling of milk of lime suspensions.

LOADING BRIDGES

Types. Loading Bridges (Verladebrucken), Friedrich Ruedig. Fördertechnik u. Frachtverkehr, vol. 15, no. 24, Nov. 24, 1922, pp. 307-312, 13 figs. Discusses general types; bridges with rotary traveling cranes; describes installations by MAN, Krupp, and others, comparing their efficiency.

LOCOMOTIVE BOILERS

Tubes. Methods of Fitting Locomotive Boiler Tubes, A. Wrench. Ry. Engr., vol. 43, no. 515, Dec. 1922, pp. 463-464, 12 figs. Discussion of several method based on writer's practical experience.

LOCOMOTIVES

POWER REVERSE GEARS. A New Construction in Locomotive Power Reverse Gears. Ry. Rev., vol. 71, no. 22, Nov. 25, 1922, pp. 743-746, 8 figs. Description and operation of All Service type, designed to eliminate creeping and respond to fine adjustment.

SLEEVE-VALVE. Steam Distribution in the Locomotive, George H. Hartman. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 801-806, 6 figs. Particulars regarding new sleeve-valve arrangement for locomotives, designed by Charles J. Pilliod, that can be applied to old engines, either simple or compound; advantages. (Abridged.)

STRESSES IN FRAMES. Stresses in Locomotive Frames, R. Eksergian. Am. Soc. Mech. Engrs. advance paper for meeting Dec. 4-7, 1922, 146 pp., 41 figs. Preliminary analysis of major reactions brought on locomotive frame, nature of frame action as regards variation of bending moment, shear, etc., for differently supported types of frames; nature of lateral reactions and dynamics of lateral oscillations on entering curve.

LUBRICATING OILS

GRAPHITE IN. Graphite in Lubricating Oils. Oil News, vol. 10, no. 22, Nov. 20, 1922, pp. 34-35. Best proportions of graphite and oil; how graphite aids lubrication; graphite in steam cylinders and marine engines.

RECLAMATION. Oil and Waste Reclaimed with Profit in Milwaukee. Elec. Ry. Jl., vol. 60, no. 21, Nov. 18, 1922, pp. 805-808, 6 figs. Describes apparatus and process employed by Milwaukee Elec. Ry. & Light Co. for reclamation of oil and waste used in motor, axle and journal housings of electric railway cars.

LUBRICATION

STEAM-CYLINDER. Lubricating the Steam Engine Cylinder, R. A. Cultra. Power Plant Eng., vol. 26, no. 23, Dec. 1, 1922, pp. 1159-1161, 10 figs. Development of modern means and pointers on cars of hydrostatic lubricators and forced-feed pumps.

M

MACHINE-TOOL INDUSTRY

PROBLEMS. Problems of the Machine Tool Industry, Ernest F. Du Brul. Iron Age, vol. 110, no. 22, Nov. 30, 1922, pp. 1425-1430. Co-operation of dealer and manufacturer; cost factors; grinding-machine problems; etc. Address before Nat. Supply & Machy. Dealers' Assn.

MACHINERY

SOUND DETECTION. The Detection, Location and Comparison of Sound, C. E. Noel-Storr. Eng. Production, vol. 5, no. 110, Nov. 9, 1922, pp. 439-443, 9 figs. Construction and application of teetoscope and tectophone reproducers; electrical and recording systems. Paper presented before Instn. Production Engrs.

MAGNESITE

CAUSTIC CALCINED. The Production of Caustic Calcined Magnesite in the Scott Furnace, W. C. Riddell and C. N. Schuette. Eng. & Min. Jl.-Press, vol. 114, no. 23, Dec. 2, 1922, pp. 981-984, 5 figs. Apparatus used in distillation of quicksilver proves readily adaptable in new fields, despite much higher temperatures essential; has no movable parts and is virtually "fool-proof".

MAGNETOS

STUDY OF. The Modern Magneto, Sydney F. Walker. Gas & Oil Power, vols. 17 and 18, nos. 204, 205 and 206, Sept. 7, Oct. 5 and Nov. 2, 1922, pp. 198-200, 3-4 and 25-27, 6 figs. Considered in all its aspects.

MANHOLES

COVERS, REVERSIBLE. Reversible Manhole Covers to Replace Solid Type. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 928-929, 5 figs. Chicago sewer department develops three-piece cover lighter and stronger than standard; tests made.

MAPPING

AERIAL PHOTOGRAPHY. Aerial Photography as an Aid in Map Making, with Special Reference to Water Power Surveys, Gerard H. Matthes. Am. Soc. Civ. Engrs.—Proc., vol. 48, no. 10, Dec. 1922, pp. 1824-1845, 5 figs. Method of utilizing aerial photographs in preparation of maps, used with success in recent survey of Tennessee River.

Surveying with Aircraft Photographs, James W. Bagley. West. Soc. Engrs.—Jl., vol. 27, no. 12, Dec. 1922, pp. 351-361, 6 figs. Deals with making of topographic maps from aircraft photographs.

MARINE STEAM TURBINES

REVERSING GEAR. Epicyclic Reversing Gear for Ljungström Marine Turbines. Engineering, vol. 114, no. 2971, Dec. 8, 1922, pp. 699-703, 24 figs. Describes application of such gears to turbine-driven steamer of 2150 e.hp.

METAL CUTTING

GAS. City Gas Used as a Cutting Agent, D. R. Lane. Gas Age-Rec., vol. 50, no. 23, Dec. 2, 1922, pp. 757-758, 6 figs. Tests made on scrapped battleships, has many advantages over hydrogen and acetylene when mixed with oxygen, has an 1800-deg. flame.

METALS

AIR-COOLING CURVES. Characteristics of Air Cooling Curves, E. J. Janitzky. Am. Soc. for Steel Treating—Trans., vol. 3, no. 3, Dec. 1922, pp. 335-338, 3 figs. Observations on cooling curves in air (radiation, convection) and their characteristics.

FATIGUE. Fatigue in Metals, C. F. Jenkin. Engineer, vol. 134, no. 3493, Dec. 8, 1922, pp. 612-614, 12 figs. Account of and experience with model made by author. Paper read before Roy. Aeronautical Soc.

STRUCTURE. Structure of Metals and Alloys (L'Etude de la structure des métaux et alliages et ses conséquences), A. Portevin. France Belgique, vol. 11, no. 4, Oct. 1922, pp. 45-55, 9 figs. Heat treatment, micrography, making of slides, microstructure, crystals and grains, grain growth.

MILLING CUTTERS

FORGED HIGH-SPEED. Advantages of the Forged Milling Cutter, William G. Calkins. Am. Soc. for Steel Treating—Trans., vol. 3, no. 2, Nov. 1922, pp. 239-244 and 251, 18 figs. Process of manufacture of high-speed steel with special reference to internal structural condition. Advantages of forged cutter as compared to cutter made direct from bar stock.

MILLING MACHINES

INDEX HEADS. New Type of Universal Index Head (Un nouveau type de poupée-diviseur universel), P. Massot. Arts et Métiers, vol. 75, no. 25, Oct. 1922, pp. 291-296, 4 figs. Detailed description of type made by Philibert and Gambin; angular division; helicoidal milling.

TYPES. Modern Milling Practice. Eng. Production, vol. 5, no. 110, Nov. 9, 1922, pp. 434-437, 10 figs. Machines and equipment of Ingersoll Milling Machine Co., Rockford, Ill.

MINERALS

BRITISH COLUMBIA. Geology and Mineral Deposits of the Bridge River Map-area, British Columbia, W. S. McCann. Canada Dept. Mines, Geol. Survey, Memoir 130, no. 111, geological series, 115 pp., 33 figs. General character and geology of region; description of mines and prospects with regard to gold-quartz veins, silver-copper deposits and other properties.

MINERALS, NON-METALLIC

CANADA. Production of Non-Metallic Minerals in Canada. Cement, Mill & Quarry, vol. 21, no. 7, Oct. 5, 1922, pp. 45-47. Minerals considered include arsenic, asbestos, barytes, chromite, feldspar, fluorspar, graphite, gypsum, magnesite, manganese, etc.

MOULDING METHODS

MOULDING BOXES. Jobbing Foundry Moulding Boxes, with Some Notes on Runners and Risers, C. Bickerton. Foundry Trade Jl., vol. 26, no. 328, Nov. 30, 1922, pp. 437-439 and (discussion) 439-440. Deals with heavier type of moulding boxes usually fitted by mechanical power; notes on weighing machine girder box, troubles from pins, box handles, weighing boxes, lifting grids, castings, planing machine tables and machine cross slides, etc.

MOTOR BUSES

EIGHT-WHEEL. The Eight Wheel Automobile, D. A. Jacks. West. Machy. World, vol. 13, no. 11, Nov. 1922, pp. 391-392, 10 figs. Line of eight-wheel passenger busses, freight trucks and street cars designed and built by Nat. Axle Corp., San Francisco and San Jose, using Fageol patents for drive and axle construction.

MOTOR TRUCKS

ALBION. The New 30-cwt. Albion. Motor Transport, vol. 35, no. 925, Nov. 20, 1922, pp. 662-664, 6 figs. A pneumatic-tired chassis constructed mainly to recommendations of War Office M. T. Advisory Board.

SHEFFLEX. The 30-Cwt. Shefflex Chassis. Automobile Engr., vol. 12, no. 169, Nov. 1922, pp. 322-328, 18 figs. Light commercial vehicle manufactured by Sheffield Simplex, Ltd., Sheffield; 4-cylinder engine driving through cone clutch to three-speed gear box, final drive being through overhead worm gear; 17-16 b.hp. at 800 r.p.m.

TRANSMISSION. Some Application of Electric Transmissions During the War (Quelques applications des transmissions électriques pendant la guerre), M. Duthil. Société Française des Électriciens—Bul., vol. 2, no. 17, July 1922, pp. 389-408, 8 figs. Applications to heavy vehicles, such as trucks, locomotives, etc., and advantages of electric transmission.

N

NATURAL GAS

ESTIMATION OF RESERVES. Estimation of Reserves of Natural Gas Wells by Relationship of Production to Closed Pressure, Paul Ruedemann and Ionel Gardescu. Am. Assn. Petroleum Geologists—Bul., vol. 6, no. 5, Sept.-Oct. 1922, pp. 444-463, 6 figs. Appraisal of gas properties. Discusses three tests for estimation, viz., open flow capacity, closed pressure, and minute pressure above line; proof of method.

NICKEL PLATING

BLACK-NICKELING. Black-Nickeling. Metal Industry (Lond.), vol. 21, no. 20, Nov. 17, 1922, pp. 457-458. Oxidizing processes; alkaline cyanide solutions; composition of black-nickel deposits; theory of black-nickeling, straight arsenic baths.

O

OFFICE MANAGEMENT

ROUTING AND CONTROL. Putting Office Work on a Production Basis, A. S. Peck. Indus. Management (N.Y.), vol. 64, no. 6, Dec. 1922, pp. 358-359, 3 figs. Routing and control in office administration.

OIL ENGINES

HOPPER-TYPE. 3-B.Hp. Hopper-Type Paraffin Engine. Engineering, vol. 114, no. 2971, Dec. 8, 1922, pp. 707-709, 11 figs. Small oil engine constructed by Drummond Bros., Ltd., Guildford, England, has cylinder 4 in. diam. by 6-in. stroke.

MARINE. The Marine and Small Craft Exhibition. Engineering, vol. 114, no. 2969, Nov. 24, 1922, pp. 644-647, 11 figs. Describes two-stroke double-acting engines shown by Reed's Patent Engine Co., Southampton, one running on gasoline or paraffin, and other on crude oil; and two-stroke two-cylinder engine exhibited by Bruntons, Ltd., Sudbury, innovations in reverse gears, etc.

SOLID-INJECTION. Compression Pressure in the Solid Injection Engine. Power, vol. 56, no. 25, Dec. 19, 1922, pp. 980-982, 3 figs. Points out that Diesel engine requires compression pressure of 450 lb. per sq. in., whereas solid injection engine uses only 300 to 350 lb. compression to cause ignition of fuel. Discusses reasons for this variation in compression requirements.

OIL FUEL

BURNING EQUIPMENT. Oil and Oil Firing (Olie en oliestoken), A. Meijer. Ingenieur, vol. 37, no. 44, Nov. 4, 1922, pp. 886-893 and (discussion) 893-894, 19 figs. Oil resources available; oil-burning equipment, including various types of burners, furnaces and combustion chambers; regulating instrument.

The Colmar Burner, Walter H. Gardner. West. Machy. World, vol. 13, no. 11, Nov. 1922, p. 393. Kerosene-burning system adapted to all heating, power and generating uses.

COAL VS. Comparing Value of Power Plant Fuels, G. Milton Levy. Power Plant Eng., vol. 26, no. 23, Dec. 1, 1922, pp. 1147-1148, 3 figs. Graphic method of computing cost of steam generated with oil and coal as fuel.

ECONOMICAL BURNING. Burning Fuel Oil Economically, Frank G. Parker. Power, vol. 56, no. 24, Dec. 12, 1922, pp. 940-941. Relation of furnace volume to heating surface, increasing life of furnace brickwork; absorption of heat in boiler; oil temperatures for mechanical and steam atomized burners; pumps and strainers.

OPEN-HEARTH FURNACES

COKE-OVEN GAS FIRING. Coke-Oven Gas for Open-Hearth Furnaces (Sur l'utilisation du gaz de fours à coke dans les fours Martin), Jean Dupuis. Revue de Métallurgie, vol. 19, no. 10, Oct. 1922, pp. 590-599. Its advantages for Martin furnace, temperature necessary, carbon deposit and its relation to quality of fuel.

IMPROVEMENTS. Open-Hearth Steel Practice, Willis McKee. Foundry, vol. 50, no. 24, Dec. 15, 1922, pp. 990-993, 5 figs. Water-cooled devices tend to stabilize furnace operations; flow-torch principle in parts gives more intimate mixture of gas and air and reduces melting time. Practice and improved furnace at plant of Brier Hill Steel Co. Paper presented before Am. Foundrymen's Assn.

LOFTUS IMPROVED. Loftus Improved Open-hearth Furnace, William Millward. Min. & Metallurgy, no. 192, Dec. 1922, pp. 25-27, 3 figs. 75-ton open-hearth furnace burning producer gas equipped with new Loftus fuel and air devices demonstrates practicability of invention.

ORE DEPOSITS

MAGNETOMETRIC DETERMINATIONS OF PLACER. Magnetometric Determinations Applied to Placer Mining, Arthur Gisson. Eng. & Min. Jl.-Press, vol. 114, no. 25, Dec. 16, 1922, pp. 1064-1069, 7 figs. Results obtained by this method of making surveys to ascertain approximate location of mineral concentrations; use of maps and charts.

OXY-ACETYLENE WELDING

BURNERS. The Burner for Oxy-Acetylene Welding and Its Defects (Der Acetylen-Sauerstoffschweissbrenner und seine Fehler), Fr. Mangianelie. Acetylen, vol. 25, no. 9, 1922, (Autogene Metallbearbeitung), pp. 49-54. Discusses oxygen excess present with all burners which represents a loss and reduces quality of weld.

LOCOMOTIVE REPAIRS. Application of Autogenous Welding in the Machine Shops of the North Railway Company (Applications de la soudure autogène dans les ateliers de machines du chemin de fer du Nord), M. Servonnet. Revue Générale des Chemins de Fer, vol. 41, no. 5, Nov. 1922, pp. 293-314, 37 figs. Application of acetylene welding to iron, steel, cast iron, repairing of fire tubes and cylinders, and of arc welding to cast iron and repairing of fireboxes, in locomotive repairing.

PLANT. Oxy-Acetylene Welding and Cutting Plant. Eng. Production, vol. 5, no. 112, Nov. 23, 1922, pp. 485-489, 20 figs. Two examples of small plants with description of each of units which go to make up complete plant.

SAFETY IN. Operating Oxy-acetylene Apparatus, H. S. Smith. Iron Trade Rev., vol. 71, no. 23, Dec. 7, 1922, pp. 1557-1561. Safety obtained only by strict observance of rules governing care of equipment; acetylene generators require skilled operators; storage of carbide and tanks.

P

PAPER MANUFACTURE

CHLORINE IN. Chlorine in Paper Making, Ismar Ginsberg. Chem. Age (N.Y.), vol. 30, no. 11, Nov. 1922, pp. 487-488. Possibilities of chlorine process for manufacture of pure cellulose from wood and straw. Chlorine for paper making in Italy.

PAPER MILLS

ELECTRIC DRIVE. Applying the Electric Motor to the Pulp Industry, Gordon Fox. Power Plant Eng., vol. 26, no. 23, Dec. 1, 1922, pp. 1153-1156, 5 figs. Notes on pulp and paper-mill drives.

Application of the Electric Motor to Paper Making, Gordon Fox. Power Plant Eng., vol. 26, no. 24, Dec. 15, 1922, pp. 1209-1212, 4 figs. Intricate driving problems solved by development of sectional drive.

PEAT

UTILIZATION. New Processes for Utilization of Peat (Neue Verfahren zur Torfverwertung und Torfveredelung), Joh. Steinert. Zeit. für angewandte Chemie, vol. 35, no. 81, Oct. 10, 1922, pp. 553-555. Peat as a fuel; water extraction; briquetting; etc. Shows that peat is a fuel well worth attention.

PHOSPHATES

UNITED STATES DEPOSITS. The Story of Phosphate Rock. Am. Fertilizer, vol. 57, no. 10, Nov. 18, 1922, pp. 23-38d, 25 figs. Distribution and character of deposits; methods of handling; phosphate reserves of United States; simple tests; manufacture of acid phosphate.

PIPE, CAST-IRON

FAILURE IN. Causes of Failure in Cast Iron Pipe, F. A. McInnes. Am. Water Works Assn.—Jl., vol. 9, no. 6, Nov. 1922, pp. 846-850. Discusses quality of pipe iron as probable cause of failures.

PIPE, CONCRETE

CENTRIFUGALLY-MADE. Reinforced-Concrete Pipe Made by Centrifugal Process. Eng. News-Rec., vol. 89, no. 20, Nov. 16, 1922, pp. 829-830, 4 figs. Pipe cast with special joints manufactured by whirling cylinder mould on longitudinal axis.

PIPE FITTINGS

COPPER-ALLOY. British Standard Specification for Copper-Alloy Pipe Fittings Screwed for Low and Medium Pressure. British Standard Copper Tubes (Primarily for Domestic and Similar Work). Brit. Eng. Standards Assn., no. 99, Nov. 1922, 52 pp., 45 figs.

PIPE, STEEL

LEAD PLATING. Remedy Rapid Pipe Deterioration in the Engine House. Ry. Rev., vol. 71, no. 24, Dec. 9, 1922, pp. 818-820, 3 figs. New process for protection of steel surfaces with a malleable lead plating chemically applied, developed on A.T. & S.F. Ry., and particularly applicable to enginehouse piping.

WATER WORKS, IN. The Use of Steel Pipe in Water Works, G. A. Elliott. Am. Water Works Assn.—Jl., vol. 9, no. 6, Nov. 1922, pp. 839-845, 3 figs. Points observed or followed in practice. Life of plate pipe.

PISTON RINGS

MANUFACTURE. The Manufacture of Piston Rings. Machy. (Lond.), vol. 21, no. 528, Nov. 9, 1922, pp. 161-164, 12 figs. Features in design and production of radially direct pressure rings. Also article on Making Over-size Piston Rings, pp. 165-166, 2 figs.

PLANING

ACCURATE. No Hand Scraping on Planed Work, L. S. Love. Iron Age, vol. 11, no. 24, Dec. 14, 1922, pp. 1555-1557, 5 figs. Method of planing metal parts for exact fits without necessity of hand scraping; accuracy and long life secured with reduction in labour cost; special fixtures to hold strips for planing.

POWER FACTOR

IMPROVEMENT OF. A New Method of Improving Power Factor, T. F. Wall. Engineer, vol. 134, no. 3492, Dec. 1, 1922, p. 574, 3 figs. New device in form of phase advancer for improving power factor, invented by author and described by him in discussion of paper on improvement of power factor by Dr. Kapp.

PRECIPITATION

ELECTRICAL. Electrical Precipitation. Am. Inst. Elec. Engrs.—Jl., vol. 41, no. 12, Dec. 1922, pp. 1011-1014. Discussion of following papers: Recent Conclusions Pertaining the Electrical Precipitation, W. A. Schmid; Electrical Engineering Features of the Electrical Precipitation Process, M. Horne; Electrical Precipitation of Solids from Smelter Gases, R. B. Rathbun.

POWER PLANTS

CONNECTICUT. Operating Features of the Montville Power Station. Power Plant Eng., vol. 26, no. 24, Dec. 15, 1922, pp. 1187-1192, 12 figs. Eastern Connecticut Power Co.'s plant is planned for ultimate capacity of 50,000 kw. but initial installation is 20,000 kw. Good results obtained during 3 years' operation.

EQUIPMENT. Glimpses of the Power Show. Power, vol. 56, no. 24, Dec. 12, 1922, pp. 928-936, 6 figs. Review of equipment; educational value of exhibits. List of exhibitors and their products.

FACTORY. Power for Making the Steinway Piano. Power Plant Eng., vol. 26, no. 23, Dec. 1, 1922, pp. 1139-1144, 10 figs. Describes power plant serving one of factories at Long Island City, N.Y. Details of boiler house, feedwater, kilns, exhaust steam, engine equipment and fire protection.

PULLEYS

SIZES AND TYPES. Sizes and Types of Pulleys, Frank E. Gooding. Indus. Engr., vol. 80, no. 11, Nov. 1922, pp. 519-526, 22 figs. Practical pointers on pulleys for transmitting power through lineshafting to machines.

PULVERIZED COAL

BOILER FIRING. How Powdered Coal Is Burned at Lakeside. Power, vol. 56, no. 25, Dec. 19, 1922, pp. 969-973, 5 figs. Details of conveyor system, burners and system of regulation; operating problems encountered and how they have been met.

FURNACES. Furnace Maintenance with Pulverized Fuel, Milton W. Arrowood. Iron Age, vol. 110, no. 25, Dec. 21, 1922, pp. 1633-1636, 5 figs. Effect of imperfect mixing in causing overheating of brick surfaces; abrasion of eddying currents; efficient firing and low maintenance.

Powdered Coal as Fuel in Steam Plants, Henry Kreisinger and John Blizard. Engrs.' Soc. West. Pa.—Proc., vol. 38, no. 5, June 1922, pp. 169-181 and (discussion) 182-200, 6 figs. Reasons for high thermal efficiency. Deals mainly with furnace design.

MALLEABLE IRON FOUNDRIES. Powdered Coal for Malleable, T. W. Atterbury. Foundry, vol. 50, nos. 20 and 21, Oct. 15 and Nov. 1, 1922, pp. 815-819 and 880-884, 14 figs. Information based on practice at plant of T. H. Symington Co., Rochester, N.Y. Oct. 15: Experimental results indicate advantages of use of powdered fuel over hand firing. Nov. 1: Calculating gas velocity, volume and length of time in furnace, application to annealing ovens.

PULVERIZERS. Self-Contained Coal Dryer, Pulveriser and Blower. Power House, vol. 15, no. 22, Nov. 20, 1922, pp. 22-23, 3 figs. New machine, known as Atritor, dries, granulates, pulverizes to any degree of fineness and delivers fuel into combustion chamber all in one continuous process, at any desired rate of delivery without auxiliary plant other than feeding arrangement for coal.

PUMPS

AIR-LIFT. Raising Liquids by Means of Compressed Air (Elevación de líquidos por medio de aire comprimido), Antonio Gomez Remires. Asociòn de Ingenieros del Instituto Catolico de Artes e Industrias—Anales, vol. 1, no. 4, 1922, pp. 290-296, 8 figs. Discusses air-lift pumping system, its advantages and application, and makes some calculations for plants.

FIRE, INSTALLATION OF. Some Point to Observe When Installing Fire Pumps, G. A. Van Brunt. Indus. Engr., vol. 80, no. 12, Dec. 1922, pp. 583-589, 17 figs. Outlines more important requirements of Nat. Board of Fire Underwriters governing installation of fire pumps.

RECIPROCATING DISPLACEMENT. Test Code for Reciprocating Displacement Pumps. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 844-847. Preliminary draft of eighth in series of 19 test codes being formulated by A.S.M.E. Committee on power test codes.

TYPES. Pumps, Ed. Cunningham. Domestic Eng., vol. 100, nos. 2, 3, 4, 8 and 13 and vol. 101, nos. 4 and 9, July 8, 15, 22, Aug. 19, Sept. 23, Oct. 28 and Dec. 2, 1922, pp. 48-51, 100-103, 139-142, 321-324 and 355, 536-539, 130-131 and 158-162, and 371-374, 31 figs. Development of apparatus of indispensible use to plumbing and heating contractor. Use of rotary pumps, which are particularly adaptable for pumping heavy liquids. Use of air-lift pumps.

PUMPS, CENTRIFUGAL

PISTON AND. Pumps (Les pompes). Métallurgie, vol. 53, no. 45, Nov. 9, 1922, pp. 1665-1668. Discusses work done by pumps and gives formulas and calculations; describes centrifugal and piston pumps, their operation and control.

Q

QUAY WALLS

REINFORCED-CONCRETE. Some Special Types of Retaining Walls, R. N. Stroyer. Concrete & Constr. Eng., vol. 17, no. 11, Nov. 1922, pp. 710-715, 12 figs. Describes type of reinforced-concrete quay walls; number of which have been built in Germany and England. Advantages.

R

RADIOTELEGRAPHY

ARC GENERATOR. Characteristics of 5-Ww. Elwell-Poulsen Arc Generator, A. T. C. Moore. Engineering, vol. 114, no. 2971, Dec. 8, 1922, pp. 697-698, 10 figs. Results of tests performed on generator manufactured by C. F. Elwell, Ltd., and erected by them at East London College.

SHORT-WAVE DIRECTIONAL. Short-Wave Directional Wireless Telegraphy, C. S. Franklin. Instn. Elec. Engrs.—Jl., vol. 60, no. 312, Aug. 1922, pp. 930-934 and (discussion) 934-938, 4 figs. Results of investigations made with reflectors and wave-lengths below 20 meters. Investigation was commenced by G. Marconi in Italy in 1916 with author's assistance.

RADIOTELEPHONY

STATIONS. The London Wireless Broadcasting Station. Engineering, vol. 114, no. 2970, Dec. 1, 1922, pp. 686-688, 2 figs. Details of station, based on technical information supplied by R. H. White, engineer of Marconi Co.

TRANSMITTERS. Commercial Radio Telephone and Telegraph Transmitting Equipment, W. R. G. Baker and B. R. Cummings. Gen. Elec. Rev., vol. 25, nos. 10 and 11, Oct. and Nov. 1922, pp. 603-606 and 666-673, 15 figs. Explains advantages of continuous-wave and interrupted-continuous-wave transmission and describes essential elements of standardized commercial type of radio transmitter for telephony. Description of 200-watt and 1000-watt vacuum type transmitter, the several component parts, and transmitter of 2000-watt output.

RAILWAY ELECTRIFICATION

ARGUMENTS FOR. Some Arguments for Railroad Electrification, W. J. Davis, Jr. Gen. Elec. Rev., vol. 25, no. 12, Dec. 1922, pp. 720-723. Discusses three necessary equipments of motive-power equipment capable of successfully meeting transportation requirements of the country, namely, (1) availability for service, (2) unrestricted power possibilities, and (3) economical operation. Comparison of steam service taken from records, and estimated electric service.

CHICAGO TERMINALS. Illinois Central Announces Plans for Chicago Terminals. Eng. News-Rec., vol. 89, no. 20, Nov. 16, 1922, pp. 841-843, 2 figs. Begins 18-year program of improvement on suburban and terminal electrification and lake-front park extension.

FRANCE. Electrification of the Midi System (L'électrification du réseau du Midi), L.-D. Fourcault. Électricien, vol. 53, nos. 1312 and 1313, Nov. 15 and Dec. 1, 1922, pp. 505-513 and 529-534, 12 figs. Program of electrification; locomotive tests in France; locomotive construction and upkeep; workshops; describes double-bogie, 1400-hp. Midi-type locomotive; overhead transmission lines and equipment; substations; converters; etc.

Electrification of the National Systems (L'Electrification des réseaux nationaux), Auguste Pawlowski. Nature, no. 2535, Nov. 4, 1922, pp. 297-300, 4 figs. Design and operation of 1500-volt electric locomotives of Midi railway, and data on sections electrified.

Partial Electrification of the System of the Orleans Railway Company (L'Electrification partielle du Réseau de la Compagnie des Chemins de Fer d'Orléans), H. Parodi. Houille Blanche, vol. 21, no. 69-70, Sept.-Oct. 1922, pp. 162-166, 2 figs. Describes work on section between Paris and Toulouse and gives some details of equipment

FUTURE OF. The Future of Railway Electrification and Its Connection with Power Supply and Distribution, Philip Dawson. Elec. Rev., vol. 91, no. 2347, Nov. 17, 1922, pp. 742-745, 1 fig. Development on Continent of Europe, especially in Central Europe; British schemes.

HYDRO-ELECTRIC DEVELOPMENT AND. Hydro-Electric Power Development as Related to the Electrification of Railroads, C. F. Loweth. Am. Soc. Civ. Engrs.—Proc., vol. 48, no. 10, Dec. 1922, pp. 1872-1878. Conditions under which hydro-electric power would be important factor in steam-railway electrification

SYDNEY, AUSTRALIA. The Traffic Problem of Sydney, New South Wales, and Its Solution, J. J. C. Bradfield. Ry. Gaz., vol. 37, no. 21, Nov. 24, 1922, pp. 649-654, 14 figs. New loop lines to separate and extend urban railway facilities, electrification proposals, further extensions of railway system, and Sydney harbour bridge.

RAILWAY MANAGEMENT

OPERATING DEPARTMENTS. Reorganization of Operating Departments, Great Indian Peninsula Railway. Ry. Gaz., vol. 37, no. 22, Dec. 1, 1922, pp. 714-717. In order to secure improved operating results and effect economy, co-ordination of running branches of traffic and locomotive departments under transportation department and formation of separate commercial and mechanical departments.

RAILWAY MOTOR CARS

ELECTRIC. New Railway Motor Cars of the Burgdorf-Thun Railway (Switzerland) Neue Motorwagen der Burgdorf-Thun-Bahn). Schweizerische Bauzeitung, vol. 80, no. 23, Dec. 2, 1922, pp. 255-257, 8 figs. New type consists of small locomotive and a passenger car, having front motor bogie in common, thus being shorter in length than such a combination ordinarily is, and traveling in both directions with changing bogie.

GASOLINE. Novel Gasoline Motor for Railway Car Bodies, Raymond S. Zeitler. Ry. Rev., vol. 71, no. 25, Dec. 16, 1922, pp. 852-854, 2 figs. New design for self-propelled car utilized bolster as crankcase; double-end electropneumatic control.

RAILWAYS

ROLLING-STOCK MATERIAL SPECIFICATIONS. Standardization of Specifications for Materials for Construction of Rolling Stock for the French Railways (Note sur les unifications des spécifications techniques pour la fourniture des matériaux entrant dans la construction des voitures, machines et tenders des grands réseaux de chemins de fer français), M. La Blant. Revue Générale des Chemins de Fer, vol. 41, no. 5, Nov. 1922, pp. 315-324. Standardization by Minister of Public Works of specifications of 1906 and 1917.

RAILWAY OPERATION

TRAIN CONTROL. Automatic Train Control, Thos. S. Stevens, C. F. Giles and A. W. Towsley. West. Soc. Engrs.—Jl., vol. 27, no. 12, Dec. 1922, pp. 370-382 Three articles discussing subject from signal, mechanical, and transportation standpoint.

RAILWAY TIES

RENEWALS. Methods of Making Tie Renewals. Ry. Rev., vol. 71, no. 23, Dec. 2, 1922, pp. 783-784, 1 fig. Committee report presented at Roadmasters & Maintenance of Way Assn.

STEEL. Steel Ties and Curbs. Can. Engr., vol. 43, no. 21, Nov. 21, 1922, pp. 558-559, 3 figs. Now being successfully manufactured by Canadian company; ties show saving in cost compared with wood; curb used at Merritton, Ont.

RAILWAY TRACK

CROSSINGS. A Practical Chart for Point and Crossing Work, R. D. Walker. Ry. Engr., vol. 43, no. 515, Dec. 1922, pp. 454-456, 3 figs. Chart devised by author expressing simple relationships between various variables required for ordinary point and crossing work.

IMPROVEMENT. Illinois Central Improves Line Near Chicago. Ry. Age, vol. 72, no. 25, Dec. 16, 1922, pp. 1123-1128, 9 figs. Reduces grades and adds to tracks between Matteson, Ill., and Kankakee under heavy traffic.

RAINFALL

INTENSITIES. Rainfall and Floods. Engineering, vol. 114, no. 2968, Nov. 17, 1922, pp. 614-616, 3 figs. Rainfall and rainfall intensities. Summary of factors upon which quantity of water which will accumulate at point or outlet of water course draining a basin depends.

REFORESTATION

WATERSHEDS. Problems in the Reforestation of Watersheds, George R. Taylor. Am. Water Works Assn.—Jl., vol. 9, no. 6, Nov. 1922, pp. 874-884. Deals with fire protection, planting, tree diseases, and utilization of deal and dying trees.

REFRACTORIES

CARBONIZED CLAY. A New Refractory Material, Walter Smith. West of Scotland Iron & Steel Inst.—Jl., vol. 30, part 1, session 1912-23, Oct. 1922, pp. 8-13 and (discussion) 13-15, 4 figs. on supp. plate. Points out marked difference which exists between admixture of carbon and clay, and structural change in clay itself after undergoing treatment by carbon-charged gases according to process.

CHROME. Chrome Refractories, J. Spotts McDowell and H. S. Robertson. Am. Ceramic Soc.—Jl., vol. 5, no. 12, Dec. 1922, pp. 865-887, 2 figs. Compilation from available literature, giving more important data on chromite and chrome refractories; Bibliography.

PROPERTIES, MECHANICAL. Mechanical Properties of Refractories at High Temperature (Sur les propriétés mécaniques des produits réfractaires aux températures élevées), E.-L. Dupuy. Revue de Métallurgie, vol. 19, no. 11, Nov. 1922, pp. 672-675, 5 figs. Experiments to find crushing strength, showing critical points at 1000 and 1400 deg.; importance of time element in experiment.

REFRIGERANTS

METHYL CHLORIDE AND BUTANE. Low Pressure Refrigerants, H. D. Edwards. Refrig. World, vol. 57, no. 11, Nov. 1922, pp. 15-18. Considers low-pressure refrigerants with low boiling points; lubrication problem; fire hazard; vapor tension; possibility of butane and methyl chloride obtain important place in refrigeration practice outside of small unit. Paper read before Nat. Assn. of Practical Refrig. Engrs.

REFRIGERATION

AIR BATTERIES. Air Batteries as Applied to Refrigeration in New Zealand Meat Works, W. G. Croll. Refrig. Eng., vol. 9, no. 5, Nov. 1922, pp. 158-159 and 162, 1 fig. Plants embody both wet and dry systems, former with brine, for egg and meat storage, and latter mostly for fruit storage.

REDUCTION GEARS

SINGLE. Efficiency Test of Two 22,500 Hp. Single Reduction Gear Units by Method of Losses. H. G. Delsall. Am. Soc. Nav. Engrs.—Jl., vol. 34, no. 4, Nov. 1922, pp. 895-876, 18 figs. Result of test of single reduction double helical gear units constructed by Falk Co., Milwaukee, Wis., shows conclusively that 98½ per cent. mechanical efficiency may be expected.

RESERVOIRS

CONCRETE COVERED. Building the Baldwin Reservoir, Cleveland Water-Works. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 916-920, 9 figs. Mixing plant has duplicate equipment; cableway electrically operated and synchronized; 7 yd. concrete bucket and 16-ton skips.

CONSTRUCTION. Construction Methods at Sugarloaf Reservoir, Victoria. H. M. Sherrard. Commonwealth Engr., vol. 10, no. 3, Oct. 1, 1922, pp. 95-99, 3 figs. Describes handling of materials, dam and outlet works, spillway, concrete mixing plant, etc. Paper read before Instn. of Engrs.

RHEOSTATS

STARTING, CALCULATION OF. A Universal "Chart" Method of Calculating Starting Rheostats for Direct-Current Motors. A. T. Dover. Instn. Elec. Engrs.—Jl., vol. 60, no. 312, Aug. 1922, pp. 867-882, 14 figs. Basis of method is use of charts of grading coefficients calculated for various numbers of sections, definite values of percentage pressure drop in motor at full load, and given starting conditions.

RIVETS

STAGGER OF HOLES. Rules for Rivet-Hole Deductions in Tension Members. Victor H. Cochrane. Eng. News-Rec., vol. 89, no. 20, Nov. 16, 1922, pp. 847-848, 4 figs. Simple formulas for equal-stress and equal-area methods derived; how they compare in practical application.

ROADS

BATES EXPERIMENTAL. Construction Data and Tests on Bates Experimental Highway, Clifford Older. West. Soc. Engrs.—Jl., vol. 27, no. 11, Nov. 1922, pp. 319-337 and (discussion) 337-339, 12 figs. Outlines progress in establishing fundamental principles of design.

DESIGN AND MAINTENANCE. Highway Design, Maintenance and Finance. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 942-943. Abstracts of committee reports made to advisory board on highway research of Nat. Research Council.

TRACTIVE RESISTANCE, MOTOR-TRUCK. Motor Truck Tractive Resistances on Road Surfaces, T. R. Agg. Eng. News-Rec., vol. 89, no. 23, Dec. 7, 1922, pp. 982-985, 9 figs. Elimination tests of measuring devices prove superiority of space-time recorders; gasoline consumption measured in relation to tractive resistance.

ROADS, CONCRETE

PORTLAND-CEMENT. Portland Cement Concrete Roads, James T. Voshell. U.S. Dept. of Agriculture, Bul. No. 1077, Oct. 21, 1922, 67 pp., 35 figs. Materials used in concrete roads; proportioning; quantities of materials required; design; construction; organization and equipment; cost of concrete pavements; maintenance; surfacing old concrete pavements.

ROCK CRUSHING

SCREENS FOR WASHING. Screens for Washing Plants, Edmund Shaw. Rock Products, vol. 25, nos. 21, 22, 23 and 24, Oct. 21, Nov. 4, 18 and Dec. 2, 1922, pp. 18-20, 32-35, 15-20 and 17-19, 20 figs. Oct. 21: Right and wrong uses of stationary screens, their principles of operation and suitable fabrics; Nov. 4: Common faults and principles of stationary screens. Nov. 18: Revolving screens and why they are preferred. Dec. 2: Shaking and electric vibrating screens.

ROLLING MILLS

BRASS. The New Works of the Hirsh Copper and Brass Co. (Das neue Werk der Hirsch Kupfer- und Messingwerke A.-G., Georg Schlesinger. Zeit. des Vereines deutscher Ingenieure), vol. 66, nos. 40, 41 and 43-44, Oct. 7, 14 and 28, 1922, pp. 949-954, 969-972 and 1022-1024, 42 figs. Details of construction of a modernly equipped brass rolling mill; conveyance facilities; organization system, etc. See also Werkstattstechnik, vol. 16, nos. 20 and 21, Oct. 15 and Nov. 1, 1922, pp. 605-613 and 653-658, 42 figs.

NICKEL AND MONEL METAL. Mills Built for Rolling Nickel and Monel. Blast Furnace & Steel Plant, vol. 10, no. 12, Dec. 1922, pp. 605-611, 7 figs. Describes refining process and new rolling mills at Huntington, W.Va. Physical properties of monel metal.

ROOFS

RESTORATION OF WESTMINSTER. The Restoration and Preservation of Westminster Hall Roof. Engineer, vol. 134, no. 3489, Nov. 10, 1922, pp. 494-496, 6 figs. Review of lecture by Sir Frank Baines delivered to Instn. Mech. Engrs.

S

SAFETY

TEXTILE CODE. Development of the Textile Safety Code Presents Many Intricate Problems, A. B. Cole. Safety Eng., vol. 44, no.s 4-5, Oct.-Nov. 1922, pp. 165-169, 8 figs. Progress of preliminary activities outlined before Am. Soc. Safety Engrs.

SEWAGE

EFFLUENTS, ANALYSIS OF. A Colorimetric Method of Analysis for Sewage Effluents, R. C. S. Walter and V. G. Pickering. Engineer, vol. 134, no. 3494, Dec. 8, 1922, p. 602, 5 figs. Presents curves which are result of experiments carried out to determine relationship, if any, between density of color in, and amount of oxygen absorbed by, sewage effluents from sewage works of Corp. of Cheltenham.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Present Status of the Activated Sludge Process of Sewage Treatment. Langdon Pearse. Municipal & County Eng., vol. 64, no. 5, Nov. 1922, pp. 184-189. Brief outline of general viewpoint of process, indicating its adaptability and value, and points which appear to require further investigation.

CHICAGO SANITARY DISTRICT. Sewage-Treatment Progress in Chicago Sanitary District. Langdon Pearse. Eng. News-Rec., vol. 89, no. 24, Dec. 14, 1922, pp. 1003-1012, 11 figs. Program includes seven major projects; changes since earlier articles; sludge-handling equipment and early operating experiences.

DIRECT OXIDATION. Successful Operation of Direct Oxidation Process of Sewage Treatment at Allentown, Pa. Harry E. Besser. Mun. & County Engr., vol. 64, no. 5, Nov. 1922, pp. 165-171, 5 figs. Description of paint, screen room, grit chambers, line tower, electrolyzers, power board and sump pumps; comparison with lime process. Paper read before Am. Soc. Municipal Improvements.

TREATMENT FOR. Sewage Treatment at Manchester. Surveyor, vol. 62, no. 1609, Nov. 17, 1922, pp. 309-312. Annual report of Manchester Rivers Dept. on operations at Withington and Davyhulme works and research work relating to dewatring of activated sludge.

SEWER CONSTRUCTION

SYSTEM. Unusual Sewer Construction at Fort Madison, L. B. Reynolds. Pub. Works, vol. 53, no. 9, Nov. 1922, pp. 222-223, 1 fig. Reconstruction made necessary by raising of water level in Mississippi River, due to Keokuk dam. Consists of 18 mi. of 8-in. to 24-in. pipe.

SEWERS

MAINTENANCE. Sewar Maintenance, D. C. Nerman Collins. Pub. Works, vol. 53, no. 9, Nov. 1922, pp. 220-222, 3 figs. Experience with cleaning 7 mi. of 15 and 20-in. sewer.

SHAPERS

TABLE SUPPORTS. Shaper Table Supports, Fred Horner. Machy. (Lond.), vol. 21, no. 529, Nov. 16, 1922, pp. 200-205, 17 figs. Devices employed by various manufacturers to counteract downward thrust of cut.

SLAG

BLAST-FURNACE. An Investigation of Losses in Copper Blast-Furnace Slag, D. F. Stedman. Eng. & Min. Jl.-Press, vol. 114, nos. 24 and 25, Dec. 9 and 16, 1922, pp. 1023-1027 and 1072-1076, 6 figs. Study of slags produced at plant of Consolidated Mining & Smelting Co., Trail, B.C., indicates some errors in work of earlier investigators; pyrogallic-acid method developed to determine amount of oxidized copper present.

SOUND

WAVES, GENERATION OF. On a New Method for the Generation of Sound-Waves, Jul. Hartmann. Physical Rev., vol. 20, no. 6, Dec. 1922, pp. 719-727, 9 figs. Pressure variation along a high-velocity air jet; describes new resonator actuated by a high-velocity air jet.

STACKS

DIMENSIONS, DETERMINATION OF. Charts for Determining Stack Dimensions, R. A. Foresman. Power, vol. 56, no. 21, Nov. 21, 1922, pp. 804-806, 2 figs. Presents charts for determining height and diameter of stack.

STANDARDIZATION

SIZE. Size Standardization by Preferred Numbers, C. F. Hirschfeld and C. H. Berry. Mech. Eng., vol. 44, no. 12, Dec. 1922, pp. 791-800, 20 figs. Study of subject in connection with American conditions and problems. Authors develop preferred-number systems based on theory of geometrical series and apply them to various industries. Successful use of preferred numbers in Germany and other European countries.

STANDARDS

U. S. BUREAU OF. The National Bureau of Standards, R. S. McBride. Chem. & Met. Eng., vol. 27, no. 24, Dec. 13, 1922, pp. 1159-1164, 4 figs. Organization and functions, types of standards investigated, funds, personnel and methods; relation of industrial research and technical work to fundamental studies of constants and research in pire physics.

STEAM-ELECTRIC PLANTS

FUEL PROBLEMS. The Fuel Element in Energy Production Costs, S. B. Flagg. Mech. Eng., vol. 44, no. 12, Dec. 1922, p. 818. Problems in rising fuel costs in connection with operation of steam-electric public-utility properties. (Abridged.)

STEAM ENGINES

UNIFLOW. A Uniflow Engine with an Unusual Valve Gear. Power, vol. 56, no. 22, Nov. 28, 1922, pp. 843-844, 4 figs. The Hamilton uniflow-engine valve gearing; method of setting valves in shop and field.

Correct Adjustment of Uniflow Engine Valve Gear. Power, vol. 56, no. 24, Dec. 12, 1922, pp. 942-943, 5 figs. Ridgway uniflow steam engine; auxiliary clearance device; how to time valves.

Unaflow Engines for Compressor Drive. Power, vol. 56, no. 25, Dec. 19, 1922, pp. 978-979, 4 figs. New Worthington uniflow engine compressor; governing device; method of setting steam valves.

STEAM GENERATION

HIGH VS. LOW-PRESSURE. High or Low Pressure for Steam Heater, Edgar Buckingham. Power House, vol. 15, no. 21, Nov. 5, 1922, pp. 21-22 and 24. Writer points out that by generating at high pressure and transmitting through small line, with large line drop, heat loss from line may be made ssuch smaller than when pressure is low throughout system.

STEAM GENERATORS

ELECTRIC. New Type of Electric Steam Generator, E. M. Horstkotte. Power, vol. 56, no. 21, Nov. 21, 1922, pp. 795-797, 3 figs. Construction and operation of new type designed by Gen. Elec. Co. Economy of using electric boilers to absorb excess power from hydro-electric plants.

STEAM TRAPS

DEVELOPMENT AND PROGRESS. Development and Progress in the Construction of Steam Separators (Entwicklung und Fortschritt im Bau von Kondenswasserableitern), Ph. Baab. Maschinenbau, vol. 2, no. 1, Oct. 14, 1922, pp. G8-G11, 17 figs. Discusses purpose, improvements and different types of steam traps.

STEAM TURBINES

BLEEDER. The Bleeder Turbine as a Coal Conservator, J. L. Moore. Indus. Management (N.Y.), vol. 64, no. 6, Dec. 1922, pp. 360-363, 7 figs. Excess power as "by-product" of waste steam.

The Bleeder Turbine—Its History and Theory, J. L. Moore. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 28, no. 8, Nov. 1922, pp. 789-794, 7 figs. Design and operation.

ROTOR BALANCING. On the Balancing of Turbine Rotors, Kyoji Suyehiro. Soc. Mech. Engrs., Tokyo, Japan—Jl., vol. 25, no. 75, Sept. 1922, pp. 1-10, 9 figs. In author's method, magnitude and phase of both statical and dynamical unbalances are found directly at once, from all external disturbances.

STEEL

ALLOY. *See Alloy Steels.*

ALUMINUM IN. Aluminum in Steel, W. H. Keen. Iron Age, vol. 110, no. 24, Dec. 14, 1922, p. 1574. Argument favoring its more liberal use; how not to use it.

CHROME-NICKEL. *See Chrome-Nickel Steel.*

CORROSION. Effects of Steel Corrosion on Motor Car Bodies, C. O. Bannister. Automotive Manufacturer, vol. 64, no. 8, Nov. 1922, pp. 9-12 and (discussion) 12-14. Theory of corrosion, results of steel plates and effects of this upon finished motor-vehicle body; how it can be avoided. Paper read before British Carriage & Automobile Mfrs.

NUMBERING SYSTEM. Movement to Designate Steel by Numbers. Iron Age, vol. 110, no. 24, Dec. 14, 1922, pp. 1569-1570. Investigation instituted under Government auspices by Eng. Standards Committee to have numbering system for tool and other steels.

STEEL CASTINGS

FACING SAND. Studies Changes in Grain Size, R. L. Doty. Foundry, vol. 50, no. 24, Dec. 15, 1922, pp. 987-989 and 996, 5 figs. Extended tests show fineness of silica sand not increased by additions of fireclay, but clay builds up on grains of sand enlarging them; results of sieve test. Paper presented before Am. Foundrymen's Assn.

STEEL, HEAT TREATMENT OF

CRUCIBLE FURNACES. Heat Treatment of Steel in Crucible Furnaces. Can. Machy., vol. 28, no. 19, Nov. 9, 1922, pp. 20-21. Uniform heat of first importance; pressed-steel pots said to give good service; handling parts in quantities; preventing formation of scale.

HARDENING. Practice on Quenching Mediums for Hardening. Can. Machy., vol. 28, no. 20, Nov. 16, 1922, pp. 28-29. Oil is said to give best proportions between hardness, toughness and warpage; care should be taken to keep water out of bath; brine and acid for extreme hardness.

SALT BATHS FOR. Salt Baths for Heat Treating, Sam. Tour. Am. Soc. for Steel Treating—Trans., vol. 3, no. 2, Nov. 1922, pp. 245-251. Covers work done by writer up to present time. Summarizes requirements which proper salt bath should meet.

STEEL MANUFACTURE

CRUCIBLE STEEL. Comparison of American and English Methods of Producing High Grade Crucible Steel, T. Holland Nelson. Am. Soc. for Steel Treating—Trans., vol. 3, no. 3, Dec. 1922, pp. 279-298, 24 figs. American method is said to differ in three great essentials from English, namely, source of heat, furnace itself, and crucible pot; comparison of American gas-fired with Sheffield coke-hole crucible furnace.

EARLY HISTORY, ENGLAND. Early History of Steel Making in England, Rhys Jenkins. Engineer, vol. 134, no. 3492, Dec. 1, 1922, pp. 572-574. Review of early works. Paper read before Newcomen Soc.

TEMPERATURE, INFLUENCE OF. Influence of Temperature in the Manufacture of Steel (Influence de la température dans la fabrication de l'acier), Ch. Clausel de Coussergues. Revue de Métallurgie, vol. 19, no. 11, Nov. 1922, pp. 639-644. Discusses temperature at all stages of the melt, and temperature measurement.

STEEL WORKS

AUXILIARY DRIVES. Steel Mill Auxiliary Drives, L. A. Umansky. Gen. Elec. Rev., vol. 25, nos. 10 and 11, Oct. and Nov. 1922, pp. 611-617 and 699-710, 22 figs. General factors affecting selection of electric motors for auxiliary drives. Explains method of calculating performance of motor-driven reversing mill table, including friction, acceleration, duty cycle, plugging, and influence of gear ratios.

ELECTRIC TOOL STEEL. Layout for Electric Tool Steel Plant, Merle W. Caruthers. Iron Age, vol. 110, no. 21, Nov. 23, 1922, pp. 1363-1364, 1 fig. Arrangement of buildings and equipment, particularly melting department, storage of scrap and ferro-alloy.

STOKERS

DEVELOPMENT. Chronological History of Stoker Development, A. H. Blackburn. Power, vol. 56, no. 23, Dec. 5, 1922, pp. 898-899. Developments in stokers from first Jukes patent in 1838 up to present day. Notes on underfeed single- and multiple-retort, underfeed lateral-retort, overfeed inclined-grate, and traveling- and chain-grate stokers. See (discussion) in no. 24, Dec. 12, pp. 911-912. Paper read before Am. Soc. Mech. Engrs.

STREET RAILWAYS

MOTOR CAR. A New Motor-Tramway Car in Paris, M. G. Vergniole. Elec. Ry. & Tramway Jl., vol. 47, no. 1157, Nov. 10, 1922, pp. 233-234 and 251-252, 2 figs. Comparison of tramcar and omnibus. Description of new car constructed by Société des Transports en Commun de la Région Parisienne, and its advantages. Translated from Industrie des Tramways.

STRIKES

CAUSES. Why Men Strike, Edward A. Filene. Indus. Management (N.Y.), vol. 64, no. 6, Dec. 1922, pp. 376-380. Remedy that lies in making business a profession. The rights of employees.

STRUCTURAL STEEL

PAINT PROTECTION. Paint as a Protection for Steel Structures, John Grieve. Eng. Jl. (Eng. Inst. of Canada Jl.), vol. 5, no. 12, Dec. 1922, pp. 582-584. Facts which have militated against proper consideration of corrosion; causes of corrosion; building-up a protective paint film; points to be considered in purchasing paints.

USES IN BUILDING CONSTRUCTION. Pressed Steel in Building Construction, A. H. Bromley, Jr. Eng. World, vol. 21, no. 6, Dec. 1922, pp. 351-365, 12 figs. Describes the various uses of metal lumber in building construction.

STUFFING BOXES

PATENT SPECIFICATIONS. Stuffing-Boxes and Substitutes Therefor (including Packing Therefor). Abridgements of Specifications, class 122 (v), period 1909-15, 1922, 115 pp. Patents for inventions.

SUBSTATIONS

AUTOMATIC. Automatic Control of A.-C. Distribution, A. E. Bettis and C. W. Place. Elec. World, vol. 80, no. 22, Nov. 25, 1922, pp. 1151-1154, 5 figs. Operating features of Kansas City Power & Light Co.'s new self-operating substation.

Automatic Substation for Control of Synchronous Converters, C. J. Fuetter. Coal Industry, vol. 8, no. 11, Nov. 1922, pp. 463-466, 3 figs. Substation at Frostburg, Md., of Consolidation Coal Co., controls two 150-kw. 275-volt d.c. converters; placed nearly mile from drift mouth and saves services of operator; also secures minimum interruption of service.

SURVEYING

AERIAL. Aerial Surveying, Thomas J. Mitchell. Mich. Technic, vol. 35, no. 4, May 1922, pp. 9-10 and 34, 2 figs. Difficulties encountered; present methods of plotting inaccurate; use under special conditions.

T

TANKS, MILITARY

AMPHIBIOUS. Amphibious Tank, Novel Engineering Development, Swims Hudson River. Automotive Industries, vol. 47, no. 24, Dec. 14, 1922, pp. 1164-1165, 3 figs. Body rests on six wheels when out of water; steering gear locked when crawler is used and steering accomplished by running one truck faster than other; screw propellers for water operation; engine-piston displacement is 665 cu. in.

TAPS

STANDARD. Commercial Standards As Adopted by the Tap and Die Institute. Am. Mach., vol. 57, no. 23, Dec. 7, 1922, pp. 883-890. Twelve tables are presented.

TELEPHONY

WIRED-WIRELESS SYSTEM. Wire-Wireless Telephony by the Post Office. Engineering, vol. 114, no. 2967, Nov. 10, 1922, pp. 593-594, 1 fig. System in commercial used between London and Bristol.

THERMODYNAMICS

LOW-TEMPERATURE PHENOMENA. The Behaviour of Substances at Low Temperatures in Relation to the New Theories of Nernst and Planck. (Das Verhalten von Stoffen bei tiefen Temperaturen im Zusammenhang mit den neuen Theorien von Nernst und Planck), H. Schmolke. Wärme, vol. 45, no. 40, Oct. 13, 1922, pp. 483-486, 2 figs. It is shown that phenomena observed at low temperatures can be explained by the quantum theory and afford confirmation of the Nernst theory.

SECOND LAW. Thermodynamics and the New Physical Theories, N. V. Cashin. Eng. Jl. (Russian), no. 1-3, Jan.-Mar. 1922, pp. 3-9. General discussion of the subject dealing with modern theories, particularly those of Boltzmann on the second law of thermodynamics and entropy. (In Russian.)

TIDAL POWER

UTILIZATION. Utilization of Tidal Power (Sur l'utilisation de l'énergie des marées), A. Dufour. Revue Générale de l'Électricité, vol. 12, no. 18, Nov. 4, 1922, pp. 673-685, 5 figs. Average power obtainable in course of a year at Saint Malo, and reservoirs, turbines and pumps necessary for a successful installation.

TIME STUDY

TRAINING MEN FOR. Training Time Study Men. Stewart M. Lowry. Indus. Management, N.Y., vol. 64, no. 6, Dec. 1922, pp. 356-371, 2 figs. System of training evolved by Westinghouse Elec. & Mfg. Co. Avoiding "hit or miss" in rate setting by educational methods.

TOOLS

DISTANCE PIECES. Manufacturing Distance Pieces, A. Wilford. Eng. Production, vol. 5, no. 109, Nov. 2, 1922, pp. 411-413, 3 figs. Describes production in four operations of distance piece manufactured from seamless steel tubing.

TRANSFORMERS

LARGE. Modern Transformers. Engineer, vol. 134, no. 3492, Dec. 1, 1922, pp. 584-585, 6 figs. Details of 19,500-kva. three-phase units designed for periodicity of 50 cycles per sec., and having ratio of 33,000 to 66,000 volts; said to be largest ever built in Great Britain.

OIL. Insulating Oils Are Decomposed by Passage of Current; How to Keep and Restore Their Dielectric Strength, F. J. Gealey. Coal Age, vol. 22, no. 24, Dec. 14, 1922, pp. 953-955, 2 figs. Heat raises an oil vapor but disruptive discharge releases hydrogen; sludge is formed by oxidation of overheated oil; one part of water in 50,000 will render oil unfit for use.

TRANSPORTATION

HIGHWAY AND RAILWAY CO-OPERATION. Urges Co-operation Between Railroads and Motor Trucks, W. H. Lyford. Eng. News-Rec., vol. 89, no. 22, Nov. 30, 1922, pp. 933-936. Seeks solution of terminal and branch-line problems in joint motor-truck delivery and short-haul service. Address before Conference on Education for Highway Eng. and Highway Transport.

TROLLEY BUSES

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AIR DUCTS. The Design of Air Ducts, Charles L. Hubbard. Domestic Eng., vol. 101, no. 8, Nov. 25, 1922, pp. 322-324, 1 fig. Methods of determining size of main ducts and branches.

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SYSTEM. The Regulation of Wage Contracts (Tarifliche Regelung des Akkordwesens), P. Schmerse. Stahl u. Eisen, vol. 42, no. 45, Nov. 9, 1922, pp. 1677-1686, 6 figs. Experiences with the Rhenish-Westphalian wage system. Recommendation for a general German wage system, based on hour-work rather than piece-work rates.

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WELDING

See Autogenous Welding; Electric Welding, Arc; Oxy-Acetylene Welding.

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ELECTRICITY SUPPLY BY. Electricity Supply by Means of Wind Motors and Storage Batteries (Elektrizitätsversorgung durch Windmotoren und Akkumulatoren), P. M. Grempe. Elektrotechnischer Anzeiger, vol. 39, nos. 176 and 177, Nov. 4 and 7, 1922, pp. 1384-1387 and 1396-1397, 3 figs. Describes erection and operation of wind motors in rural districts for supply of electric light and power and water supply.

WIND TUNNELS

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Z

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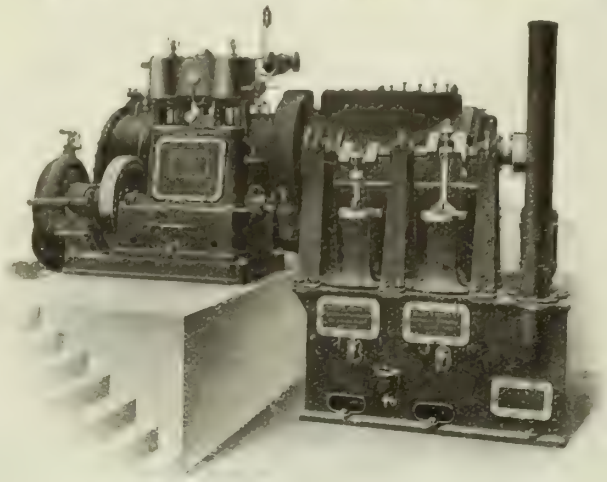

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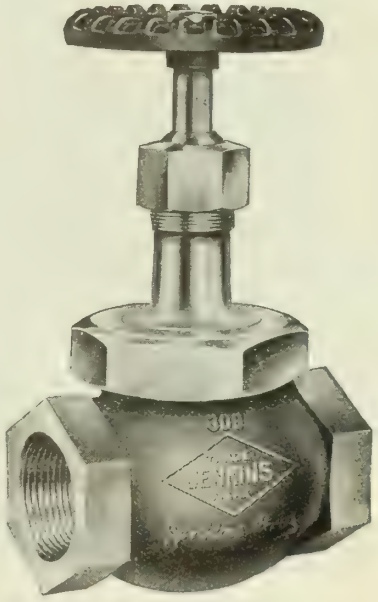

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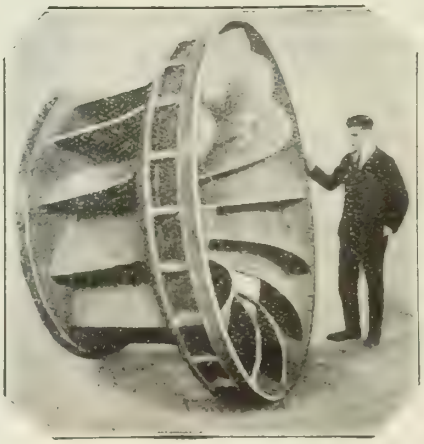

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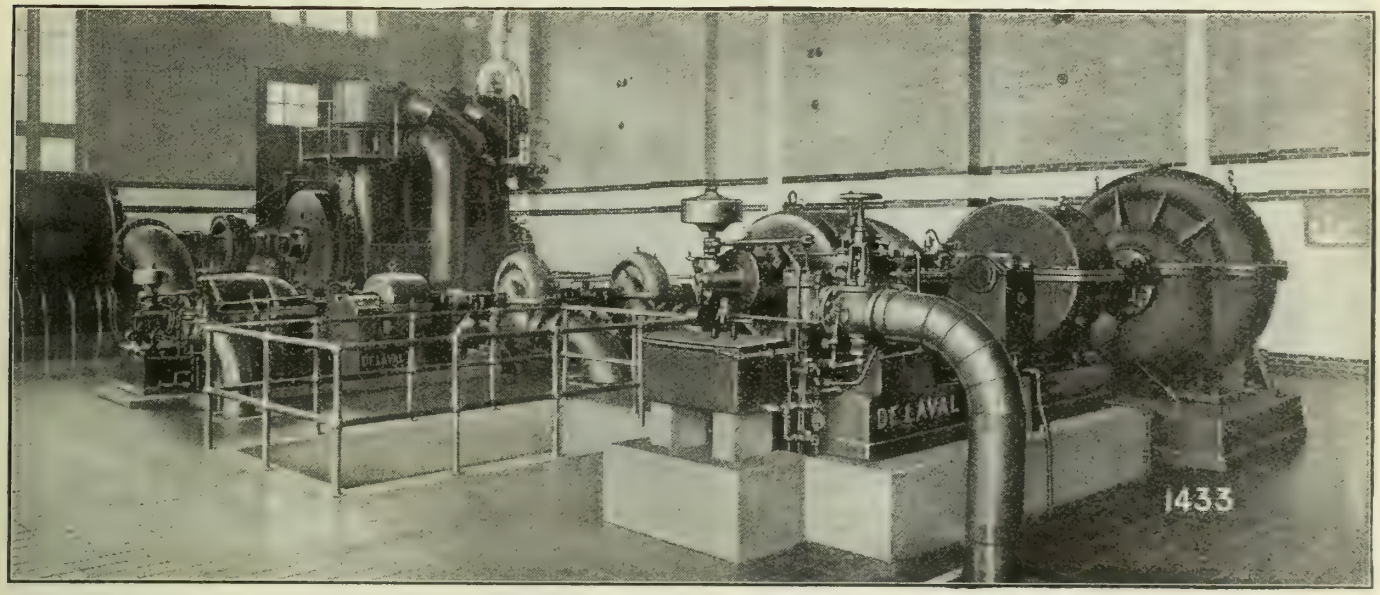

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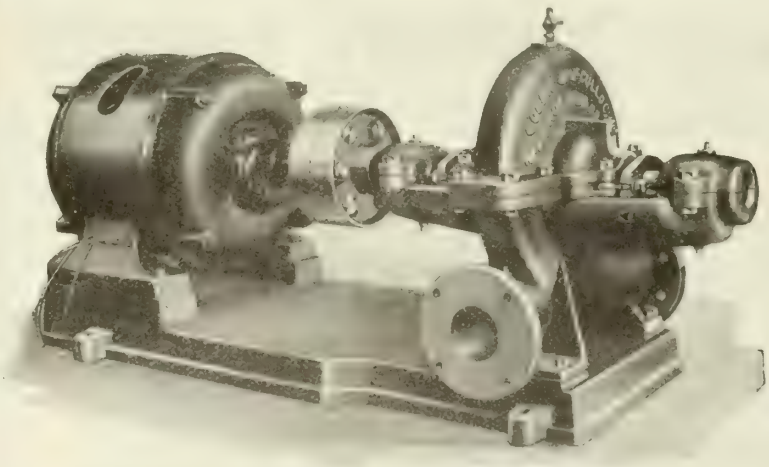

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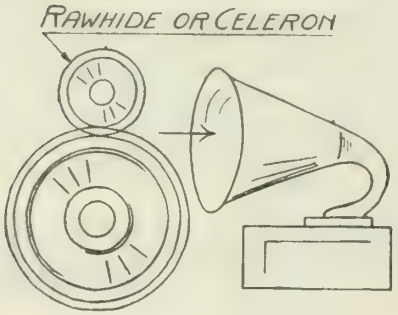

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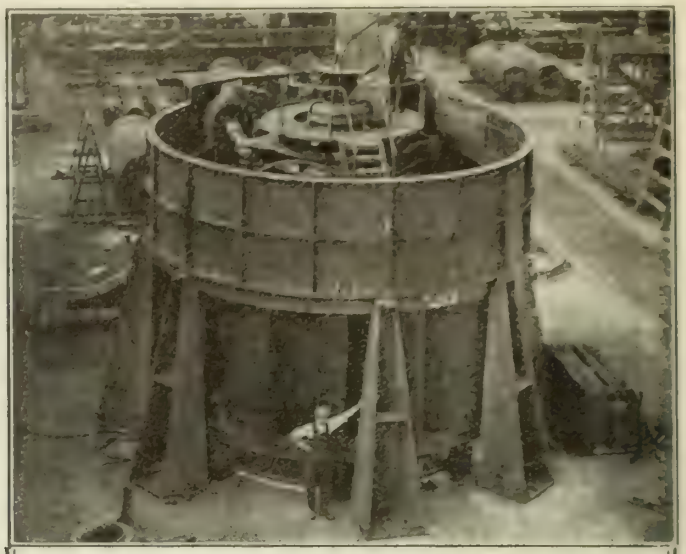

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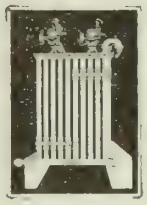

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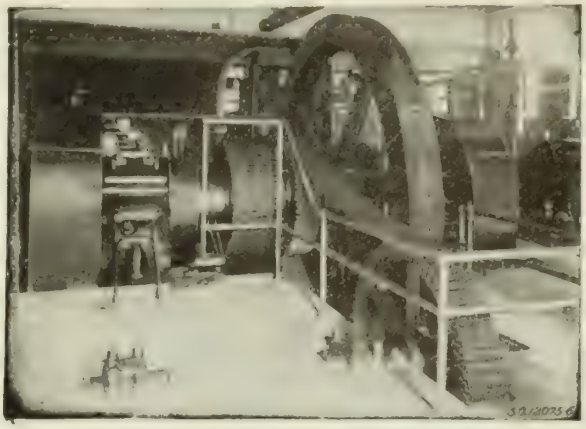

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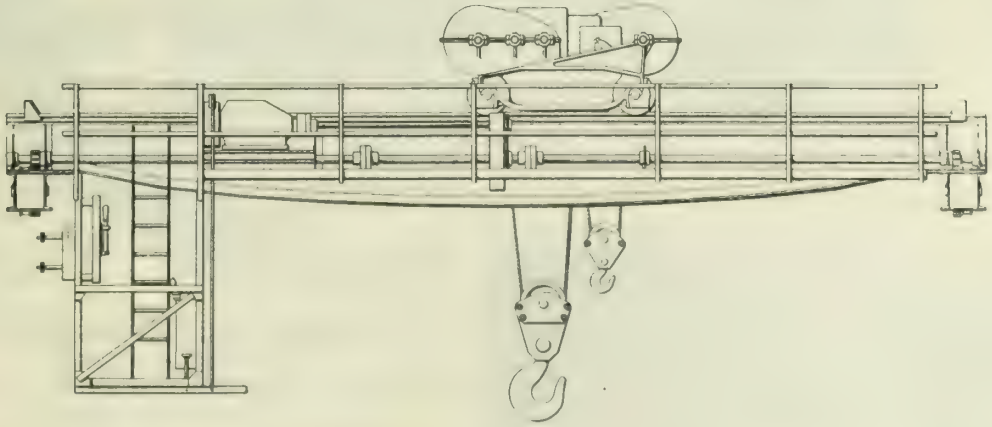

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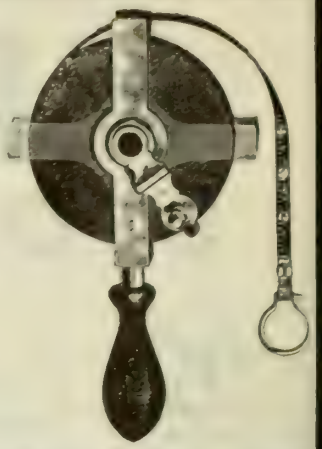

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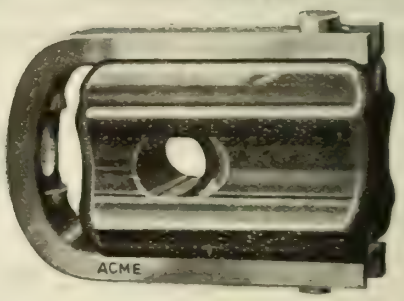

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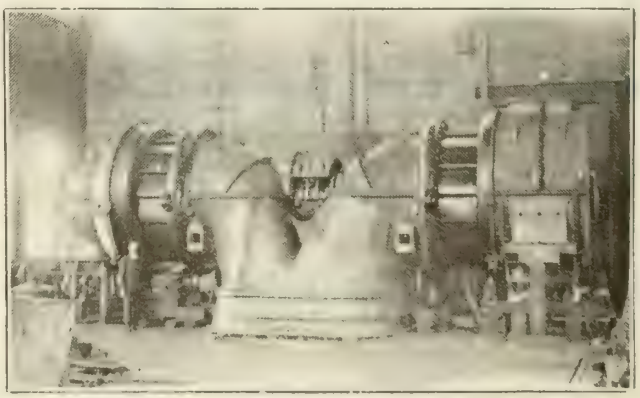

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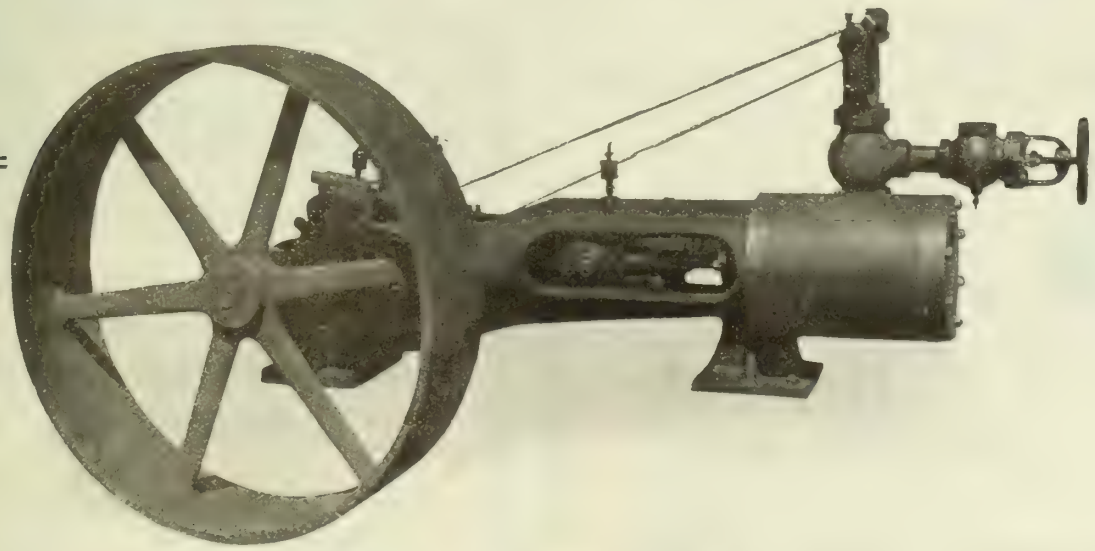

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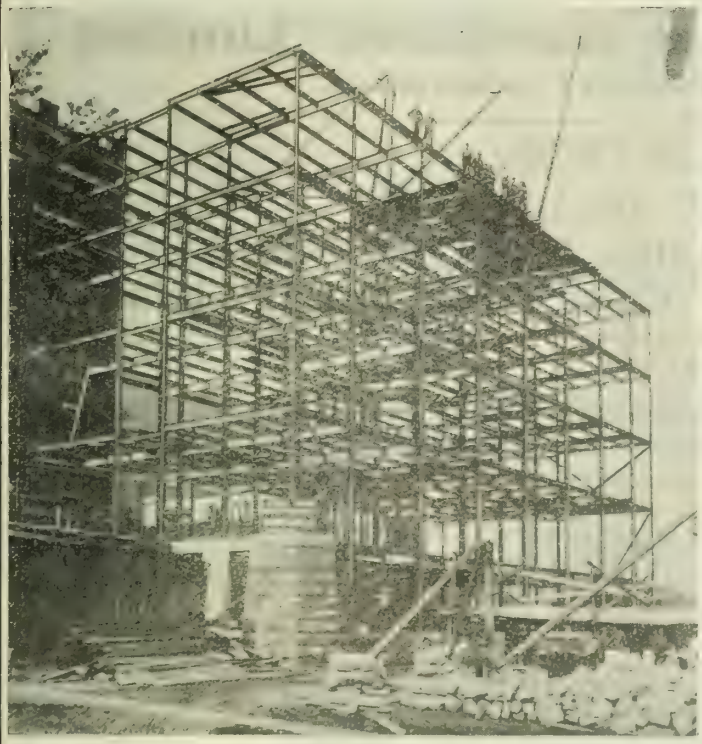

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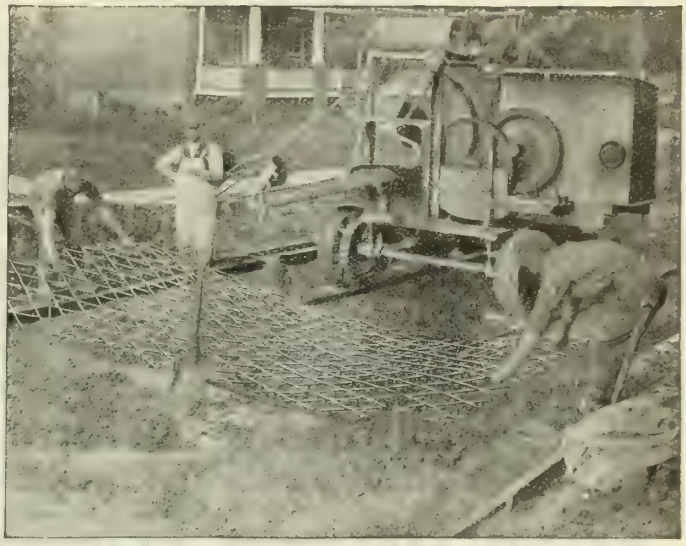

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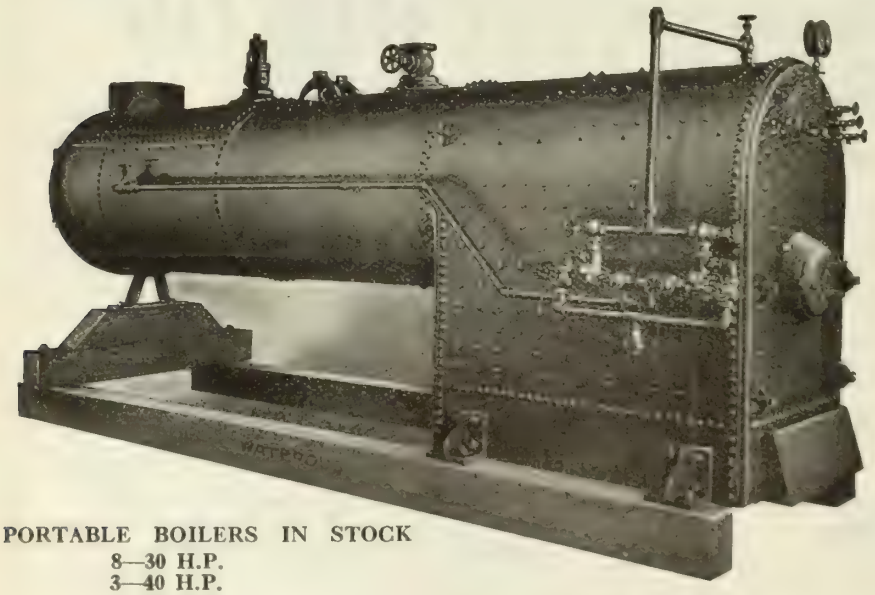

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COMPANY LIMITED

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Makers of Base-Supported and 100% Rail Joints for Standard, Girder and Special Rail Sections. Also Joints for Frogs and Switches, Insulated Rail Joints and Step or Compromise Joints.

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AT YOUR SERVICE

A Modern Well-equipped Canadian Factory

Making Material for Canada's Electrical Industry

OVERLOOKING Niagara Falls, in the midst or one of the world's greatest Hydro-electric developments and dedicated to the service of Canada's electrical industry, the plant of the Dominion Insulator & Manufacturing Company, Ltd., is busy manufacturing materials for some of Canada's most important electrical projects.

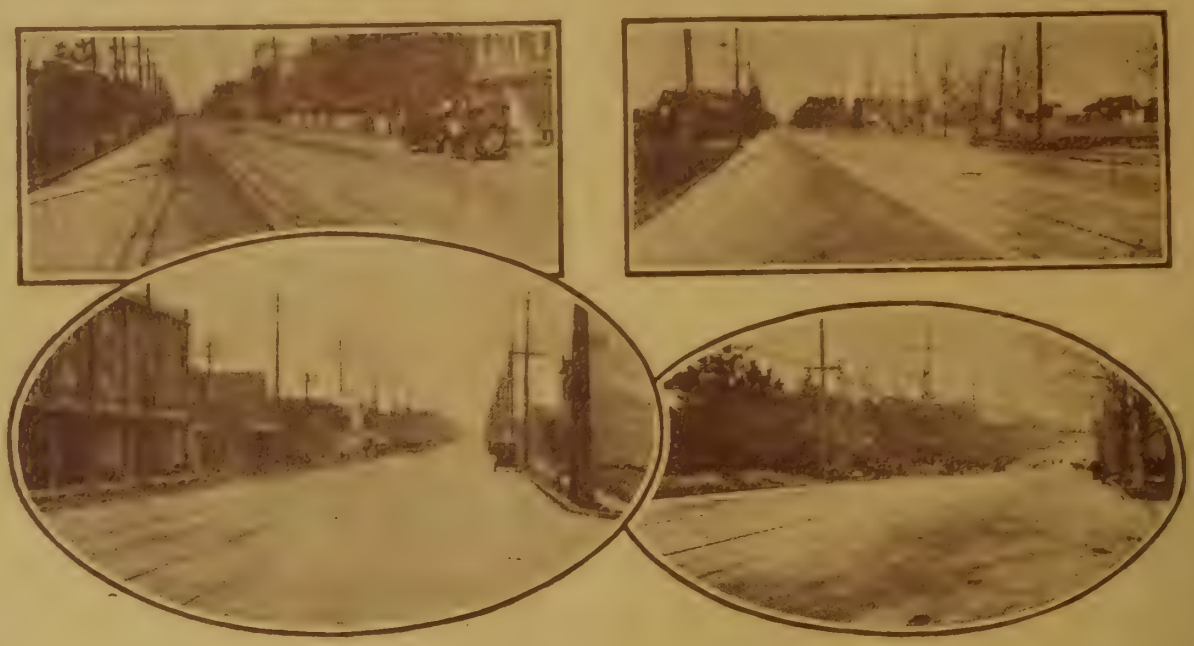
This factory—equipped with every modern facility and manned by skilled, experience labor—manufactures by the most advanced processes, the latest, approved designs of High Tension Porcelain Insulators. It is also planned, so far as possible, to manufacture other O-B products such as Trolley Material and Rail Bonds for Electric Railways and Mines, Electric Railway Car Equipment and Steam Road Electrification Materials.

May we serve you ?

Dominion Insulator & Manufacturing Company, Limited

(Manufacturing Ohio Brass Company Products)

Niagara Falls, Ontario.



Asphalt North Yonge St. Toronto

The activity of the City Works Department, under Works Commissioner R. C. Harris, in repaving car line thoroughfares has paralled the Toronto Transportation Commission's splendid progress in the rehabilitation of the street railway system. One particular instance of close co-operation occurred on North Yonge Street between the C.P.R. tracks and the city limits.

As soon as track laying had advanced sufficiently to permit, contracts were awarded to the Warren Bituminous Paving Co. Limited, the Constructing & Paving Co. Limited, Kilmer & Barber Limited, and the Godson Contracting Co. Limited, for the construction of sections of Asphalt surface averaging 18 feet in width, both sides of the track allowance. The short time required for laying the Asphalt surfacing and the rapidity with which stretch after stretch of the roadway was opened to traffic was a revelation of what can be achieved with Asphalt in the hands of capable and efficient contractors.

It is only necessary to take a trip over this portion of North Yonge Street to appreciate the type of service afforded by this clean, resilient, dustless pavement which will stand continued use and heavy traffic for years without any appreciable cost for maintenance.

In supplying Imperial Asphalt for this street improvement project we welcomed the opportunity to expedite construction by the usual prompt delivery of material.

IMPERIAL Asphalt PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

MARCH 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA,

AT 176 MANSFIELD STREET, MONTREAL

L. VI

No. 3

·BULLETIN·· №·7

·BURLINGTON·STEEL·Co.·LTD.

RAIL CARBON REAL STRENGTH

·HAMILTON·ONT·

"THE·FRAYED·THREAD"

STEEL MANUFACTURERS ALL HAVE A BUG-A-BOO,—
A SKELETON IN THEIR CLOSET CALLED "PIPED STEEL".

WITH ALL THE REFINEMENTS IN MODERN STEEL MAKING, IT HAS NEVER BEEN FOUND POSSIBLE TO ELIMINATE PIPING ENTIRELY, AND IN EVERY FORM OF STEEL WORK ITS PRESENCE IS ALWAYS TO BE FEARED.

WE HAVE ALREADY EMPHASIZED THE FACT THAT RAIL-CARBON STEEL IS SUBJECTED IN ITS PRIMARY MANUFACTURE TO A VERY SEVERE INSPECTION TO GUARD AGAINST PIPING. THE INGOT FROM WHICH THE RAIL IS ROLLED IS CUT THROUGH HORIZONTALLY, AND THE TOP PORTION CONTAINING THE PIPING IS DISCARDED.

SUFFICIENT OF THE INGOT MUST BE DISCARDED SO THAT NO EVIDENCE WHATEVER OF PIPING WILL APPEAR IN THE BOTTOM PORTION RETAINED.

IN THE MANUFACTURE OF HEAVY ORDNANCE, THE INSPECTION GOES EVEN FURTHER, AND TO MAKE DOUBLY SURE ON THIS POINT, IT IS LAID DOWN THAT THE INGOT SHALL BE CUT VERTICALLY THROUGH THE CENTRE TO FIND OUT JUST WHERE THE PIPING STOPS.

A RAIL STANDING ON END IS SIMPLY AN ELONGATED INGOT AND THE FIRST OPERATION IN THE MANUFACTURE OF RAIL-CARBON BARS, IS TO SLIT THE RAIL FROM END TO END IN TWO PLACES.

THIS AT ONCE EXPOSES ON THE SURFACE ANY PIPING THAT MIGHT HAVE CREPT PAST PREVIOUS INSPECTIONS, AND THE DEFECT AT ONCE BECOMES VISIBLE, AND THE MATERIAL CONSEQUENTLY IS REJECTED.

IF IT WERE NOT REJECTED THE DEFECTIVE MATERIAL WOULD JAM IN THE ROLLS AND CAUSE A SERIOUS DELAY.

JUST AS A FRAYED THREAD CANNOT PASS THROUGH THE EYE OF A NEEDLE NEITHER CAN A PIPED RAIL PASS THROUGH OUR ROLLS

IN OTHER WORDS, THE PRESENCE OF "PIPING" WITHIN THE THICKNESS OF A RAIL-CARBON BAR, IS JUST AS IMPROBABLE AS ITS PRESENCE IN THE STEEL OF THE "QUEEN ELIZABETH'S" 15 INCH GUNS.

THIS IS JUST ONE MORE REASON WHY RAIL-CARBON BARS ARE THE STRONGEST AND MOST RELIABLE ON THE MARKET TODAY.

·THE·INGOT· ·THE·BLOOM· ·THE·RAIL· ·THE·SLIT·RAIL·

SPECIFY RAIL-CARBON FOR REAL STRENGTH

·BULLETIN·№·8—4½·BILLION·VIBRATIONS.·

The BERTRAM Page

MACHINE TOOLS

J.B. & S. Co.

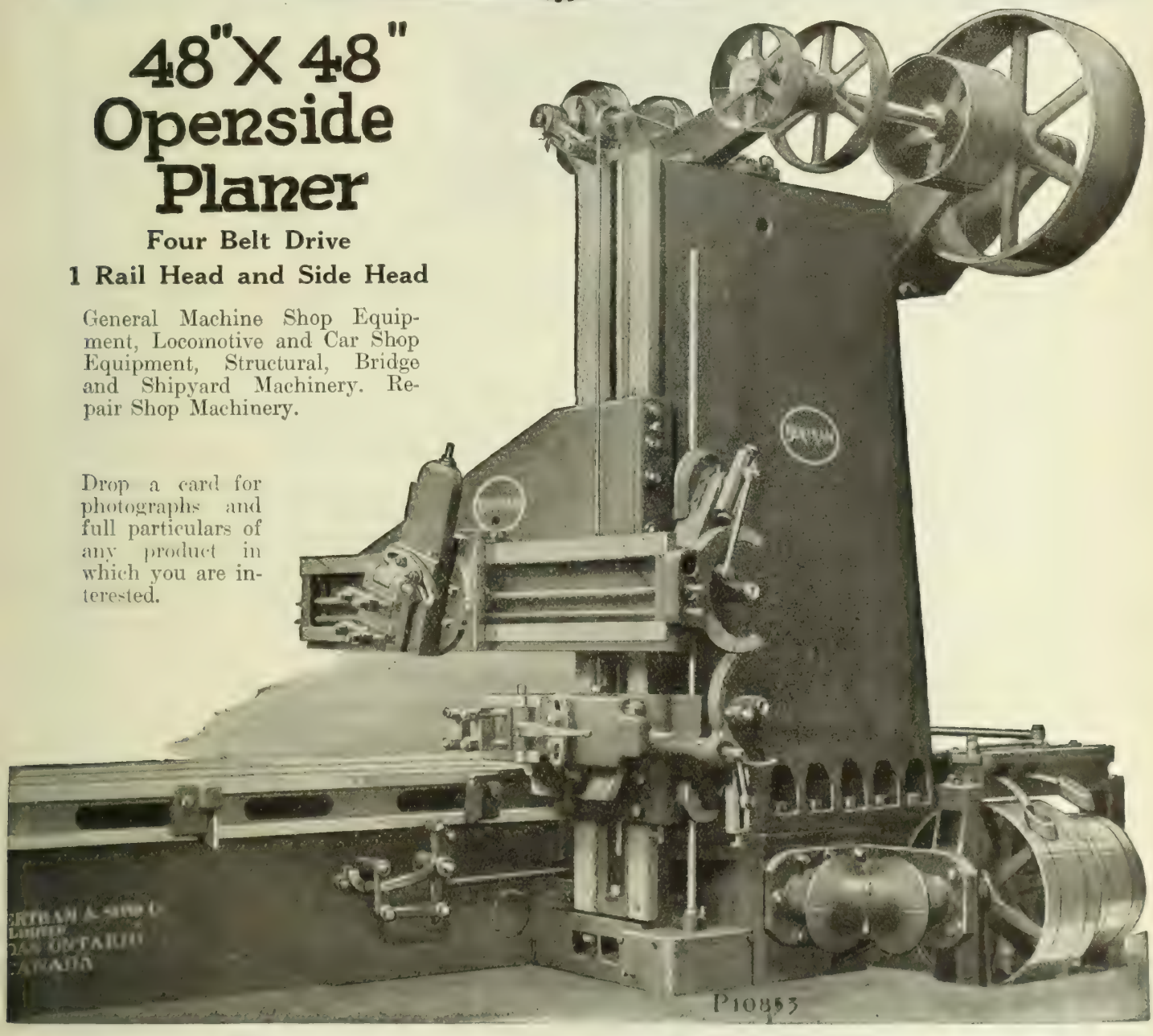
48"X 48" Openside Planer

Four Belt Drive

1 Rail Head and Side Head

General Machine Shop Equipment, Locomotive and Car Shop Equipment, Structural, Bridge and Shipyard Machinery. Repair Shop Machinery.

Drop a card for photographs and full particulars of any product in which you are interested.

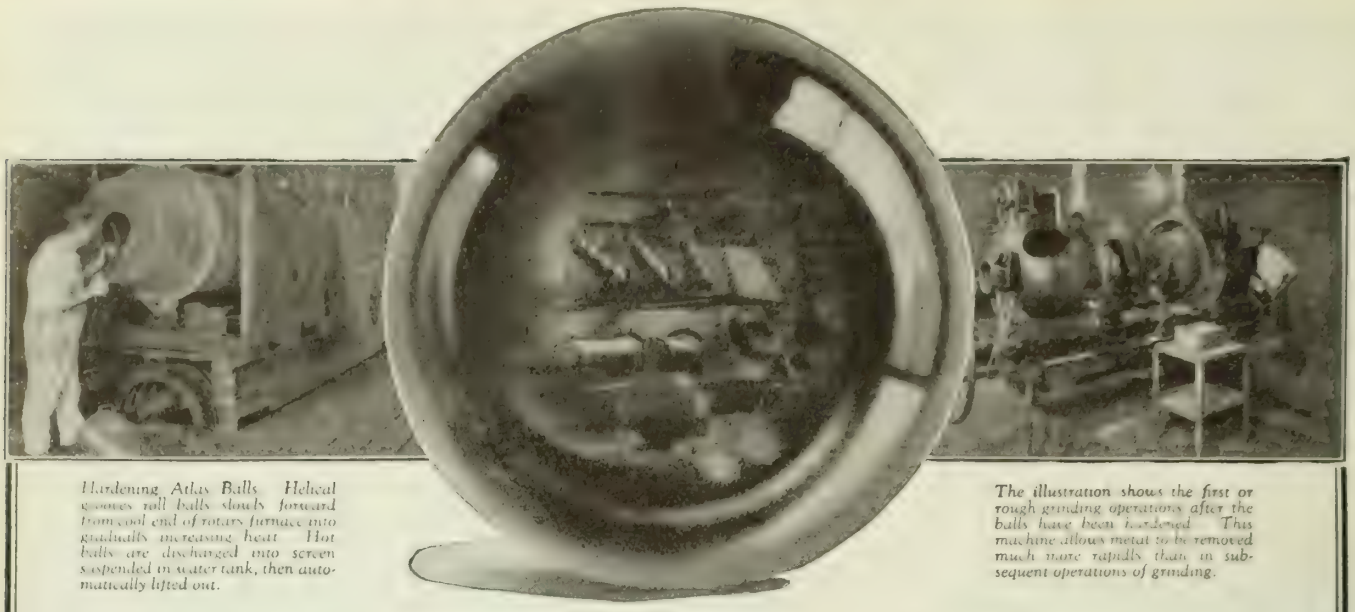


The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO. CANADA.

MONTREAL	TORONTO	VANCOUVER	WALKERVILLE	WINNIPEG	HALIFAX
723 Drummond Bldg.	32 Front St., West	609 Bank of Ottawa Bldg.	103½ Sandwich St.	1205 McArthur Bldg.	Roy Bldg.

Men of influence consult Journal advertising.



Hardening Atlas Balls. Helical grooves roll balls slowly forward from cool end of rotary furnace into gradually increasing heat. Hot balls are discharged into screen suspended in water tank, then automatically lifted out.

The illustration shows the first or rough grinding operations after the balls have been hardened. This machine allows metal to be removed much more rapidly than in subsequent operations of grinding.

True Sphericity—Plus Resilient Toughness Keep Atlas Balls Poised Ready to Roll

It takes less than thirty seconds to turn guns and turrets through a 45-degree arc. In supporting this dead weight on Atlas Steel Balls, the impulse of a small motor swings the load like a toy.

This quick response of massive weight to motive impulse is but another way of telling of friction's defeat—whether it's a turret to be moved, your automobile, or the most complicated industrial machinery.

You can imagine, then, the part Atlas Steel Balls must play in overcoming destructive friction. If one ball varies from another one ten-thousandth of an inch—or one-tenth the thickness of the thinnest tissue paper—the unequal burden imposed is often enough to cause serious damage to the overloaded balls.

Atlas Steel Balls not only approach true sphericity within this extremely close limit, but possess a resilient toughness of steel which keeps them from crushing under shock and strain.

CANADIAN SKF COMPANY, LIMITED

TORONTO — MONTREAL

745

ATLAS STEEL BALLS

Made Under SKF *Supervision*

Write for the advertisers' literature mentioning The Journal.

19 Years In Active Service

After 19 Years of Service in Brooklyn, N. Y., this pipe was dug up and found to be in perfect condition.

Brooklyn Has Over 405 Miles of Concrete Pipe In Use

EVERY municipality planning sewerage or water systems can wisely and safely follow the example of Brooklyn, Milwaukee, Halifax and other large American and Canadian towns in selecting Concrete pipe for drains, sewers or culverts.

Their satisfactory experience with this pipe over a long period of years, is your guarantee of satisfactory service. Concrete pipe properly designed and properly made, combines great strength and density, and will resist the severe action of ordinary industrial wastes.

There can be no question of the strength, density and all around serviceability of McCracken Sewer Pipe because McCracken pipe is manufactured in accordance with standard specifications issued by American Society for Testing Materials for Cement-Concrete Sewer Pipe; and inspected by the Canadian Inspection and Testing Company Limited.

Write for complete information and quotations.

GENERAL SALE AGENT

Jno. E. Russell Company Limited

504 Harbor Administration Building Toronto.

McCRACKEN SEWER PIPE "The Pipe That Endures" ICP TRADE MARK

DIAMETERS

"McCracken" 6" to 24"
"Lock Joint" 27" to 108"

Ensures Satisfaction,

Specify McCracken.

ST. EUSTACHE PARISH, QUEBEC.
DOMTAR-2 ON WATER BOUND
MACADAM 1922.

Domtar

Makes
Good
Roads

REPEAT ORDERS

increase steadily the mileage of DOMTAR ROADS

Write our Service Dept. They will co-operate with you for the success of your programme.

Dominion Tar & Chemical Company, Limited

Head Office 171 St. James St., Montreal Branch Office 53 Yonge St., Toronto

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SYDNEY, N. S. MONTREAL, P. Q. SAULT STE. MARIE, ONT.

Every advertisement is a message to you.

SILENT

When buying machinery or any other commodity the wise purchasing agent takes into consideration not the actual cost of the article but the **service it will give in return for the price paid.** This is why so many progressive Canadian Firms are now installing

CONDENSITE CELORON SILENT GEARS

WATERPROOF - - OIL-PROOF

They know from actual test that Condensite Celoron Silent Gears and Pinions lengthen the life of the expansive metal mating gears, do not require any shrouds, save wear and tear on bearings and other mechanical parts, eliminate errors and accidents due to nervous strain and exhaustion and save labor, materials, time and power.

Condensite Celoron Silent Gears are not only silent but are also absolutely waterproof and unaffected by oil, grease and other organic solvents.

Their resistance to wear, immunity from breakage and permanently accurate mesh make them as near perfection as it is humanly possible to make any mechanical part.

Send for booklet on Condensite Celoron. It contains technical data and much other useful information about Condensite Celoron and its uses.

Write for information on grade No. 10 Condensite Celoron for waterproof insulation.

Diamond·F

DIAMOND STATE FIBRE CO.,
OF CANADA, LIMITED, - TORONTO, ONTARIO

GEARS

Every advertiser is worthy of your support.

Advertisements have an educational value. Read them carefully.

SUPERIOR GRAPHITE PAINT
It Prevents Rust

THE DECIDING FACTOR OF PAINT VALUE

Service records should always be the deciding factor in determining value, when paint is selected for protection of structural steel and metal surfaces.

On this basis it is not surprising that SUPERIOR GRAPHITE PAINT is so widely used.

Engineers the country over—and building owners as well—pin their faith on SUPERIOR GRAPHITE PAINT, because they know through experience and observation it can be used with definite assurance of service and satisfaction.

Use SUPERIOR GRAPHITE PAINT and eliminate the hazard of experiment.

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- Superior Graphite Paint
- Sta-White
- Degraco House Paint and Varnish
- Degraco-Tone-*Flat wall finish*
- Degraco Brick and Concrete Paint
- Anti-Aqua-*Damp-proof coating*
- Degraco Gas Holder Paint
- Degracolin-*Concrete floor hardener*
- Degraco Enamels
- Industrial Finishes

DOMINION PAINT WORKS, LIMITED
WALKERVILLE, CANADA

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Toronto Calgary
Edmonton

Winnipeg Halifax
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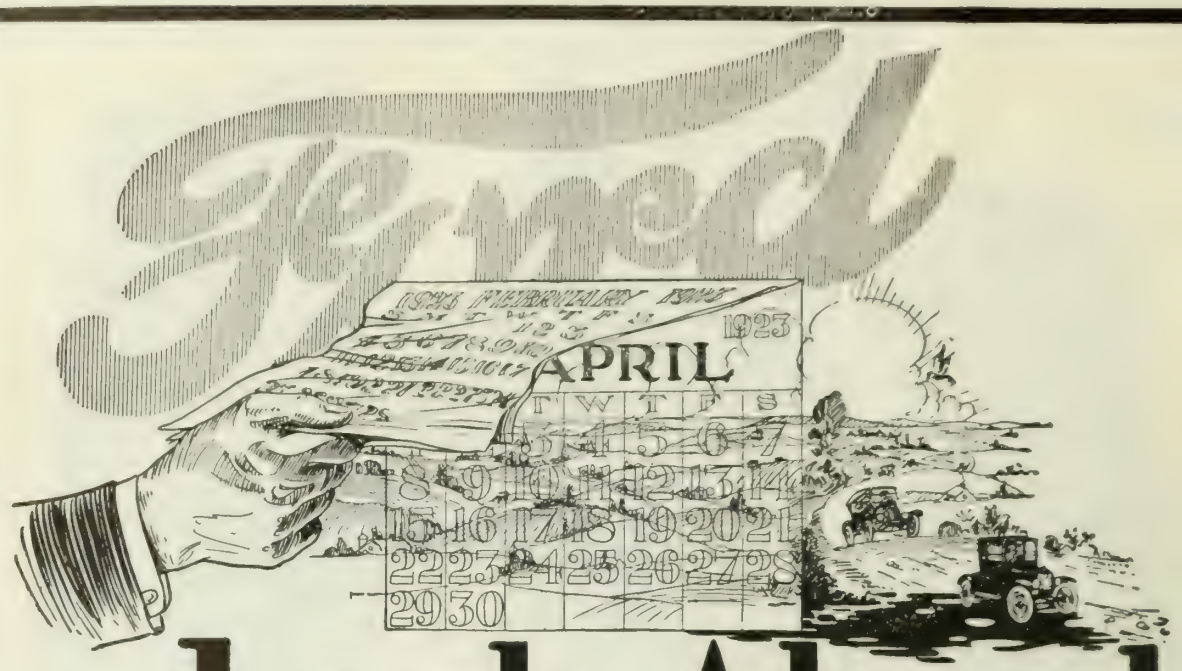
Vancouver

SUPERIOR GRAPHITE PAINT is one of the DEGRACO line of dependable paints. Sold through branch offices with warehouse stocks in all principal cities.

DEGRACO
All Colors for All Purposes

PAINTS
VARNISHES
ENAMELS



Look Ahead—

¶ NO promise can be made that the present low-record prices of Ford Cars will hold through-out 1923.

¶ Look ahead—the car that you have made up your mind to buy in April, *buy now!* Get the use of it—at least place your order.

¶ To-day you can be sure of securing a Ford for $445.

Order your Ford Today

ORDER NOW AND MAKE CERTAIN YOU GET A CAR AT THESE PRICES

Runabout	$405
Touring	$445
Coupe	$695
Sedan	$785
Chassis	$345
Truck Chassis	$495

F.O.B. FORD, ONT. GOV'T. TAXES EXTRA
STARTING AND ELECTRIC LIGHTING STANDARD EQUIPMENT ON SEDAN AND COUPE

FORD MOTOR COMPANY OF CANADA, LIMITED, FORD, ONTARIO.

2314

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Private Automatic Exchange

CONFIDENTIAL

The Automatic Telephone

Turn the Dial and immediately your call not only reaches the engineer, the shipping room, any executive—but the call is for yourself only.

Use P. A. X. to quicken confidential transactions, to lessen irritation, to create better understanding and thus maintain greater co-operation throughout the extended plant.

The P. A. X. is the reliable friend of executives.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
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"Makers of the Nation's Telephones"

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DISTRIBUTING
Construction Material
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Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

THE LINN TRACTOR FOR Economical Hauling

Linn Tractor Loaded at Gravel Pit

The Linn Tractor is a powerful machine for hauling. It has the added advantage of not only carrying a load on itself, but can, at the same time, haul trailers behind. It will carry a ten-ton load, yet the weight is so well distributed that the roadbed is not disturbed. It can be used on City Streets or Country Roads, and will go to places where ordinary wheel trucks could never reach. It can be used in winter by replacing the wheels with sleds, and the hauling capacity in winter is 50% greater. It will work in temperatures of 50 degrees below zero. It will pay big dividends on your investment. Write us for full information.

Linn Tractor Takes a Load from the Pit

Linn Tractor Hauling Two 10-ft. Blade Graders on Highway work.

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

EVERY ONCE IN A WHILE

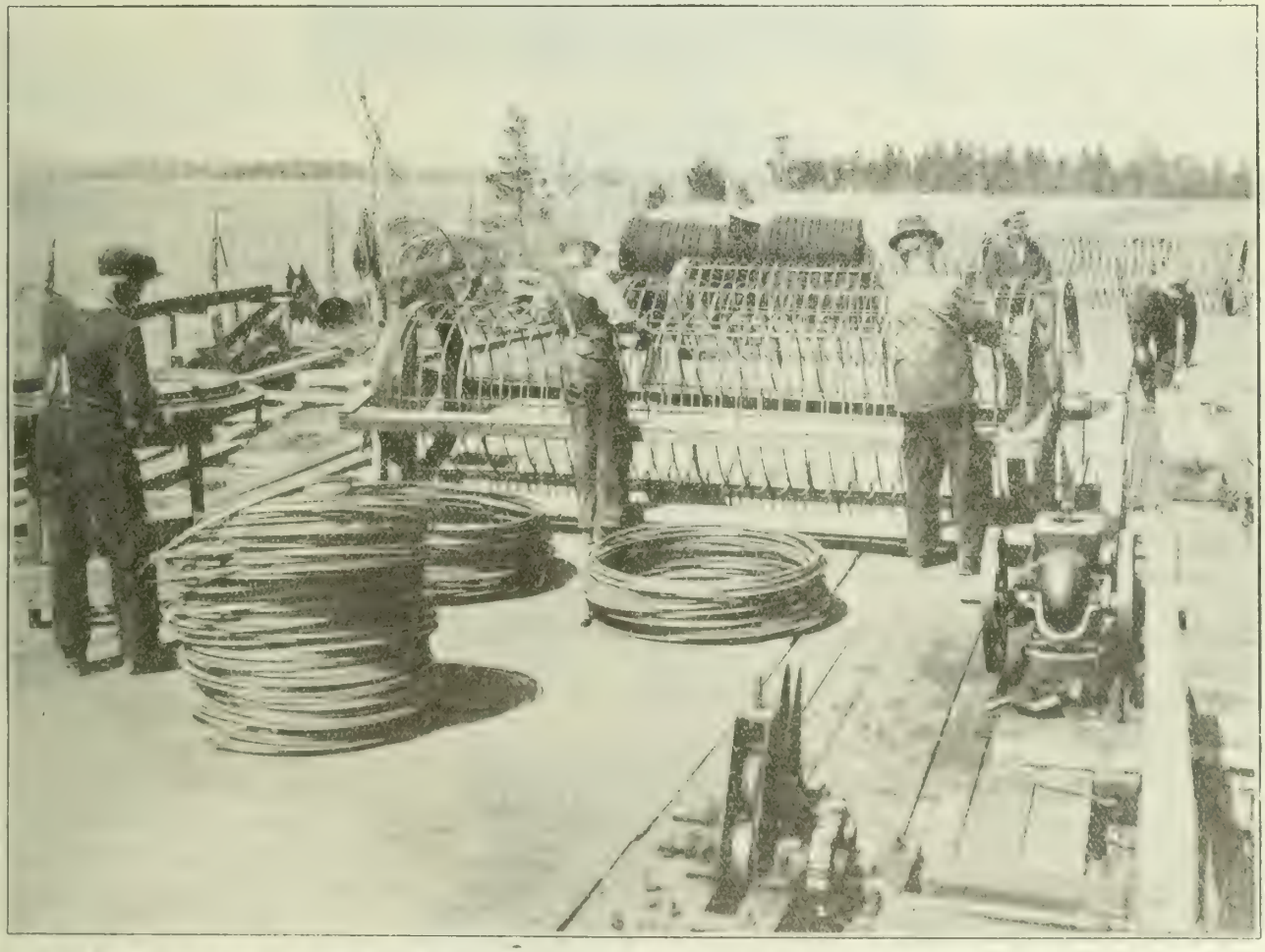
We read of a Large Water Main or Conduit bursting and of the escaped water DOING DAMAGED TO PERSON AND PROPERTY.

BURSTING MAIN FLOODS PINE ST. AT BROADWAY N. Y. CITY.

15,000 gallons of Water a Minute Rips Up Pavement and Flows Into Equitable Vaults.

NO LOCK JOINT REINFORCED CONCRETE PIPE LINE HAS SO SUFFERED NOR CAN SUCH A LINE SO SUFFER OR FAIL

Our pipe is composed of the highest quality of concrete in which is embedded a dense mesh or network of reinforcing steel WORKED AT LOW UNIT STRESSES.



LOCK JOINT REINFORCED CONCRETE PIPE DELIVERS THE WATER ENTRUSTED TO IT.

CANADA LOCK JOINT PIPE LIMITED

65 Pleasant Boulevard, Toronto, Ont.

CANADA CEMENT
CONCRETE
FOR PERMANENCE

SPECIFY
CANADA CEMENT
UNIFORMLY RELIABLE

St. Patrick St. Bridge, Arch No. 4. Falsework. Elevated Mixer in Background.
Above—Completed Bridge—North Elevation.

Spanning the Rideau with Concrete

Replacing light bridges previously in use, and not adequate for heavy modern Traffic, Ottawa now has two fine Bridges of Reinforced Concrete crossing the Rideau River.

Cummings Bridge, opened to traffic in January, 1922, crosses from Rideau Street on the West bank to Montreal Road on the East, clear of the north end of Cummings Island.

St. Patrick Street Bridge (shown above) was opened to traffic in July, 1921. It is 490 feet in length between abutments; and consists of four open spandrel type arches, each 110 feet clear span: and three intermediate piers.

The deck beams are suported on crosswalls on top of arches—the projecting sidewalks being carried upon brackets. The contractors were McDougal Bros., Ottawa.

The work was carried out under the direction of Mr. A. F. Macallum, M.E.I.C., Commissioner of works, Ottawa, and Mr. F. C. Askwith, A.M.E.I.C., Deputy Engineer, Ottawa. Mr. Robt. H. Henham, A.M.E.I.C. Bridge Engineer, designed the structure.

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

CANADA CEMENT COMPANY BUILDING

Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary

Mentioning The Journal gives you additional consideration.

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CORPORATION LIMITED
SAULT STE. MARIE, ONTARIO

THE ALGOMA STEEL CORPORATION LIMITED

announce to their customers and the Canadian trade that they can supply American Standard Sections of BEAMS and CHANNELS up to and including 15″, all standard sections of ANGLES from 6″ x 6″ down to 1¼″, ZEE BARS for car builders and general purposes; small and large ROUNDS, SQUARE and FLAT BARS. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process, and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

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Order from us and you will get both quality and prompt service. A trial is convincing.

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Our extensive warehouse facilities ensure prompt delivery.

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Open Hearth - Alloy Steels

Chrome-Vanadium,
Chrome-Nickel,
Nickel Steel

All of these steels we supply in Hot Rolled Bars or Billets.

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WE ALSO FURNISH

Blooms, Billets, Slabs,
Structural Steel,
Merchant Bars,
Concrete Reinforcing Bars,

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STEEL RAILS, Open Hearth quality, all sections from 12 lbs., to 105 lbs., per yard.

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Angle Bars, 100% Joints,
Continuous Standard Joints,
Steel Tie Plates

PIG IRON

Basic, Foundry, Malleable,

++

Sulphate of Ammonia
Sulphuric Acid Nitre Cake

KOEHRING

Heavy Duty Mixer

Built to withstand strains of day after day operation.

KOEHRING frame construction with liberally cross membered superstructure and joints machined to perfect fit—strongly gusseted and angle braced—insures steady, dependable performance and long service life.

Koehring Mixers are trouble proof to the utmost degree that they can be made so by experienced mixer engineering and heavy duty construction.

Capacities

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete. Write for Catalog C 24.

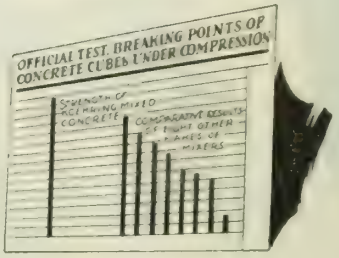
Pavers: 7, 10, 14, 21, 32 cu. ft. mixed concrete. Write for Catalog P 24.

Dandie: Light Mixer, 4 and 7 cu. ft. mixed concrete; power charging skip, or low charging platform. Light duty hoist. Write for Catalog D 24.

Koehring Company of Canada,
LIMITED

105 Front Street, East, Main 1498
TORONTO, — ONTARIO.

MONTREAL OFFICE:
616 Canada Cement Building
TEL. UPTOWN 3026

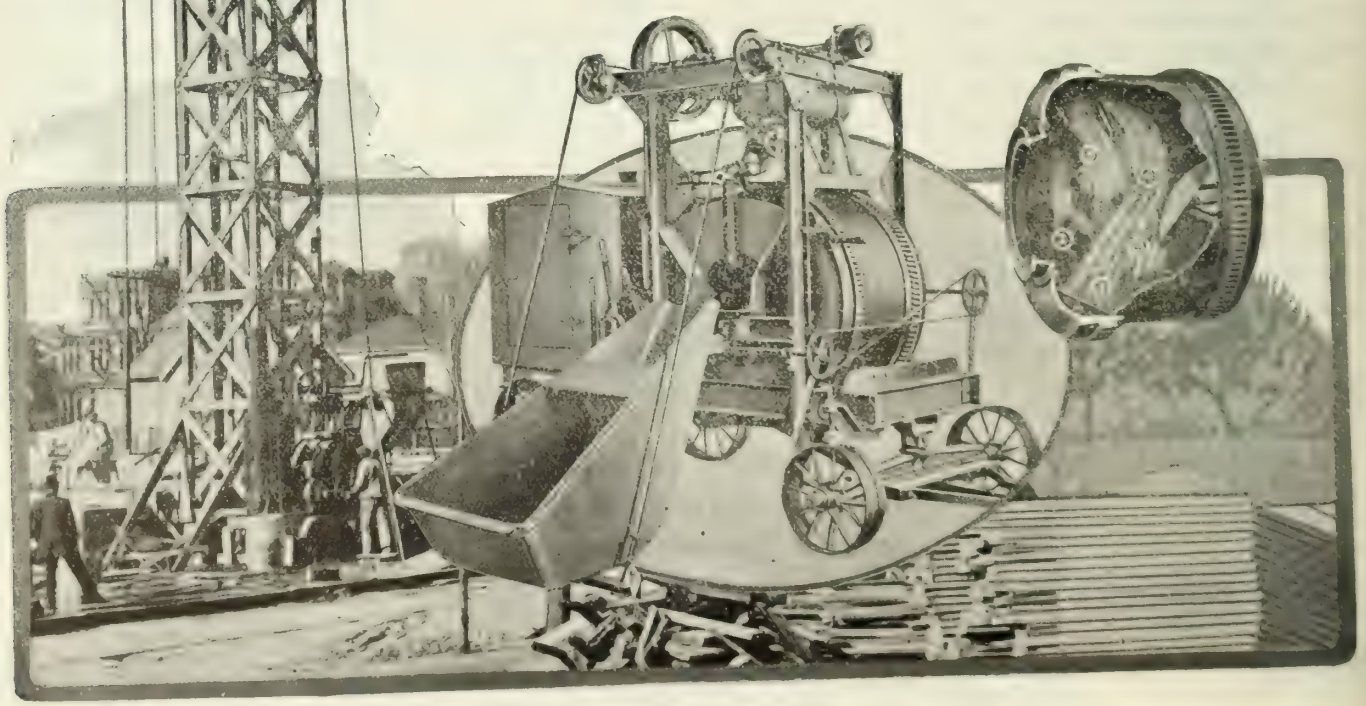


Dominant Strength Concrete

The above chart shows the variation in strength of concrete mixed of the same aggregate under strictly standardized conditions, by nine different mixers. The strength was determined by compression test of cubes. Mixing, seasoning of cubes and compression tests were conducted by independent engineers.

31% Variation

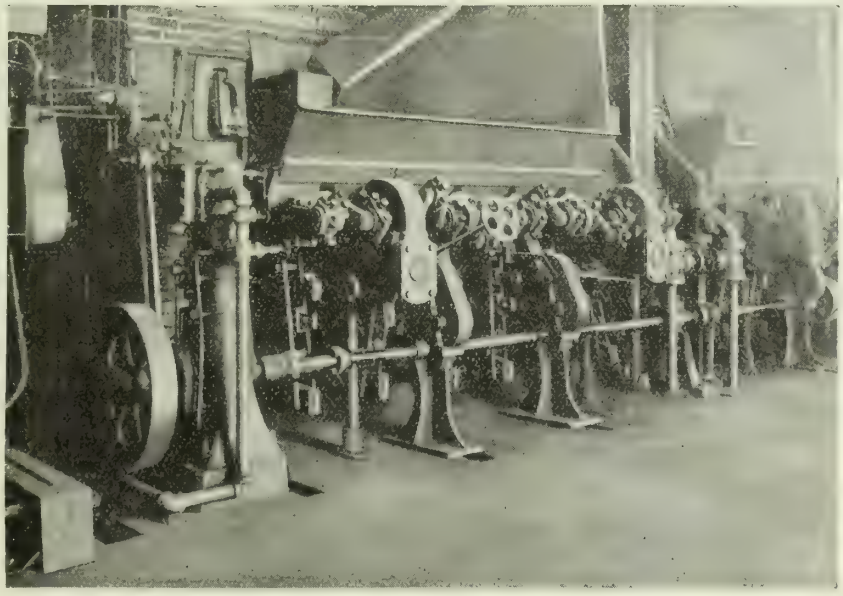
was disclosed between the lowest strength concrete, and Koehring mixed concrete, which rates the highest, stronger, more uniform than the concrete mixed by all other mixers in the test. This is authoritative proof that the Koehring Re-mixing Action means Dominant Strength Concrete.



Remember The Journal when buying apparatus.

The location of the shearing pin in the rotary drive of the stoker originated on The Taylor Stoker and has proven uniformly successful. It is the logical location, being always in sight and readily accessible.

A glimpse of the boiler room in a Mid-Western packing house. Here eight Taylors serve 4000 rated horsepower. Other plants of the same company are also Taylor Stokered.



The boilers in this plant average 150% of rating with frequent jumps to 225%. The Taylors burn slack at an average efficiency of 70% or better.

The man who KNOWS always buys

The Taylor Stoker

because he gets more than a Stoker. He gets the service of the engineering ability that has kept the Taylor Stoker in the lead for eighteen years. He gets an operation and maintenance service of the highest order.

Money can't buy a better Stoker.

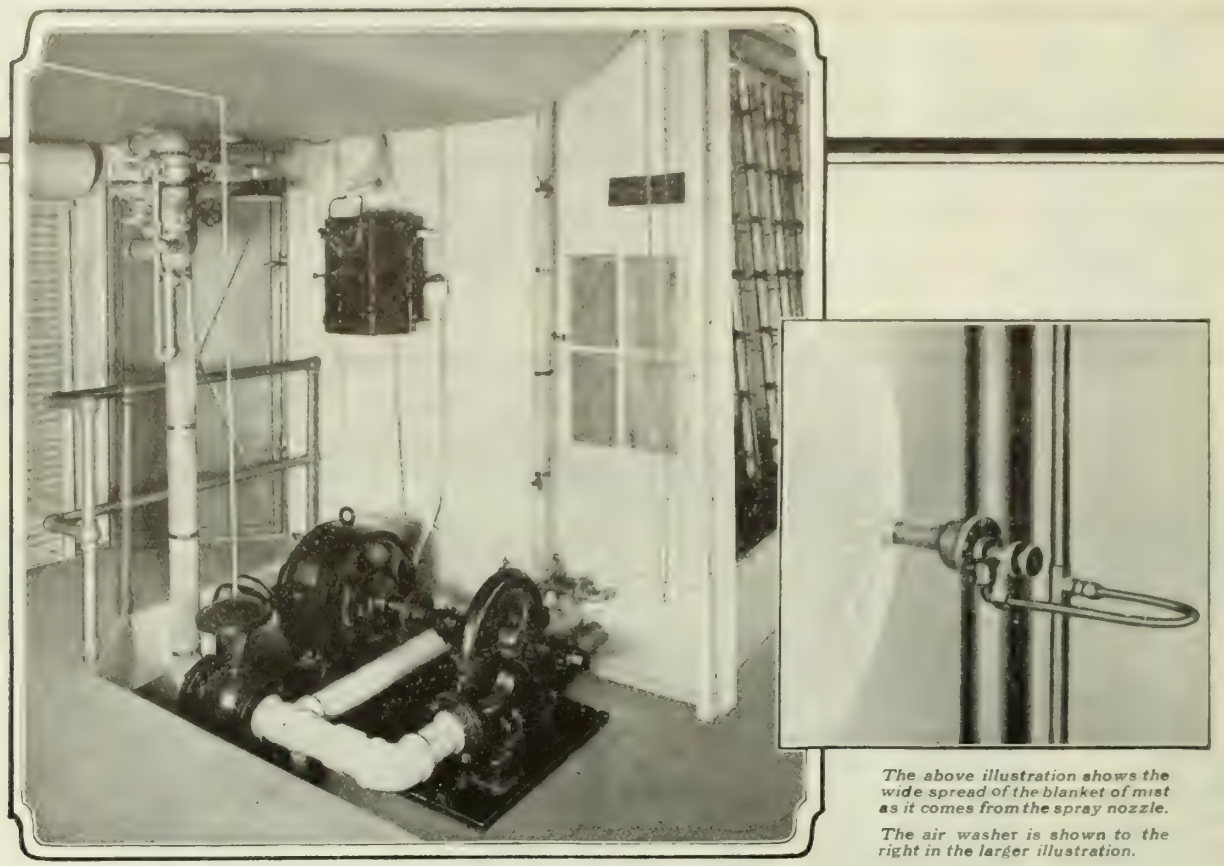
Ask today for a copy of our new booklet, The Rotary Ash Discharge.

THE TAYLOR STOKER COMPANY, LTD.

TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

The advertiser is ready to give full information.



The above illustration shows the wide spread of the blanket of mist as it comes from the spray nozzle.

The air washer is shown to the right in the larger illustration.

Distinctive Service In Air Washers

Air that is properly humidified, cooled, and as clean and pure as a mechanical process can make possible, is a certainty with the Canadian Sirocco Air Washer.

It's because of the special design of the spray nozzles of the Canadian Sirocco Air Washer that the impurities are removed from the air passing through this air purifying system.

These spray nozzles produce a heavy blanket of mist so finely divided as to literally form a dense cloud through which every atom of air must pass, causing it to be cooled, humidified and purified.

The automatic flushing feature of the nozzles provides a means for keeping them clean and insures continuous operation at a maximum efficiency.

If you have a ventilating problem bring it to the attention of our engineers. Many years of practical experience enables them to cooperate with you.

CANADIAN SIROCCO CO., LTD., WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

(215)

"Sirocco" Products
TRADE MARK
BLOWERS · EXHAUSTERS · VENTILATING FANS · AIR WASHERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK
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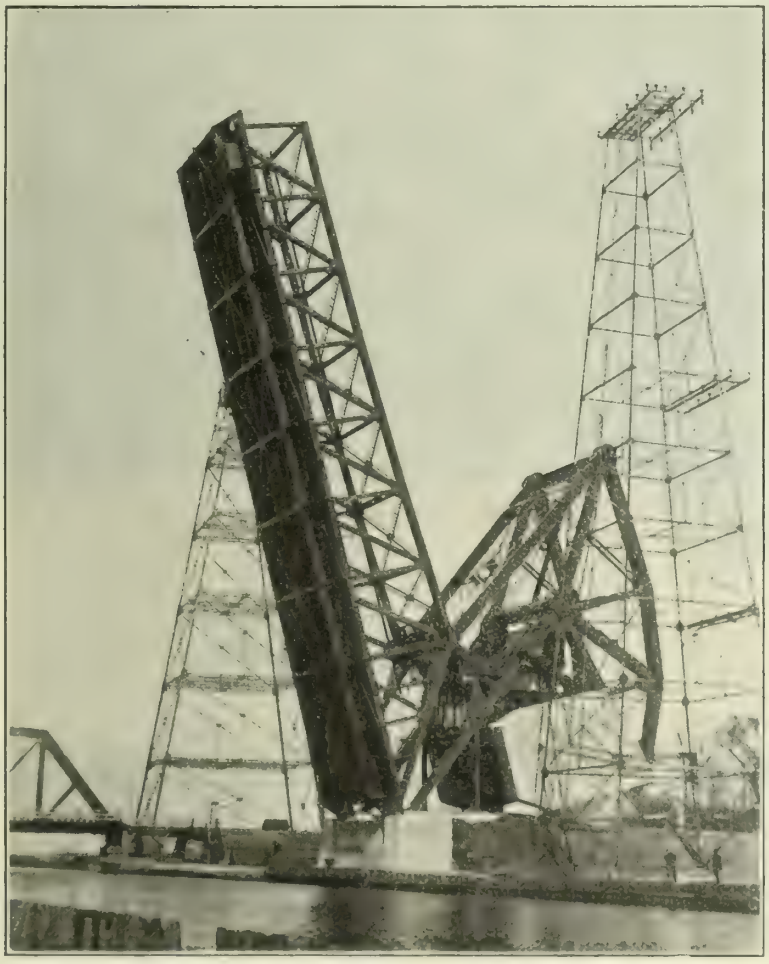

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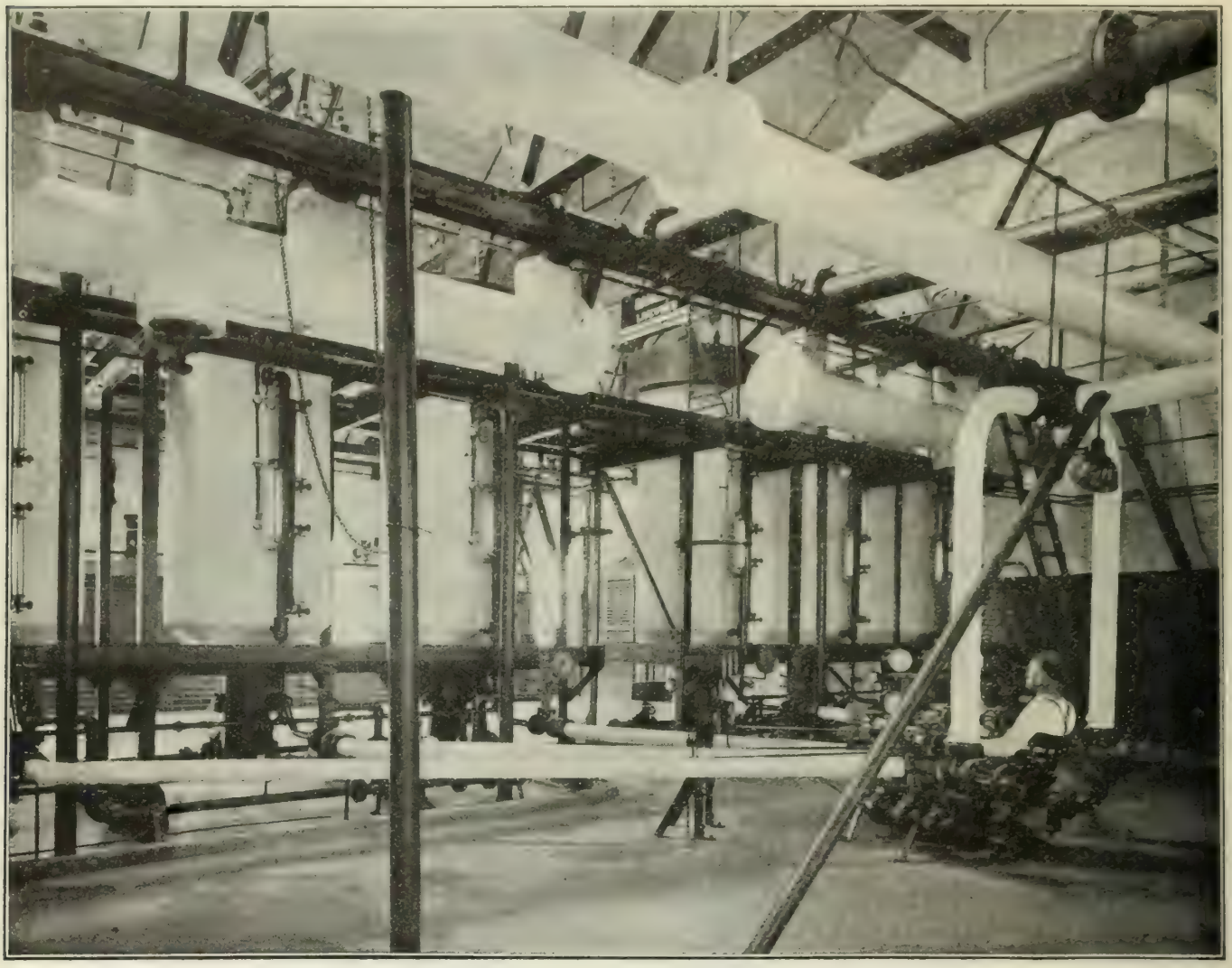

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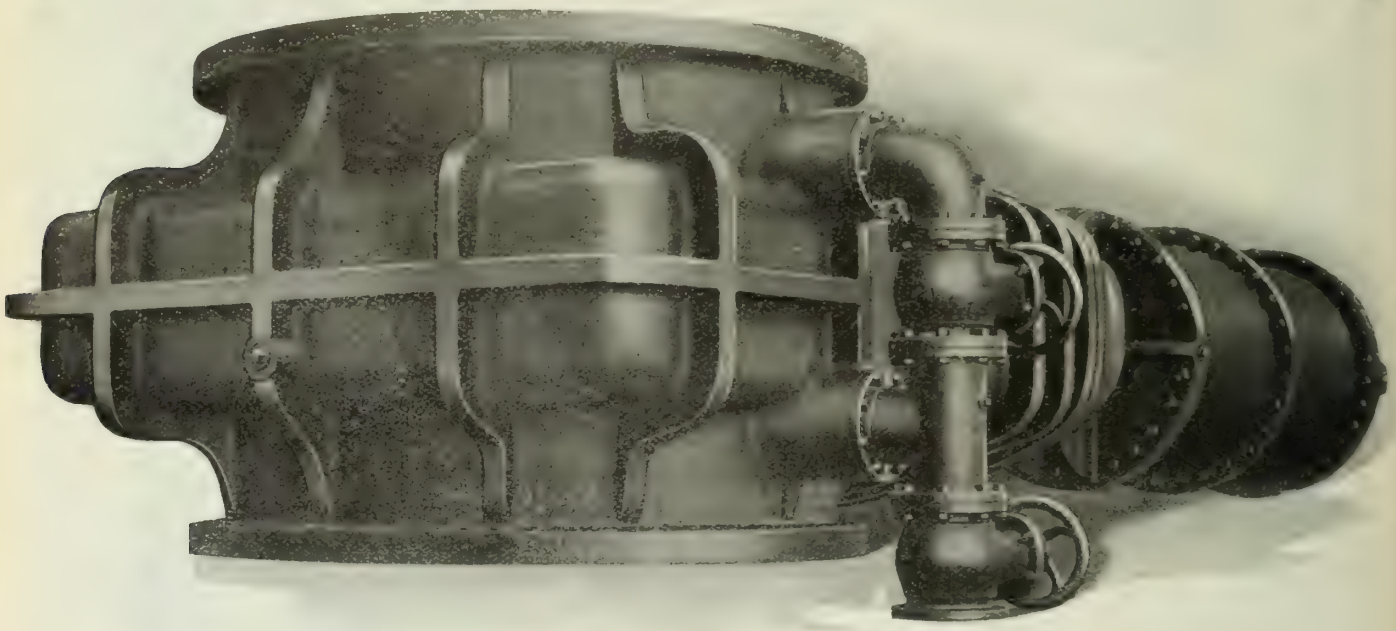

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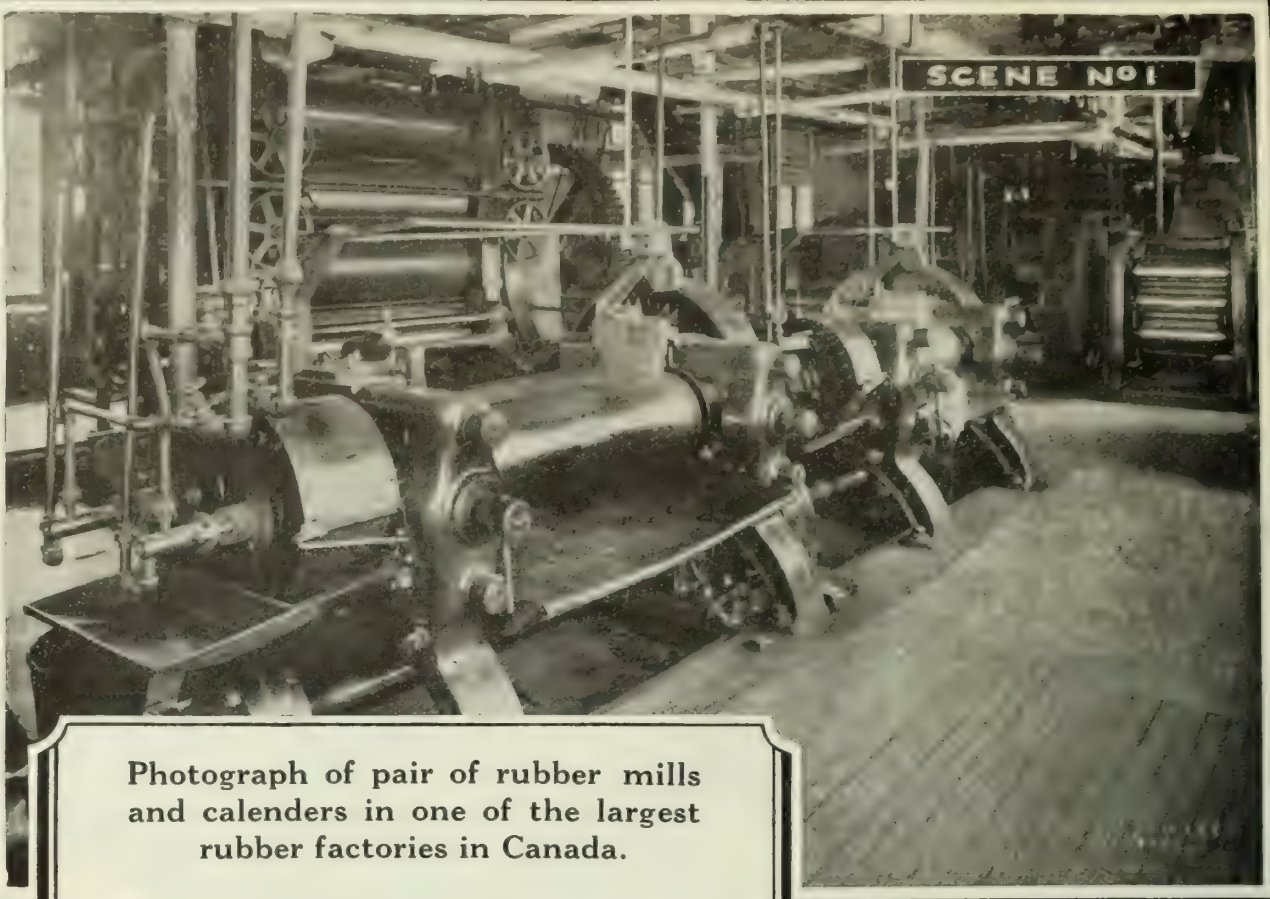

Photograph of pair of rubber mills and calenders in one of the largest rubber factories in Canada.

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Dr. Steinmetz gave an exhibition of his artificial lightning-making machine for Mr. Edison's benefit, and in the accompanying illustration he is showing the visiting inventor broken porcelain insulators and a piece of a tree limb which he had shattered a few minutes before in a mimic lightning storm.

Oxide Film Arresters—seven years of service is proof of their reliability

OK'd in the Laboratory

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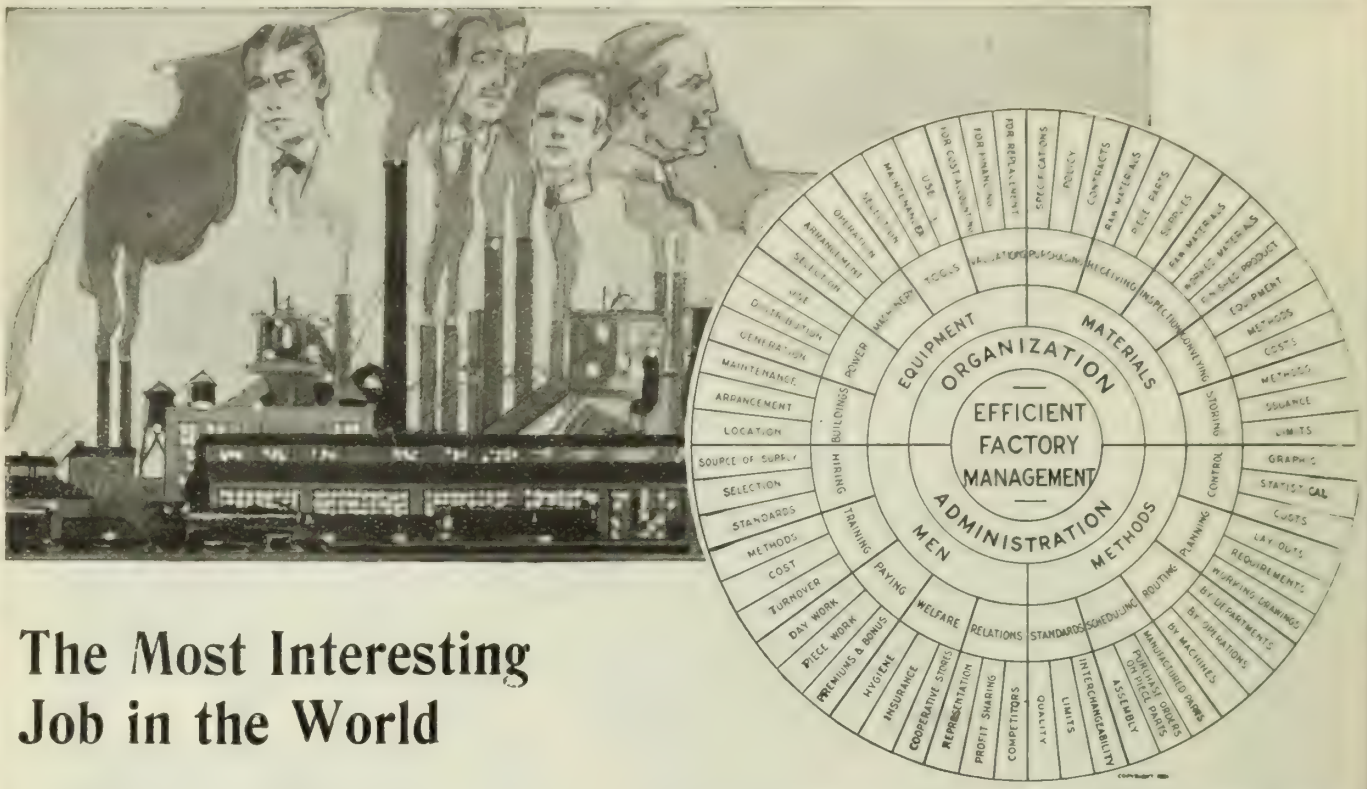

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OF CANADA

MARCH 1923 Volume VI, No. 3

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Railway Electrification

Notes on Electrification of the Chicago, Milwaukee and St. Paul Railway.

Arthur L. Mudge, A.M.E.I.C.

Electrical Engineer, Kerry and Chace, Limited.

Paper read before the Montreal Branch, The Engineering Institute of Canada, January 18th, 1923

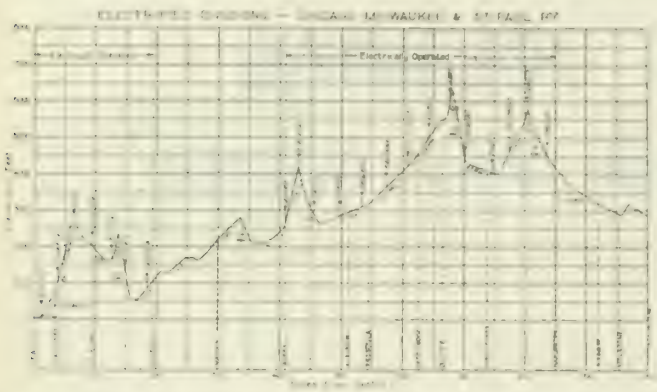
A rule to be generally observed is that a technical paper should be prepared by an expert on the subject. The writer must confess that he is neither a railway engineer nor an electric railway engineer, but just an ordinary electrical engineer, however, he has had the privilege, during last winter, of being associated with two railway engineers, viz., Messrs. S. B. Clement, M.E.I.C., and J. G. G. Kerry, M.E.I.C., in an electrification study, and during that time has made inspection trips over the Chicago Milwaukee and St. Paul Railway, and the Butte Anaconda and Pacific Railway, in the north western states.

Before going into details regarding the Milwaukee road, let us briefly review the conditions on a railway, the existence and degree of which, makes its operation by electric power desirable. These are:– 1, congested terminals; 2, long tunnels; 3, heavy traffic density, particularly where the traffic is approaching the limit of capacity of the existing tracks under steam locomotive operation; 4, long heavy grades; 5, severe winter conditions; 6, expensive fuel; 7, ample power supply available at reasonable cost.

The more of the above conditions which exist, the more favourable will be the results of electrification, both from an operating and from an economic point of view, but many electrifications are justified by the existence of only a few of these conditions. The most difficult railway traffic problems can be handled, from an operating standpoint, entirely satisfactorily by electric power, which eliminates various troubles incidental to steam operation. In fact it is where the operating problems are most difficult that electrification makes its best showing. For the average railway, upon which the extreme conditions mentioned do not exist, or exist in a much lesser degree, it is purely a financial and economic question, and the decision for or against electrification depends upon a comparison of fixed charges and operating expenses for steam and electrical operation. If a favourable balance is found and electrification adopted, a number of important incidental advantages will be reaped. With regard to the advantages, both primary and incidental, the following may be quoted from a recent paper by W. J. Davis.

"The saving in fuel, while of increasing importance on account of the steadily advancing price of coal, is as a rule not alone of sufficient magnitude to demand the adoption of an electric traction system. In addition to the increased track capacity obtainable, the use of larger train units and higher speeds permits changes in methods of handling freight and passenger traffic which results in substantial reductions in nearly all of the principal items making up operating costs. In the aggregate these savings will prove sufficiently large to yield an attractive return on the capital cost of electrification.

"There are many indirect reductions in operating costs which will follow the adoption of the electric system. These will include such items as reduced maintenance of track and structures due to decreased axle weights, the use of shorter wheel bases and improved riding qualities of the locomotives, postponement of necessity for double tracking; savings in maintenance and cost of water supply, shop equipment, roundhouses and turntables; reduction in overtime caused by delays; practical elimination of ruling grade problems; reduced operating costs due to reduction in company coal movements; and improved



Profile, Harlowton, Montana to Seattle and Tacoma, Washington

service to shippers due to increased speed and greater reliability in operation. These savings all have a real monetary value, the magnitude of which may be determined in specific cases with a fair degree of accuracy. Nevertheless, we may neglect them entirely and still show that electrification will pay where justified by the density in traffic, by considering only the main operating items usually included in statements of operating costs."

Electrified Sections

The electrified sections of the Chicago Milwaukee and St. Paul cover 649 route miles of single track road. About two-thirds of this consists of the Rocky Mountain and Missoula divisions in the state of Montana, where three mountain ranges, including the Continental Divide, are crossed with long grades of 1.7 per cent and 2.0 per cent. This section has been electrically operated since 1916. The remaining one-third of the electrified mileage is on the Coast division in the state of Washington where the Cascade mountains are crossed with a maximum grade of 2.2 per cent. Between the two electrified sections there is a division of 226 miles still under steam operation.

Since 1916 there have been placed in operation on the road the following sixty-one electric locomotives, made by the General Electric Company and by the Westinghouse Electric and Manufacturing Company.

No.	Total weight tons	Drive	Service	Max. safe speed m.p.h.
42	288 tons	Geared	Freight	35
10	278 "	Geared	Passenger	65
5	262 "	Gearless	Passenger	90
4	72 "	Geared	Switching	35

About two-thirds of these locomotives have been in service since 1916, so that ample time has elapsed to observe results and judge of the reliability of operation. The system of power supply to the locomotives is 3,000-volt, direct-current, supplied through pantagraphs from overhead conductors, and a bonded rail return circuit. The maximum operating voltage across any motor is 1,500 volts for the geared motors and 1,000 volts for the gearless motors, although the windings of certain motors on every locomotive have to stand an insulation strain of 3,000 volts to ground. The 3,000-volt direct current is furnished from synchronous motor driven sets in substations located at intervals averaging about 33 miles along the railway. These substations are fed by 110,000-volt, 3-phase, 60-cycle power purchased from the Montana Power Company who have a number of hydro-electric developments and a net work of transmission lines in Montana.

The Butte Anaconda and Pacific Railway, a subsidiary of the Anaconda Copper Mining Company, has an electrified single track mileage of 123 miles and since 1913 has been operating twenty-eight 80-ton geared electric locomotives on the 2,400-volt direct-current system.

Reliability of Electrical Operation

High voltage power supply is rarely off as every substation is fed by at least two 110,000-volt circuits. The direct current supply rarely fails for in the event of a substation being shut down power can be supplied from the substations on either side. By this means a moderate traffic can be handled at somewhat reduced speed.

If a derailment brings down a pole, trainmen telephone to substations on either side to shut power off the section, however, the circuit breakers have probably already opened. The wires are cleared either by trainmen or off-duty operators from nearest substation, circuit breakers closed, and trains drift past the break until the line gang arrives and makes repairs.

Lightning protection is good, by means of overhead grounded wires on transmission line and distribution system; by electrolytic arresters on a.c., and d.c., sides of substations and on locomotives; and interruptions from lightning are rare.

In case of sleet both pantagraphs are put up. The forward one cuts the sleet and rear one collects the current. Sleet on high tension lines is melted off by tieing together the three wires of a dead line and putting 3,000 volts, d.c., through them to ground.

Grand Central Terminal, New York City, from 50th Street, before and after electrification.

On the Rocky Mountain and Missoula divisions for February, 1922: — freight locomotive mileage was 70,000, and passenger locomotive mileage was 60,000. During this time there were three train detentions from mechanical failures and four detentions from electrical failures, or one detention for each 18,571 miles, this being not far from the usual average.

No wrecks have been due to electrical failures. The only extended use of the steam locomotive on the Chicago Milwaukee and St. Paul since they electrified was during a four-day strike of substation operators.

It is not necessary to house locomotives in winter between runs. If they have to be brought into shop when cold they will sweat badly and motors should be dried out with low voltage — 220 volts — before attempting to put operating voltage on them again.

Mr. Bellinger, electrical engineer of the Butte Anaconda and Pacific Railway, claims that in eight years they have had to fall back on steam locomotives on only two occasions. He also states that of the twenty-eight electric locomotives on the road, twenty-six are in regular service, one is a spare, and one in shop.

Comparison with Steam Operation

We found very general satisfaction with electrical operation and its decided advantages over steam on the three mountain divisions of the Chicago Milwaukee and St. Paul — F. C. Dow, superintendent of the Coast division — 600 miles, of which 200 miles is electrified — says he can pretty well forget about the electrified section of his division. Most of his troubles are on the steam sections which are at a lower altitude, have much less snow, no zero weather, much easier grades and lighter trains than the electrified section. Mr. Dow also says that power is never off the line. A freight enginedriver, when hauling a 2,400 — ton train up a 2 per cent grade, 20 miles long, near Donald, with two electric freight locomotives at 12 m.p.h., said that the same train would require three of the heaviest steam locomotives and run only 7 m.p.h., up this grade.

The electrics run with less frequent inspection, less train detentions, both in number and total time, much lower cost of maintenance and repairs and less trainmen's and enginemen's wages per unit of traffic handled.

Under the worst conditions of weather, grades and traffic, where the steam locomotive has not done as well as might be desired, the electric locomotive has taken over the job and is doing it exceedingly well. There is a very complete and enthusiastic satisfaction among all the officials and employees of the road as to the results obtained by electrification and the only thing they want now is a considerable increase in traffic in order to make full use of it. Steam enginedrivers are given about one week's training and then put in charge of an electric locomotive.

Railway Transmission Lines

For the Rocky Mountain and Missoula divisions there are 363 miles of 110,000-volt single-circuit wood-pole transmission line. This parallels the railway and there are sufficient feeding-in points to ensure that every substation has at least two circuits supplying it. Three-hundred-foot spans are used on tangents. Particular attention is given to stringing the line conductors at correctly calculated sags. Sixteen feet for clearance of conductors above ground is strictly maintained.

The system was put into operation December 1916, and the single wood pole construction has been found entirely satisfactory, shutdowns being rare. Suspension insulator failures have not exceeded one per cent per year. The same type of high tension line construction is used on the Coast division.

To carry a 110,000-volt circuit on single wooden poles set 300 feet apart, to an eastern engineer looks a bit risky, however, they are doing it and apparently getting away with it. It should be noted, however, that in Washington they have sleet but no very low temperatures, whereas in Montana there are extremely low temperatures but little sleet.

Railway Substations

Substations are located at about 33-mile intervals, which is found entirely satisfactory from an operating point of view. They are all manually operated and contain one, two, or three 2,000-k.w., synchronous motor generator sets, each set being fed by one 3-phase oil-filled self-cooled transformer and controlled by a high tension, oil circuit breaker. Electrolytic lightning arresters are installed on the high tension bus on all generators, and all 3,000-volt d.c., feeder circuits.

Chicago, Milwaukee and St. Paul Railway 100,000-Volt Transmission Line.

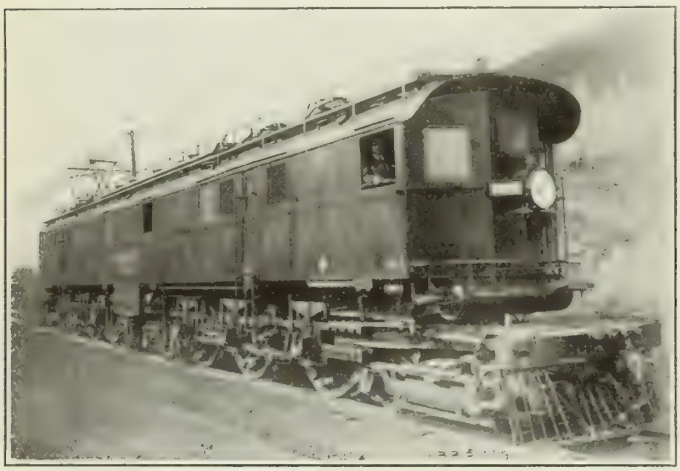
Two 3,000-volt, d.c., feeders leave each station. Negative high speed breakers or flash suppressors are used, and generators are provided with blowers for cooling purposes. Each station is fed by two 110,000-volt, 60-cycle circuits, controlled by oil circuit breakers. Generator commutators are undercut, and, after two years operation, without repair or turning, are in excellent condition. Original brushes still in holders, wearing about one-eighth inch in two years, were found in the station inspected.

There are two exciters direct connected to each motor generator set, one for the synchronous motor and one for the two d.c., generators. A compound winding on synchronous motor exciter field, from the main d.c., generator circuit, automatically controls the power factor with varying loads. No Tirrell regulator is used. Synchronous

motors are wound for 2,200 volts and are started from half voltage taps in the main transformers. All 2,200-volt a.c., and 3,000-volt d.c., cable is cambric insulated and covered with flame proof braid, mounted on porcelain insulators or carried in fibre conduit. There is no lead sheathed cable in the station. Each station is equipped with a ten-ton hand-operated travelling crane.

Communication to, and between, substations is by means of despatchers telephone on railway right-of-way. One substation operator is on duty per eight-hour shift, but under certain conditions of light traffic, some stations operate for only one or two shifts allowing stations on either side to carry the load during the remaining shifts. This is a continuous arrangement and operators are carried only for the operating shifts.

Operators now receive $207.00 per month with rent, fuel and light. There is a travelling substation superintendent. The opinion of Mr. Beeuwkes, chief electrical engineer of the road, is that one motor generator set per substation is safe practice provided it is of sufficient



Baldwin-Westinghouse 270-ton passenger locomotive on the Chicago, Milwaukee and St. Paul Railway.

capacity to carry the load. Two of their stations have only one unit each but it would not be desirable to have less than two units in substations at either end of the line. Mr. Beeuwkes thought that full automatic operation of substations would not suit their particular conditions, but that a partially automatic system with some manually operated and some remote control stations might be satisfactory.

Maintenance of Overhead and Transmission Lines

The 440 single track route miles of overhead distribution system together with about 140 miles of sidings, yards tracks and spurs, and the 363 miles of 110,000-volt transmission line on the Rocky Mountain and Missoula divisions are maintained by a line superintendent, and two gasoline electric repair cars, each fitted with tower, store room, eight bunks, kitchen, etc., each car carrying the following crew:—one enginedriver, one conductor, one brakeman, one foreman, three linemen, and one helper who also acts as cook. The tower on the repair car swings far enough to eliminate pole climbing. These cars in 1916 cost about $21,000., each.

The cost of maintenance of overhead for first year or so, until system became tuned up, was high. The untreated wooden poles are considered to have a life of about seventeen years, the hard drawn copper contact wire much longer, and no appreciable deterioration has shown yet in hardware or insulators. Mr. Bellinger, electrical engineer, of the Butte Anaconda and Pacific, says that their cost of maintenance and repairs to overhead and bonding runs from $125.00 to $175.00 per mile of single track per year, the higher figure being when wages and materials were at the peak.

Track Bonding and Negative Feeder

The bond used is of stranded copper about 37 inches long, attached to the rail, beyond either end of the angle bar, by drilling the webs of the rail and expanding the lug of the bond by means of a steel pin. This type of bond evidently requires a fair amount of attention, and on both railways they incline towards a welded bond for future work.

Both roads use a supplementary negative feeder of No. 0000 stranded copper on all of single track mileage, but discontinue it where there are two or more tracks. On the Chicago Milwaukee and St. Paul, this negative feeder is carried along the top of the poles for lightning protection. On spurs they bond one rail only and carry a stranded steel negative feeder along the ground.

The bonding is maintained by section men without any increase in size of gang as used for steam operation. One inspector and helper, on a speeder, test bonds on a 440-mile section.

Effect of Steam Operation on Overhead

There has been no serious effect on overhead from steam locomotives where latter are used in the open for switching. There has been trouble at certain tunnels where joint use has occurred with another road using steam. In such cases another type of insulator, viz, the Hewlett, has been used and has proved satisfactory. Cleaning the insulators is of no use as the heat from the steam locomotives causes cracks and breakdowns.

Interference with Communication Circuits

Train despatching telephone circuits are carried on poles on the railway right-of-way within twenty-five feet of 3,000-volt d.c., contact wires and feeders and, as a rule, within 150 feet of the 110,000-volt a.c., circuit throughout practically the entire length of the electrified sections. No very special precautions are taken and no troubles from interference are experienced. Where telephone wires have to cross tracks to enter stations they are carried in lead sheathed cable under tracks to avoid overhead crossings. At the time of visit of the French Railway Commission a number of special tests were made, including operation by the Western Union Telegraph Company of multiplex telegraphy over some of the telephone wires. The French Commission were entirely satisfied with the results of the tests.

Locomotive Mileage

Chicago Milwaukee and St. Paul Railway.

Approximately per year, per locomotive, 60,000 miles.

One locomotive on Rocky Mountain and Missoula division, (440 miles) made 12,000 miles in 1 month.

One passenger locomotive on Coast division (209 miles) made 8,200 miles in 1 month.

One passenger locomotive on Coast division made mileage on 208 out of 211 consecutive days, in this time making 50,000 miles.

Butte Anaconda and Pacific Railway.

Freight locomotive per year about 23,000 miles.

Passenger locomotives per year about 36,000 miles.

Most of these records would have been better had the electrified divisions been longer. In a year of heavy traffic the average mileage of locomotives on the Butte Anaconda and Pacific ran up to over 48,000.

Locomotive Inspection

Rocky Mountain and Missoula Division.

A general inspection is made once every 5,000 miles and requires about nine men for four hours. The general scheme of overhauling in shop is as follows: — after

5,000-ton freight train on the Missoula Division, Chicago, Milwaukee and St. Paul Railway, hauled by a 3,000-volt D.C. freight locomotive.

40,000 miles, one week in shop, after 80,000 miles, ten days in shop, after 100,000 miles, two weeks in shop. Different features are attended to at each shopping, the above cycle being repeated. At the end of each 440-mile run, a nut and bolt inspection is given and bearings are lubricated.

Coast Division.

Five gearless locomotives have been in operation about two years. The first and second have had their first general overhauling. The third has just had its first general overhauling after running 110,000 miles. The fourth has run 115,000 miles and has just been put into the shop. Overhauling will require about 28 days. No tires turned before this overhauling, and some do not require turning yet. One shop inspection every 5,000 miles, takes about eight hours.

Butte Anaconda and Pacific Railway.

A general inspection is made every forty days. This inspection takes place over a cinder pit and the locomotive is not taken into the engine house for it. The commutators, brushes and contactors are examined and the gears lubricated, — the whole being not over one hour's work. Axle bearings are lubricated every day. Locomotives come into shop once a year for general overhauling which includes turning tires and rebabitting motor bearings.

Steam and Electric Locomotive Maintenance Costs and Operation

The following table shows a comparison of repair costs for steam and electric locomotives and includes repairs, maintenance, inspection, engine-house costs and wreck repairs.

Railway	Division	Steam or Elect.	Year	No. of Locos. in Service	Wt. of Loco. tons	Repair cost cents per mile	
						Per Loco.	Prorated to 100 tons
C.M. & St. P.	R.M.&M.	steam	1920	—	150	34	22.7
"	"	"	1921	—	150	32	21.3
"	"	elect.	1920	—	288	24	8.3
"	"	"	1921	—	288	21	7.3
"	"	"	Jan. 1922	38	268	18	6.2
"	Coast	steam	1921	—	150	34	22.7
"	"	elect.	1921	23	285	19	6.7
B.A. & P.	—	"	1920	28	80	6.7	8.4

There is not much difference in cost of repairs between passenger and freights, and no one seemed to fear any rapidly increasing deterioration with age. Mr. Beeuwkes suggested a life of twenty-five years or more without increasing the annual maintenance charges. So far the locomotives have been improving with age as the various original troubles are eliminated, partly at the expense of the manufacturing companies.

Wear of Locomotive Parts

Commutator record of the main railway motors is exceedingly good, showing that motors must run sparklessly. This indicates that the interpole winding is doing its work properly, that satisfactory types of brushes are being used and that the motors are well designed for good commutation. The writer saw several commutators from main driving motors of each type of locomotive. All were in perfect condition and it was claimed that they had never been turned, and that they never turn a commutator for wear approximate record of commutators examined is shown in the following table.

Railway	Type of locomotive	Weight in tons	Years in operation	Probable miles run
B.A. & P.	geared freight	80	8	180,000
C.M. & St. P.	geared freight	286	6	360,000
C.M. & St. P.	geared passenger	300	2	120,000
C.M. & St. P.	gearless passenger	262	2	120,000

Main motor brushes wear about one-sixteenth inch per 11,000 miles, one-quarter inch being total allowable wear, giving about 44,000 miles for one set of brushes.

Most of the original gears and pinions are still in operation on both freights and passengers. Any replacements that have been made are generally due to gear teeth being broken off when a piece of the gear spring falls into the gearing. On both types of geared locomotives there are springs between gears and driving wheels. In neither case was the original spring arrangement satisfactory, as far too much play was allowed. Play has now been greatly reduced, with consequent elimination of spring trouble.

On some of the main driving gears, which after six years wear can no longer be operated with springs, the rim has been riveted to spider and operation continued without springs. Tooth wear will be somewhat quicker under these conditions, but material additional mileage per gear will be obtained. Springs are desirable in order to decrease wear of teeth. On the 80-ton Butte Anaconda and Pacific locomotives there are no springs between gears and driving wheels. They expect a gear life of about fifteen years, and pinion life less in proportion to gear ratio.

Wheel rims of locomotives are turned approximately as follows: — geared, once in 50,000 miles; gearless, once in 100,000 miles. Three turnings is the life of a rim. Allowable variation in wheel diameters is one-eighth inch on one axle and one and one-half inches on the locomotive.

The operating record of the locomotives seems generally to have been good. Certain troubles have developed, both electrical and mechanical, of which the local officials talk quite frankly. These were incidental to developing new types of locomotives for very heavy service and most of them by this time have been, or are in a fair way of being eliminated. The manufacturing companies are working in close co-operation with the railway officials in correcting the defects. The best commentary on the seriousness of any troubles which may have occurred is the absolutely complete enthusiasm of every railway official we met as to the success of electrical operation and its very favourable showing as compared with steam.

Wrecks

The following train wrecks have occurred since the road has been electrified.

1. Due to a landslide two electric freight locomotives on the Coast division rolled over an embankment down 400 feet. The sole witness was a woman who described how the cabs sprang free from the trucks and hit each other in the air as they bounced down the mountainside. Nine men went over with the locomotives, two of these men were injured seriously, but all recovered. The parts of the locomotives were brought back to the shops on twenty-one flat cars, the motors themselves being uninjured. The railway company rebuilt both locomotives at a cost of $90,000., and they are now in operation on the road in as good condition as ever.

2. One passenger locomotive was ditched west of Deer Lodge but not seriously injured.

3. Freight locomotive and train ran away down a 20-mile 1.7 per cent grade on the Beverley Hills to the Columbia river. A mallet engine and sixty cars all went off track. The electric locomotive, whose safe speed rating is 35 miles per hour, went around six degree curves at sixty miles per hour or over, but stayed on the track without damaging it, and ran a considerable distance up the next grade. The banding broke on two armatures, locking the wheels which slid for some distance. No other damage done to the locomotive. This wreck was due to combination of failure of air brakes and wrong handling of regenerative braking control by the enginedriver.

4. In September 1920, a wreck occurred at Piedmont. Forty-eight cars ran away down a 2 per cent grade into the caboose of a train at the bottom and all piled up within ninety feet. One pole was broken and tangled up the 3,000-volt overhead feeder. The wreck was cleared within twenty-four hours and the overhead was repaired by the time the track was cleared. This was the last occasion on which a steam locomotive has been used on the Rocky Mountain division.

No electric locomotives on the system have been damaged beyond repair, and no wrecks have been due to electrical failures. The general opinion of the superintendents, roadmasters, master mechanics and electrical engineers is that electric locomotives are not as hard on track as steam locomotives are. The Beverley Hills wreck is cited in support of this opinion. After this wreck the track was carefully examined, particularly at curves, and no sign of spreading was found.

Passenger Car Heating

On the Milwaukee road this is done by means of an oil fired boiler on the locomotive. The oil tank holds 750 gallons which is sufficient for a 440 mile run for one of the heavy transcontinental trains of, say, ten cars. With oil at $1.87, per barrel, this means about 7.5 cents per train mile. Water tanks hold about 3,000 gallons and can run 226 miles on one filling. There are four water stations left on the 226 miles of the Rocky Mountain division.

Steam may be required at night in the mountains at any time during the summer and is required at all times for baths on the "Olympian". The boilers originally used were unsatisfactory and cost over five cents per locomotive mile for maintenance. The type of boiler now used costs less than one cent per locomotive mile to maintain. It is desirable to have the boiler compartment entirely shut off from remainder of the locomotive, otherwise gas and soot dirties the electrical contacts of control equipment and is liable to make its action uncertain. It has been suggested that passenger cars might be heated from a separate tender carrying an oil, or coal fired boiler. This would allow passenger trains to be handled by freight locomotives and heating tenders could be left off in summer.

Passenger locomotive cabs are steam heated; freight cabs are provided with electric heaters. Electric heating of passenger trains generally would be too expensive as it requires nearly as much power to heat a train as to haul it. On the Butte Anaconda and Pacific Railway, however, between Butte and Anaconda, 26 miles, a three-car passenger train makes four round trips per day. The cars of this train are electrically heated. We made a run in the locomotive cab of this train with an old steam enginedriver. His cab was spotlessly clean, electrically heated, floored with linoleum and a small rug, muslin curtains

on the windows, pictures, photographs and calendars on the walls. He was very proud of his train and on arrival at Butte took us back through it and told us that it was, "Lit up, het up, and coaled up, by 'lectricity".

Regenerative Braking

This is an important and successful feature of the installation. When trains are running down the heavier grades, motors can be operated as generators and the momentum of the train converted into electric power which is returned to the line. This acts as a smooth and effective brake, saves in repairs and maintenance of brake shoes and rigging, and saves power. On the Chicago Milwaukee and St. Paul it reduces the total power required for operating the road by from 15 per cent to 20 per cent.

An example may be cited of a 2,400-ton train descending a 1.7 per cent grade at 20 m.p.h. The locomotive was delivering 800 amperes to the line at 3,200 volts, which represents over 3,000 h.p. On a 0.5 per cent grade the trains coast at about 25 miles per hour without power or regeneration. There would therefore be no object in adopting regenerative braking unless a road had long grades well in excess of 0.5 per cent.

Power Consumption and Contract

The power supply is metered separately on the three electrified divisions.

Division	From	To	Length miles	Peak load limited to kw.	Rate per kw. h. cents
Rocky Mountain	Harlowton	Deer Lodge	226	12,000	0.536
Missoula	Deer Lodge	Avery	212	12,000	0.536
Coast	Othello	Tacoma	209	12,000	0.536

Power is furnished at 110,000 volts at the railway company's right-of-way, for the Rocky Mountain and Missoula divisions, by the Montana Power Company, and for the Coast division by the Intermountain Power Company, in which the Montana Power Company is interested. The railway company own the 110,000-volt transmission line which parallels their track for the greater part of the electrified sections.

Power is paid for on the high tension side of the substations on the basis of maintaining a load factor of at least 60 per cent on each division. Load factors on various divisions with present comparatively light traffic do not exceed 35 per cent. In August, 1920, with double the present freight traffic they operated on the Coast division with a load factor of about 72 per cent with a peak limited to 10,000 k.w. Such a severe limitation of the power peak was found to slow down the trains and increase engine and trainmen's wages to such an extent that the limit was raised to 12,000 k.w. Unfortunately traffic immediately began to fall off with resulting load factors of from 45 per cent to 31 per cent. The railway company may raise or lower the peak limit monthly by increments of 1,000 k.w., or multiples thereof, their minimum payment for the month being on the basis of 60 per cent load factor on the peak limit set for that month, which peak limit, for purpose of minimum payment, may not be reduced below 12,000 k.w., per division.

For the Coast division, (209 miles), the contract now works out as follows:—

Freight: 5,000 gross trailing tons daily westbound.
4,000 gross trailing tons daily eastbound.
Passenger: Two transcontinental trains daily each way.

Peak load (controlled by power limiting device)	12,000 kw.
Load factor	35 per cent.
Monthly power consumption on high tension side substations, on basis of 30-day month	3,024,000 kw h.
Contract rate per kw h.	0.536 cent
Actual rate paid per kw h. on account of low load factor .536 x 60/35	0.92 cent
Monthly power bill	$ 28,000.
Annual power bill	$336,000.
Power rate per h.p. year	$ 21.
Each 1,000 kw. increase in setting of power limiting device would add annually to power bill	$ 28,000.

Power Indicating and Limiting Device

Briefly this consists of a small motor generator set and switchboard containing graphic watt-meter, etc., in despatcher's office, a circuit of two No. 8 copper wires connecting all substations and despatcher's office in series; relays, instruments and motor operated exciter field rheostat in each substation. This equipment for the Rocky Mountain and Missoula divisions is said to have cost originally about $50,000., and for operation, about $1,000. per month. It gives an indication to the despatcher at all times of the total load on the system and automatically limits the peak load to any predetermined value which may be decided upon.

As soon as the load reaches, and begins to exceed the predetermined peak, the direct current voltage at all substations is automatically lowered sufficiently to keep total power consumption within the predetermined limit. This of course slows down all trains. The despatcher can instantaneously at will alter the point at which the limiting device operates, but in practice he does not do it, as a raising of the limit would proportionately raise the power bill for that entire month.

It is claimed that if the limiting device does not come into operation for more than 10 per cent of the time, the slowing down of the trains is not at all serious, also that a load factor of between 50 per cent and 60 per cent can be obtained without serious slowing down. The value of this device depends on the nature of the power contract, but in any case would be desirable, although the point of setting must be given careful and intelligent attention to avoid too great slowing down of traffic.

Under electrical operation it is desirable to modify the existing system of train despatching as a more even spreading out of the trains over the twenty-four hours will raise the load factor and consequently reduce the cost of power. The old despatchers require some training at first in order to adjust themselves to the new system but they soon work into it.

The following statement was made in 1920 by the president of the Chicago Milwaukee and St. Paul Railway. "Our experience so far indicates that electricity shows a considerable economy over steam operation from a financial standpoint and in other respects is far superior to steam." It cannot be emphasized too strongly that the operation of heavy railways by electric power is, from the operating point of view, a most complete success and nothing is more convincing as to this fact than the inspection of an electrified road like the Chicago Milwaukee and St. Paul. From an economic point of view each case has to be studied on its own merits.

Low Grade Ores of Algoma

Their Development and Use with Particular Reference to Canada.

J. D. Jones, M.E.I.C.

General Manager, Algoma Steel Corporation Limited.

Paper read before the Sault Ste. Marie Branch, The Engineering Institute of Canada, December 22nd, 1922.

This is the age of iron and steel. Examine where you will, you cannot help but note how intimately this basic material enters into the individual and collective life of all the progressive people of this world, and it is on this foundation that the greatest nations of to-day have established their supremacy. Yet with this important basic material, with its field of usefulness as yet not fully explored, we find ourselves facing, within a comparatively few years, exhaustion of the high grade iron ores upon which the industry is founded and to-day operated. We hear a great deal, and rightly so, of the necessity of conserving our natural resources, such as timber, coal, etc., but hardly a murmur, excepting from those who are actively engaged in the operation and development of the industry, about the necessity of a conservation of our ore resources. It is strange that such a great industry should rest on such a precarious foundation that if to-morrow the means were taken away for removing from mother earth the source of high grade ores she so patiently prepared for us, practically all our producing activities would cease, as generally we have done nothing but develop huge machines for reclaiming these ores, and for transporting them to the furnaces for use as they come from the mines or pits. It is not probable that such a condition will ever become an actuality, but we do know that we cannot go on forever mining the ores we are now using on our furnaces, and it is only a question of a comparatively few years until these high grade deposits will be depleted to the extent of seriously affecting the position of many of the large producing steel and iron companies of this continent. It is but in keeping with the spirit of the times that attention should be directed to the conservation of the ore resources of the world by the development of the low grade ores, and it is with this development that this paper purposes to deal, with particular reference to Canada's position.

It is a fact that the leading iron and steel producer of the world is the United States, and it can be said that the reasons underlying this attainment are three,—first, the discovery of immense bodies of bituminous coal, of excellent coking and gas-making quality, in the Ohio River basin; second, the discovery of immense deposits of high grade hematite ores in the Lake Superior region; third, the fact that the Great Lakes and adjacent rivers provide a means of cheap transportation for the assembly of raw materials necessary for the production of iron and steel. Practically all this development had taken place subsequent to the Civil War, and while it might be said that the development and settlement of her vast prairie lands for agricultural purposes made this expansion possible, it is also right to say that it was only by the aid given by the development of the iron and steel industry that the settlement of these lands was facilitated and made possible.

Development of the Iron and Steel Industry in Canada

This movement was closely followed by the settlement of prairie lands in the Canadian provinces, and to-day Canada is one of the greatest food producing countries in the world. She, however, did not depend upon her own iron and steel activities to facilitate this settlement, but rather looked to Great Britain and the United States to furnish her necessities in iron and steel. The reason for this is that, outside of the maritime provinces, no discovery of coal suitable for metallurgical purposes, or iron ore of high enough grade in large quantities, had been discovered to justify the development of her iron and steel industry to sufficient capacity to meet the needs of a growing country. It is true that blast furnaces and steel plants have been located on the Canadian side of the Great Lakes system, but as they have been nearly always dependent on American sources for supplies of raw material, they have been considered in the light of an overflow of the industry on the American side of the lakes.

In the opinion of the writer, due to the development in the art it is not necessary that Canada should be longer dependent on other sources for her iron and steel requirements. She is in a position to-day, if she will but take advantage of her opportunities, to take her place as a producer of iron and steel, not only to supply her own needs, but also to export to countries less favourably situated. She has within her eastern provinces coal of good metallurgical quality, and this coal is within a few hundred miles of the immense Wabanna ore reserves of Bell Island, Newfoundland, and the industry at this point is in a favourable position to carry on an extensive export business, as well as supply the needs of eastern Canada.

As we move further west, we enter the industrial centre of Canada, eastern Ontario, situated on the Great Lakes. It is at this point that the heavy requirements of iron and steel begin and continue westward through to the western provinces. It is in this area from lake Ontario to lake Superior that the largest steel and iron works are situated, and it is within this area that the largest development will take place.

It is at this point that we are confronted with the problem of what it is we have to justify the building of a basic industry when we have neither coal nor high grade ore in sufficient quantities to justify the founding of a

native iron industry. It is true that we have the Great Lakes, a prime necessity, but that is all.

This is the answer. We do not have the coal, but we do have unlimited resources of water power which can take the place of coal, as at present, with the exception of coal for coking purposes, and this coal can be laid down at Ontario points as cheaply as it can be delivered to many American plants located on the Great Lakes. It is within reason to suppose that it will not be many years until there will be developed means of electrically converting ores into iron suitable for steel-making purposes, thereby disposing of the necessity of importing coal for coking purposes. This problem is now being investigated. We have as yet not discovered ore of sufficiently high grade, but in our search for these ores, we have discovered millions of tons of low grade ores, which can and should be brought into production.

Depletion of High Grade Ores

Reverting to the ores of the Lake Superior region, we find the annual rate of production about sixty million tons, and it is reasonable to suppose that this production will increase, not only due to the normal increase in population, but also on account of the per capita consumption of iron and steel increasing at a rapid rate. Like most mining districts, the Lake Superior region has lost its highest grade ores first, and it only took eight years, from 1902 to 1909, to reduce the average iron content of ores shipped from this region from 55.39 per cent to 51.81 per cent. Since then, the drop in the average iron content has not been nearly so rapid. In fact, it has remained practically stationary, but this is because of more intelligent mining methods by the mining of low grade hematite ores and concentrating them by washing. It is stated that there are fifteen plants concentrating ore west of Hibbing, Minnesota, and it is probable that the tonnage from these plants has had some effect in maintaining the average unit value of the ores shipped from this region.

A condition is therefore existent to-day, where of necessity in order to fill the current requirements from the Mesabi Range, at least 10 per cent of the ores that are shipped from this district are in concentrated form. A further condition that exists is that several high grade pits or mines are held in reserve, and only enough ore taken from them to mix with the lower grades in an endeavour to combat the gradually diminishing unit value of the Mesabi hematites. A further step in the protection of these values, and one that has just started producing at this time, is the concentration of the lean magnetite ores of the eastern Mesabi Range.

In connection with the conditions as outlined above, we find that the high grade ore reserves are not equitably distributed among the large steel companies, and while the life of the high grade deposits is estimated at from forty to fifty years, some companies find themselves with perhaps seventy to seventy-five years reserves, while others are in the unfortunate position of facing exhaustion of their reserves in the next few years. It is the conclusion that companies that are dependent on the market supply of ore for their requirements will be most likely forced to protect themselves through the acquisition of low grade reserves, or be forced to purchase concentrated ores to fill their requirements. This is the position that Canadian companies will find themselves in within the near future, as they will be forced to depend on concentrates for their operation, if they are to continue to fill their requirements from American sources. It is this condition, becoming more apparent every day, that points the way to the solution of their difficulties, namely, if our Canadian plants within a few years are to be forced into the purchase of beneficiated American ore, then it is time that they turned their attention to their native ores, which consist mainly of siderite and magnetite ores. They both require beneficiation before they can be used in blast furnaces, but once they are prepared, they become ideal ores for furnace use, both from the standpoint of physical structure as well as analysis.

There are three kinds of ore used in making pig iron, namely: — first, the hematites (FE_2O_3); second, the carbonates or siderites ($FECO_3$); and third, the magnetites (FE_3O_4). Generally, these three classes of ore divide themselves into two groups. The hematite, generally containing over 50 per cent of metallic content, is classified as a high grade ore, while the carbonates and magnetites, having a metallic content below 50 per cent, are grouped as low grade ores. It is therefore with these latter two ores that we propose to deal.

Use of Low Grade Ores

The metallic unit value of the siderite ore in its natural state, runs from 35 per cent to 40 per cent, and the magnetites run from 20 per cent to 60 per cent, with an average of perhaps 30 per cent to 35 per cent. In assuming that these ores can be used, we are not entering an unknown or unexplored field, but are simply taking advantage of the development in the industry, and co-ordinating its many developments in order to meet the problem that confronts us. In the first place, magnetite ores were used extensively in the early history of the industry, and are referred to as early as 2200 B.C. These ores are to-day quite extensively used in Sweden, and it is from a combination of the Swedish magnetites and charcoal that the famous Swedish iron is made to-day. The early history of the iron industry in the British Colonies of North America situated on the Atlantic seaboard is founded on the use of magnetite ores. The famous Cleveland ores of England are a type of siderite ore. The first recorded discovery of these ores was in 1801, but they were used only at the Calder Iron Works in the parish of Old Monkland for several years after their discovery, although they have since furnished a very large tonnage to British furnaces.

With the discovery of the immense ore bodies in northern Michigan, the eventual building of the locks at the Soo, and the later discovery of the famous Mesabi Range at the head of lake Superior, the higher grade and much cheaper ore was made available, and the use of magnetite ores on eastern furnaces was gradually discontinued, excepting in a few places where these ores were required for making special irons.

Canada is fortunate in having within the boundaries of northern Ontario immense deposits of siderite and magnetite ores. The chemical characteristics of each ore are not sufficient within themselves to permit the

exclusive use of either one of the ores on the furnace, without diluting with other ores, but the combination of the two ores makes an ideal mix, and by varying the percentages of each of these ores on a furnace burden, bessemer or basic iron can be made at will.

In order to illustrate why it is necessary to use two ores, we will take as an example the operation of a steel plant which is making basic, bessemer and foundry iron. In the making of pig iron, the operator is compelled to make iron to suit the various operations for which it is intended, whether it be for use in a basic open-hearth furnace, a bessemer convertor, or is desired for foundry use, and as a result he has to produce iron of varying chemical characteristics in order to meet the market demand. At the plant at the Soo, the major production of pig iron is for the purpose of making steel in basic open-hearth furnaces and, as a consequence, the iron produced must be basic. The chemical characteristics of basic iron should be about as follows:—

Silicon	0.90 per cent to 1.25 per cent.
Sulphur	0.03 per cent to 0.05 per cent.
Phosphorous	about 0.20 per cent.
Manganese	1.50 per cent to 2.00 per cent.

If they are producing duplex basic open-hearth steel, and using the old bessemer convertor in connection with the basic open-hearth tilting furnace, an iron is required which must have the chemical analysis of bessemer iron, whose principal characteristics must be low phosphorous and manganese, that is, phospherous about 0.20 per cent and manganese not exceeding 0.90 per cent. The analysis of siderite ore after treatment is about as follows:—

Iron	50.00 per cent.
Phospherous	0.013 per cent.
Manganese	2.50 per cent.
Sulphur	1.36 per cent.
Silica	9.00 per cent.

The analysis of magnetite ore after concentration and sintering is about as follows:—

Iron	64.00 per cent.
Phospherous	0.027 per cent.
Manganese	0.20 per cent.
Sulphur	0.005 per cent.
Silica	9.00 per cent.

You will note that these two ores with respect to sulphur and phospherous are lower than our practice requires, and as these two elements are the ones that must be reduced to a minimum in order to ensure a good quality of steel, it means that these elements are under control during the entire process of manufacture, and as very little attention need be given them, the result in the finished material must be much better than under present conditions. The silicas in these two ores are about constant with the silica content in the Lake Superior ores. This therefore reduces the plant's problem to the element of manganese, which to-day more than ever is given consideration in the manufacture of steel. You will note that the siderite runs high in this element, and the magnetite correspondingly low, so that the problem is again reduced to the simple expedient of varying the mix to suit the grade of iron required. Briefly, a mix of 60 per cent siderite and 40 per cent magnetite, will give a manganese content of about 2 per cent, and about 0.063 per cent phosphorous, making an excellent basic iron; and a mix of 80 per cent magnetite and 20 per cent siderite will make a duplexing bessemer iron of 0.77 per cent manganese and 0.061 per cent phosphorous, with the other elements constant at all times, with the exception of the metallic content which will vary with the mix. With the basic iron mix, namely, 40 per cent magnetite and 60 per cent siderite, an actual yield on the furnace of about 57.28 per cent should be shown as against about 52.50 per cent if the furnace is burdened with all Lake Superior ores. This would show an increased yield on the furnace of about 8.8 per cent with the low grade treated ores as against the Lake Superior ores. This increase is based entirely on the difference in the metallic content of the two ores, but we are of the opinion that the furnace will drive faster with ores that have already been partially prepared through the medium of heat treatment, than they do now with the use of raw ores. This, however, can only be determined by making experimental runs in order to determine the increase.

For the manufacture of foundry iron, in which the phosphorous element is usually high, it will be necessary to import a small amount of high phosphorous ore, or to use a phosphorous rock in order to raise the phosphorous to the requirements of the foundry trade. There is nothing unusual set forth in this idea, as that is exactly how we make foundry iron to-day.

It has been noted previously that both these ores require beneficiation, and it is in order now to set forth how this can and has been accomplished. We will first take up the question of siderite ore. This ore is a carbonate ore, though more popularly known as a siderite ore, and as found in its native state requires treatment to remove undesirable elements and to raise the metallic content before it is available for blast furnace use. In order to make this ore available for the furnace, it must be roasted to drive off the carbon dioxide and other volatile constituents. This process has been successfully accomplished for several years with the siderite from the Magpie mine of the Algoma Steel Company, and for several years it has been successfully used on the furnaces. Its chemical analysis after treatment has been previously noted. The process of roasting this ore is very simple, as the ore is crushed to sizes suitable for introduction into the rotary kiln, where it is subjected to heat derived from the combustion of powdered coal within the kiln, and the undesirable elements eliminated in this manner.

In the treatment of magnetite ores, a much more complicated and co-ordinated operation is required. In its native state, it occurs in comparatively thin bands of varying thickness, with bands of silica in between, and it is necessary, in order to bring the silica within desirable limits, that the ore be very finely crushed, in the case of the Canadian magnetites as fine as 150 to 200 mesh. After the grinding operation, the next process is magnetic separation, during which operation a very considerable amount of silica is discarded, but not enough to make the ore desirable. Further treatment is necessary, and the flotation process, worked out by the copper companies in reclaiming their low grade porphyry ores, has been adapted for this phase of the operation. This flotation process separates the finely divided particles of silica and iron ore. After having gone through this process, the ore is so fine that it is practically impossible to ship it, or even if this could be accomplished, to put it on the furnace, as its fineness would act as a deterrent in the working of the furnace. It is necessary therefore to dry

these fines to about 15 per cent of moisture, and to then run them over a sintering machine, where they are put into physical shape suitable for shipment and furnace operation. Such a plant is now operating at Babbitt, Minnesota, producing a high grade ore which has met with success on the furnaces on which it has been tried out. There is at least one plant in eastern Pennsylvania which has a plant of similar design operating, and this plant has been in successful operation for several years. There are several other plants in eastern Pennsylvania, northern New Jersey, and in the Adirondack region of New York, at which magnetite ores are being prepared for furnace use by means of plants that have been designed to suit the condition of the ore in the particular locality in which they are situated.

These means of beneficiation have been tried out, and are a commercially proven success, and the only problems that confront us are the location of sufficiently large bodies of magnetite ore adjacent to the existent railways, or reasonably close to the Great Lakes waterway, and the adaptation of the known means of concentrating these ores to meet the situation with respect to the possible variation there might be in Canadian ores.

In connection with this problem, it is gratifying to know that the government of the province of Ontario have become interested in the possibility of the development of Ontario iron resources, and have appointed a committee composed of eminent men in their several professions of mining engineering, geology, metallurgy, transportation and commercial experts, to investigate this possibility, and the committee is now actively engaged upon this work. It is to be hoped that the Dominion government will also take an interest in the problem, as it is a question of national importance, not only from the fact that the development of these immense reserves will establish an actual, rather than a potential, value on the ore reserves of the Dominion, but also that it will eventually become an important factor in the building-up of our industrial life, with the consequent increase population and wealth.

Abnormal Friction Losses in a 12-inch Water Main

A Discussion of a Number of Important Considerations in the Design of Water-Supply Pipe Line

James Purves, M.E.I.C.

Resident Engineer, Nova Scotia Steel Company, Sydney Mines, N.S.

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To the members of the engineering profession, who have specialized in hydraulics and all that pertains to that branch of engineering, particularly those who have had experience in municipal work, the theory of the flow of water through pipes under all conditions is familiar. There are many, however, especially of our younger men, holding responsible positions, men who are not specialized in the flow of water for instance, or especially so in any particular branch of practice, they are the so called general purpose engineers, who nevertheless may have the onus thrust upon them, and accept the responsibility of designing and recommending a water-supply installation of comparative importance. It is to these members that the writer wishes to address this paper, in the hope that it may be a reminder of the caution that is necessary in view of experiences that are coming to light from time to time, with regard to the abnormal friction losses that develop under some conditions of flow, and for variable ages of service.

Designing for Future Efficiency

It seems that the problems involved in an important water-supply installation, should be approached primarily from the aspect of length of time a main should flow efficiently, all things considered, as equated against the first cost of installation. For instance, a pipe line may be installed that will function satisfactorily for a number of years. Then a sensible depreciation in delivery and pressure is noticeable. This lessening in efficiency is appreciable from year to year until ultimately, say, at the end of ten years, the supply of water is inadequate for requirements.

Therefore, an important question is, to what extent should the engineers burden present consumers with the cost of facilities provided for the future. This issue is capable of various determinations, depending on size and wealth of the community or corporation, and the possible or probable future demand for supply, the cost of pipe, labour, etc., at the time. It looks as though no hard and fast rules of practice can be laid down. Each design must be considered from a view point of its own, based on its own particular merits or demerits, and insofar as this phase of the problem is concerned, the engineer is forced to stand upon his own judgment and sagacity.

Merriman says that as a general rule, design should be made for ten to fifteen years only, where the growth is over three per cent per annum, and design for twenty to twenty-five years where the growth is under two per cent. At the time Merriman wrote, the cost of pipe was between $17. and $35. per ton, to-day it runs between $60. and $80. per ton, and in all likelihood will not be as low again as $30. per ton. Labour and all other materials are proportionately high. The greater first cost of any installation to-day is obviously a factor to be taken into account in design insofar as its relationship goes to efficient service life.

The foregoing is by way of a general statement, and while a discussion along these lines seems to be more or less pertinent, it is the intention here only to briefly go over the question of loss of head due to friction in a

specific case that has recently come under investigation, and make a comparison with a calculated performance for the pipe as it was supposed to function, for its length of time in service, in order to show that in this particular instance, it might have been better had more thought and study been given to the question in the beginning. The pipe line under consideration failed to live up to expectations. That there are many such failures is probably true, and no doubt in each case it could be shown that the design was made and carried out strictly accordingly to some formula, making, as was thought, due allowance for increase in consumption and decrease in carrying capacity. Yet, in the light of experience, the calculations were not sufficient. The actual results prove that not sufficient allowance was made for deterioration of inside surface over a period of years, apart from a possible increase in demand.

A Specific Case of Abnormal Friction Losses

The instance to be cited is that of a municipality and adjacent industrial plant receiving their water from a reservoir owned and maintained by an outside, independent community. The water is of excellent quality, in fact, there are few sources of supply giving so good a water. Analysis shows little or no impurity. It comes to the consumers jointly through one pipe twelve inches in diameter, and the main, without branches from the reservoir, to a certain point in the town is 12,000 feet long. It is this main that will be discussed here.

There is no necessity to deal with the ramifications of the water question as it exists, between the town and the industrial plant. It is sufficient to say that the original installation agreed twenty years ago to supply not more than 1,500,000 gallons per day, and not less than 500,000 gallons per day, to their neighbours and the industrial plant jointly; they to take it away as required.

The reservoir is 202 feet above high water, and the point of delivery insofar as this discussion is concerned, is 81 feet above high water. The higher parts of the town are in the vicinity of 135 feet above sea level. From the above it might be inferred that the 12,000 feet of twelve-inch main was designed to flow at the rate of 1,500,000 gallons per day, and have sufficient reserve head left to feed the higher levels of the town. By sufficient reserve head, it can be assumed that a minimum of 10 pounds per square inch, or say 25 feet of head would be required at high levels, making no provision for fire service, as this would be handled by either pumping engines or by reversing the flow of water through the industrial company's main and using pond water at high pressure. The latter figure of 25 feet added to the elevation of the higher districts of 135 feet, means that the main was supposed to flow at a maximum rate of 1,500,000 gallons per day with an effective head of 202—160, or 42 feet.

Now it may have been further considered at that time that the maximum rate of 1½ million gallons per day would not likely be required, although certainly provision was made in the agreement for this quantity within a twenty-year period. Considering the design from the foregoing assumption, we find that a 42-foot head will flow about at the rate of: 1,300,000 Imperial gallons per day by Merriman; the same by Kutter with a coefficient of .011 for new pipe; the same by tables in Allis-Chalmers catalogue for new pipe; and 1,339,000 Imperial gallons per day by D'Arcy's formula.

From the above it would appear that for new pipe, the line was not intended to flow at the rate of 1,500,000 gallons per day, and not even at a 1,300,000-gallon rate, and hold a head of 42 feet for delivery to the higher levels, as this latter figure was its total capacity under the conditions when new, with nothing to fall back upon for peak supply. The demand upon it, however, from the beginning was for more water than it could handle at peak. That is, when the industries were taking at the rate of 900,000 gallons and the low levels of the town were taking all they could get, there was nothing in the way of head left to supply the higher districts.

Boosters Used to Improve Pressure

Under these conditions, the community struggled along for nine years, when it became evident that even what pressure they had in the beginning was perceptably diminishing. At this time they put in a small electric-driven booster pump on one of their mains to lift the water to the high consumers. This arrangement gave indifferent satisfaction for five years, when again they could not get service even with the aid of their booster, and in 1917, six years later, they installed a much larger electric-driven booster direct on the twelve-inch main, at a point in the town and also just outside their branches. This latter pump gave sufficient additional pressure, and the supply, when this new pump is running, is fairly satisfactory. The cost of operating this booster was so great, however, that the town authorities used it only at stated intervals during the twenty-four hours. Now, during the periods in which the new pump was shut down, the supply was so limited and the pressure so low over large sections, that an investigation was started to find out why a twelve-inch line, that in the beginning could supply some water, could not supply any to the unfortunate higher levels.

Investigation proves Uniform Loss of Head System due to Abnormal Friction

It looked at first as though there must be serious leakages that were not visible. The pressure had dropped at the 12,000-foot mark to 38 pounds, when the main was flowing at the rate of only 600,000 gallons per day, or with a loss in head of 34.5 feet as against a theoretical loss of 11 feet for new pipe. Leakage was disproved by careful comparison of meters at the pumping station and at the delivery end. Pressure readings were taken at intervals throughout from reservoir to the end of the 12,000 feet, followed by pitotmeter readings, all of which established the fact that the drop was uniform throughout, and about three times greater than that given for new pipe. The pitotmeter velocity curves, indicated an abnormal skin resistance, in one instance the tube showing actually a reverse direction of flow for an outside reading, with a centre velocity of about 3.4 feet per second. The town engineer, made a special caliper for the purpose of testing diameters and feeling for roughness. A small packing gland was screwed into the usual service cock and through this he passed a steel rod about 3/16 inch in diameter. With this rod he could measure the inside diameter accurately, and also feel for tubercules or growth. He found that the inside

diameter did not average ¼ inch less than the diameter of new pipe, but he could feel blisters or so called tubercules through which his calipers could be crushed. The reverse direction of flow indicated by the pitotmeter was at a point ⅛ inch from the top side and can only be accounted for as a swirl or eddy of water behind a small projection on the skin of the cast iron, possibly a blister or tubercule, just as can be seen in any stream where a rock or projection on the bank causes a swirl or back wash.

Length of time in service	Rate of flow. gallons per day	Actual head lost	Calculated rate of flow for actual head lost. Kutter with N. 013	Actual coef. of roughness as applicable to Kutter formula	New pipe would flow under same loss. D'Arcy & Kutter .011
19 yrs.	600,000	34.5	960,000	.017 — .018 C — 59	1,232,000
19 yrs.	880,000	48.5	1,142,000	.017 — .018 C — 59.5	1,452,000
19 yrs.	1,100,000	78.5	1,446,000	.017 C — 60.1	1,857,000

The accompanying tabulated losses in head for certain quantities passing in the pipe also shows the calculated flow by Kutters formula, using a coefficient of roughness of .013. This coefficient is classified by Kutter, Jackson and Herring as follows: "For ashlar, well laid brickwork, earthen and stoneware pipe, not new, cement pipe not well jointed, nor in perfect order; plaster, planed wood in inferior condition, metal pipe, not new." There is also shown the quantity that should flow in new pipe with the actual drop in head as measured for the actual flow, and in addition the actual coefficient of roughness as applicable to Kutter's formula. This coefficient is .017 — .018, and is classified by Jackson, Herring and others as follows: "Brickwork, ashlar, stoneware in poor condition, tuberculated iron pipe, rubble in cement or plaster, fine gravel ⅓ to ⅔ in diameter rammed, and generally the material mentioned in the classification for .013 when in bad order and condition."

In looking over the little hand book of tables published in 1886 by P. F. Flynn, who is also the author of a treatise on hydraulics, there can be found set forth most concisely, tables giving values for $C\sqrt{r}$ for velocity and $A.C.\sqrt{r}$ for quantity, for all sizes of pipe, also tables giving the square root of all slopes. This little book is very handy and calculations for quantities, velocity, size of pipes, etc., can be readily found and with a minimum of effort. Possibly these tables of Flynn's have been in very general use, and yet, his tables are only good for coefficients of roughness up to .013.

The inference is that at that time it was considered unnecessary and unusual to use a higher coefficient in designing for the usual periods of service life. It is true that in many places mains that have been in service twenty years or more, are cleaned, but for a small community this is an expensive process varying from sixteen to eighty cents per foot of pipe cleaned, depending on the size of pipe and the lengths that can be worked without cutting. It is also uncertain even to-day, what the exact value of cleaning is, — the degree of permanancy is variable, a newly cleaned pipe may have a capacity of 96 per cent of that of new pipe and deteriorate to 65 per cent within a very short period of time, the rapid deterioration is attributed to the scoring or abrading action of the spring steel scrapers on the coated inner surface, causing a rapid accumulation of rust, and tuberculation.

Effect of Different Qualities of Water in Pipe Lines

Any discussion on the friction losses in pipe lines and the causes thereof is incomplete without some reference to the different effects of different qualities of water that can be observed. It is essential to distinguish between deposits on the internal surface of the pipe and its actual corrosion. There is as much variety in the form the deposits take as there is in the manner in which they originate. Some are formed as modules or limpets which readily leave the coating without damage to it and others are like miniature mountain ranges. Some nodules often are in actual contact with the metal through a perforation in the coating. Electrolytic action is corrosive and affects the exterior as well as the interior. The deposits from raw moorland or river water are caused by a species of bacteria which flourish in the early months of the year when organic matter is excessive. As long as the organic condition of the water favours this growth, they multiply in myriads.

It might be expected that filtered water would cause less trouble than unfiltered, but this has not yet been proven. The presence of acids, carbonic acid particularly, liberated by organisms present in the water, free oxygen and alkalies cause the formation of nodules. Both salts and acids in solution are responsible for nodules of incrustation. In general, soft waters being more commonly acid will cause corrosive action more readily than hard waters; therefore surface waters which are softer than ground waters can be expected to give more trouble. The latter remarks are the result of various superficial readings of pamphlets and such, and are not to be taken as an indication of a deep seated knowledge on the part of the writer.

In contradiction of some of the above statements, it can be said that while the water passing through the 12-inch main, referred to in this paper, can be classified as ground or spring water, it has given evidence of having a serious and vicious effect on cast iron pipe. In contradistinction to this, the water used by the Dominion Iron and Steel plant, having its origin in the Upper Sydney river, and being largely surface drainage from the surrounding watershed, can be classified as surface water; yet we are informed that the main carrying this supply for the past twenty years still works out to very nearly its original capacity, showing little signs of tuberculation or decrease in diameter. It seems, therefore, that the wiser thing to do in every case would be to obtain firsthand information, if possible, of the action of any water upon existing pipes and treat such information and data, if obtainable, as of prime importance in designing.

In conclusion, it will be noted that no suggestions have been offered as to what, in the writer's opinion, might be better practice in designing for a given requirement, but rather as mentioned in the beginning, that the engineer give due appreciation and thought to the many other phases of design that should receive equal considera tion with the mere question of flow as set forth by the various formulae and tables.

The Cost of Industrial Power

A Comparison of the Cost of Steam and Electric Power in Industry, with a discussion of Operating Features of the Latter.

J. A. Burnett, M.E.I.C.
Consulting Electrical Engineer

Paper read before the Montreal Branch, The Engineering Institute of Canada, November 23rd 1922.

The district of Montreal is a large and important one, with a population approximating 900,000, and the consumption of electric power in this district approximates eight hundred million kilowatt-hours per annum. The per capita consumption of electric power is therefore about 880 kilowatt-hours per annum. Of this large amount, better than ninety-nine per cent is hydro-electric power furnished by the public utilities. It may here be stated that the cost of power represents about five per cent of the value added or created in manufacturing process. Wages, (exclusive of clerks or salaried help), represents about twenty per cent.

Steam Power

In this district are installed some 270,000 h.p. of steam boilers; about fifty per cent are low pressure for heating, and fifty per cent are rated at 100 pounds or over. The latter are used for production, mainly in sugar refineries, abattoirs, manufacture of rubber, cordage, linoleum, wall paper, gramophone records, sash and doors, paint and varnish, and laundries. The rolling mills use steam as a waste heat proposition, the billet furnaces producing enough heat to operate vertical boilers, which in turn deliver steam to the roll engines. There is not enough steam produced, however, to serve other parts of the plant and a block of electric power is therefore required. All these users of steam, use electric power in varying quantities, except for actual production.

Almost all users of purchased electric power use steam for heating and production; in this connection, it may be stated that the public utilities are anxious to procure consumers who need steam in production and who could use electricity during the summer season — special rates are available for this.

Cost of Steam Power

The cost of steam coal delivered may be taken at:—

Birdseye anthracite, No. 2 and No. 3 Buckwheat, carloads lots on siding	net ton	$4.86
Dominion, run of mine, (but actually slack) delivered at Windmill Pt. dock	gross ton	6.90
city cartage	gross ton	1.25
Large users, on dock	gross ton	6.00
Pennsylvania, run of mine, on cars	gross ton	8.05

Naturally, large consumers of coal are located near harbour or canal, and so derive an added advantage in price.

The cost of steam power is very variable. In the case of a manufacturing plant using steam as a prime mover, the installation of a slow speed engine is essential. This permits of belting to main countershaft and drives to various floors. It is obvious that the steam turbine cannot readily be belted, and is therefore, generally used jor direct connection to electric generators, centrifugal pumps and blowers. In the event of the turbo-generators being installed and power being distributed electrically to various departments, it will be found that the capital outlay will be prohibitive as compared with purchased electric power.

500-H-P Steam Plant

The cost of steam power in this district may be taken thus:—

Capital outlay for boilers, steam mains, engine and main drive, buildings and chimney, also engineering	$78,000.00
Annual costs	
(Fixed charges)	
Interest and depreciation, 12 per cent	9,360.00
(Operating charges)	
Coal for production, 821,000 kw.hrs per annum or load factor of 0.25 and evaporation of 9 lbs., water, rate of 30 lbs. per kw.hr., coal at $6.50 per ton	7,950.00
Taxes, insurance, labour, oil, water, supplies and removal ashes	9,000.00
Total annual cost	$26,310.00
Cost per kw.hr.	$ 0.032

A conservative estimate places the number of isolated steam plants, shut down and replaced by hydro-electric power, during the last decade, as close to three hundred. It is manifest, therefore, that unless a quantity of live steam is used for production, thus reducing the proportion of overhead charges, the use of steam power in this district may be considered as being very expensive, even under the most efficient and economical of plant operations.

As compared with the purchase of electric power, steam power has the following disadvantages:—

1—Large capital outlay on part of consumer; the cost for an installation of 500 h.p. in electric motors may be set at $12,000, as compared with the preceding figure of $78,000 for steam plant.
2—Liability to damages due to smoke nuisance.
3—Obligation to buy coal from week to week at fluctuating prices.
4—Necessity for use of condensing water, thus locating plant near canal or river. Condensing towers or ponds are not of much practical use in this climate owing to heavy cost and maintenance.
5—Increased fire hazard.
6—Plant subject to interference by labour unions.
7—No flexibility in use of power. With steam plant the machine is brought to the power and the opposite with electric power.
8—Large space and buildings required.

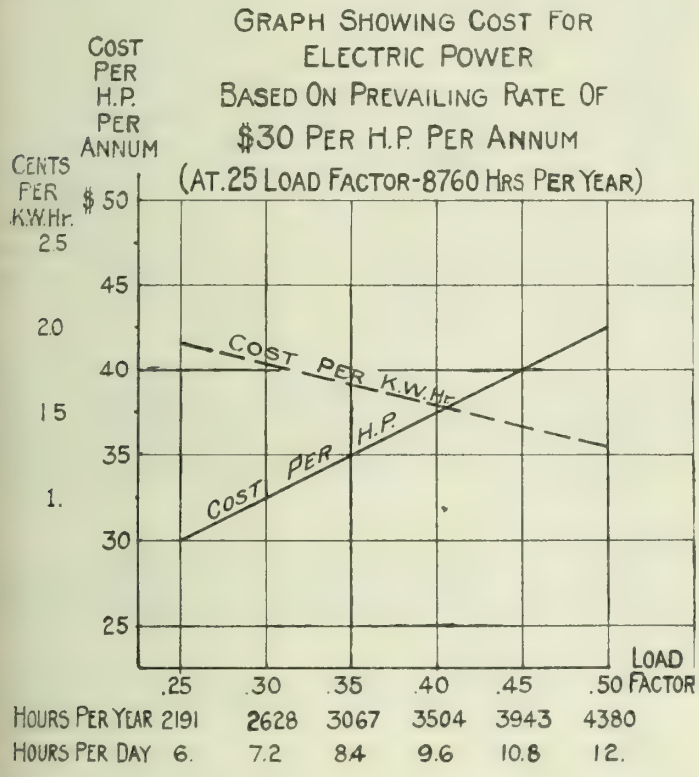
Electric Power

The following may be cited as natural users of electric power:—

Productive: aerated waters, bakeries, breweries, bag manufacturing, blouse factories, boot and shoe manufacturing, flour mills, leather and locomotive manufacturing, machine shops, newspresses, paper box manufacturing, printing establishments, stone quarries and crushing, textile, cotton, tinware and tobacco manufacturing.

Non-productive: passenger and freight elevators, pumping water, refrigeration, and street lighting.

With the conditions as outlined in the preceding, let us analyze the cost for electric power at prevailing rates. The rate in vogue in Montreal is composed of two elements; a fixed charge based on maximum demand, generally $12.00 per h.p. per annum, and in addition, a sliding scale meter rate which varies with the load factor of the plant; the combination of the two elements of the rate produce the net cost per horse power per annum of approximately $30. for a consumer using power ten hours per day or between 7 a.m. and 6 p.m., and for a consumer who uses power twenty-four hours per day the net cost is worked out at approximately $35. per horse power per annum.



Take then, 500 horse power at $30. or $15,000. per year or $1,250. per month. Then on a basis of 25 per cent load factor, the yearly kilowatt-hour consumption is 821,000 kilowatt-hours, which equals $0.0183 (1.83 cent) per kw.hr.

Electric power therefore costs only 55 per cent of the cost of steam. An increase of load factor produces a lower cost per kw.hr., (see figure No. 1). A cost of as low as $0.006 (0.6 cent) per kw.hr., may be attained with a load factor of .80 or upwards.

Reliability of Electric Power

On the score of reliability electric power makes a fine showing and in this connection it is worthy of note that this district has unrivalled hydro-electric facilities, being served from the following sources:—

Year developed		Capacity	Distance in miles
1898	Chambly plant	20,000 h.p.	16
1899	Lachine plant	12,000 h.p.	5
1900	Shawinigan plant	200,000 h.p.	88
1907	Soulanges plant	12,000 h.p.	20
1908	St. Timothee plant	25,000 h.p.	24
1912	Shawinigan plant (Laurentide)	180,000 h.p.	88
1915	Cedar Rapids plant	180,000 h.p.	22
	Total	629,000 h.p.	

To insure the most reliable and continuous service possible these water-power plants are all interconnected by modern high tension transmission circuits. Supplementary to its water-power developments the public utilities maintain steam reserve plants of most modern design, in Montreal, having a capacity of about 25,000 horse power, with room for additional installation of the same size.

Operating Features

Having thus in a general way demonstrated the advantages of electric power, let us now discuss the various features in detail. About 2 per cent only, of the connected load is direct current, 220 volts, and about 98 per cent of the connected load is a. c., 550-volt, 2,200-volt, or 11,000-volt, all three-phase, 60-cycle.

Direct Current Power

The use of direct current is confined to the central district with an area of two square miles, and includes passenger elevators and printing press loads, also ventilating systems for hotels, etc., demanding a variable speed. The cost of the direct current service is about 20 per cent more than the 550-volt a.c., service, and the disadvantages are: — (a) Increased capital cost for motors and slightly increase maintenance. (In this connection it is the opinion of the writer that the d.c. motor makes a surprisingly good showing owing to the moderate voltage employed). (b) Difficulty in locating grounds in the motors or wiring. This is especially the case in elevator motors, which are so designed as to be rather inaccessible as regards field coils and armatures. Naturally a ground on a d.c., system is more serious than on an a.c., system, the latter being more or less sectionalized due to the transformer insulation. (c) Limited area of the city served.

Alternating Current Power

The use of alternating current power is well nigh universal, due to the economy of transmission and to the ruggedness of the induction motor. With the exception of certain machine tools which require strictly adjustable speeds throughout a wide range, and in such applications as cranes, elevators, small hoists, etc., for which variable speed motors are usually demanded, the great majority of industrial applications are successfully met with a constant speed motor. The many excellent characteristics of the induction motor together with the unquestioned advantages of a.c. systems of distribution have led to its general adoption even in many instances where, from the standpoint of speed control alone, a d.c. motor with shunt field control would have been preferable.

(*This paper will be continued in the April issue of The Engineering Journal*).

THE
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Institute Year Book-1923

The Year Book of *The Institute* is now in the course of preparation and it is of the utmost importance that the listing for each member be complete and accurate. It is therefore desirious that every member whose place of residence or official position has been recently changed, should notify the Secretary as soon as possible.

Institute's Relations with Professional Associations

When *The Engineering Institute*, on account of the general feeling on the part of the members that the results would be beneficial, originally sponsored legislation for engineers by drawing up a model act and then passed the result to the engineers in the various provinces for attention, whether members of *The Institute* or not, it was definitely intended and so stated in the original draft, that the various associations formed should function only for the purpose of registering engineers in the province in which the act might be passed.

Since that time professional associations have been created in every province but one, and some of the provincial associations have established themselves on a sound substantial basis. In view of the fact that there is a tendency on the part of some of the members of the associations to depart from the original intention of their formation, and to endeavour to have the associations function in a manner not originally intended and not necessary, the situation as to the relations of *The Institute* to the various professional associations is being given consideration. Members in the west, who are officers of *The Institute* and of the provincial bodies, have pointed out to Council that a definite understanding should be reached in this connection. After considerable review of the situation at the last meeting of Council, the following resolution was unanimously adopted:—

> Whereas it is the opinion of the Council of *The Engineering Institute of Canada* that all technical matters in connection with engineering should be the function of *The Engineering Institute of Canada*, and that the various corporations and associations of professional engineers in the different provinces are, or should be, designed solely for the purpose of administrating the provincial laws in connection with legislation.

Be it resolved:—

> That the Council of *The Engineering Institute of Canada* go on record as approving of the above principle and that all possible steps be taken towards the adoption of this principle.

Be it further resolved:—

> That the Secretary be instructed to write the various provincial bodies calling their attention to this resolution and asking their co-operation to that end.

Also be it resolved:—

> That the Council of *The Engineering Institute of Canada* suggest to each of the various provincial bodies that they send one or more representatives to a meeting for the purpose of discussing the relations of those bodies to *The Engineering Institute of Canada*, to the end that finally an act may be enacted similar in principle to the Roddick Medical Bill.

A letter has been written to the secretaries of the provincial associations calling attention to the resolution of Council and requesting its consideration by the various executives.

No greater loyalty to *The Institute* exists anywhere than in the west where this question is a matter of concern, and it is anticipated that there will be no difficulty in arriving at a clear definite understanding regarding the relations of *The Institute* to the professional associations, as the functions of the two bodies are entirely distinct and different, and not only should not compete at any point but should co-operate in every way to the mutual advantage of the profession.

Publicity

The report of the Publicity Committee of *The Institute*, presented at the annual meeting and referred to the Council for action, represents an important departure in the affairs of *The Institute*, recognizing officially, as it does, the important bearing that publicity has, and may have upon the standing of the profession and upon its future. This report, as published on page sixty-four of the February *Journal*, apart from its general interest, is further noteworthy because of the constructive suggestions made therein.

This report was dealt with by Council in two sections. First, those suggestions which could better be carried out by the Council of *The Institute* — in four paragraphs as follows:—

In the preparation of biographical sketches of the pioneer engineers of Canada, already approved by Council, the authors keep constantly in the foreground the vital importance of the results of the work done by these men towards the development of Canada.

Articles on the engineer's place in industrial and material progress, based on engineering works accomplished, making the importance of the engineer a prominent feature.

By encouraging the members to make use of their *Institute* title on every possible occasion, and to insist that it appear after their names in all published articles and in letters to the press, and encourage its use wherever the name of a corporate member appears in print.

In securing a proper valuation of the everyday practical work of the engineer in bettering the economic and physical conditions of life.

At the annual meeting at which the Publicity Committee's report was presented, there was also presented the report of the Committee on Biographies, showing that the first suggestion of the committee was already well in hand. Members will no doubt be glad to assist the Committee on Biographies in the work they have undertaken.

The second, third and fourth paragraphs of the Publicity Committee's suggestions have been referred to a committee of the Council consisting of Messrs. George D. Macdougall, M.E.I.C., Walter M. Scott, M.E.I.C., George T. Clark, A.M.E.I.C., Sam. G. Porter. M.E.I.C., and the Secretary, with the suggestion that they crystallize these suggestions and suggest practical methods of putting them into effect.

The Publicity Committee's recommendations directly affecting the branches are:—

A committee in every branch whose function shall be to make certain that the local press is supplied with an account of every meeting and who shall provide the press with a popular abstract of all papers read, and a summary of all addresses delivered.

The holding of meetings to which the public is invited, the subject being such as to inspire those present with a better appreciation of the engineer's value.

Taking an active constructive part in helping to solve the problems of the community in which the branch is located.

Having a definite object of the branch to become a leading influence in its municipality's progress.

By encouraging and assisting the members to accept and secure offices in the public bodies of the branch's community.

Providing speakers, as opportunity offers to present before local organizations, such as Rotary and Kiwanis Clubs, addresses on engineering subjects, the interest in which could be used to greater advantage; these addresses to emphasize the practical side of engineering, and the necessity of the employment of only recognized engineers.

A constant striving for recognition of the word ENGINEER as being applicable to professional engineers only and that engine operators or drivers be known as enginemen.

A number of the branches have had these ideals before them, and have, from time to time, as opportunity afforded, put them into effect. It is now intended, and the definite recommendation has gone from the Council to the branches, that every branch take these suggestions as part of their constant policy, in order that the practice may become universal as a means whereby the branches can better promote the interests of the profession, increase their standing as an organization in the community, and assist every member in the branch to be better appreciated by those not in the profession.

Plummer Medal

The announcement of the award of the Plummer Medal for the year nineteen twenty-one to nineteen twenty-two was received from the medal committee at the last meeting of Council and approved.

The winners of the medal are Nelson W. Smith, M.E.I.C., and Doctor J. W. Shipley, for their joint papers, "The Self Corrosion of Cast Iron and other Metals in Alkaline Soils", October Journal, nineteen twenty-one, page five hundred and twenty-seven, and "The Self Corrosion of Buried Lead Pipes", June Journal, nineteen twenty-two, part one, page two hundred and ninety-two, and July Journal, nineteen twenty-two, part two, page three hundred and fifty-nine.

Arrangements will be made to have these medals presented at a meeting of the Winnipeg branch.

THIS MONTH'S CONTRIBUTORS

Abnormal Friction Losses in a 12-inch Water Main

In a paper read before the Cape Breton Branch on December 12th, 1922, James G. H. Purves, M.E.I.C., has emphasized certain considerations of abnormal friction losses, which his experience has proved, must be taken into account in the design of water-supply pipe lines.

Mr. Purves is a native of Nova Scotia, having been born at North Sydney in 1872. He graduated in Applied Science from McGill University with the class of 1892, having received his earlier education at Upper College, Toronto. His first engineering work included railway location for various railways in the mining district of Cape Breton. From 1894 to 1896 he was manager of the International Colliery, and the following two years he was engaged in gold mining operations in Guysboro county, N.S. From that date his work with the Nova Scotia Steel and Coal Company has included preliminary surveys and construction of pier and haulage-way at Wabana, charge of mine construction at Sydney Mines, railway location of the St. Peters Railway, and since 1909 he has been in charge of all civil and construction engineering work for the company at Sydney Mines.

Low Grade Ores of Algoma

The necessity for the conservation of our iron ore resources and particularly the development of the low grade ores has been treated in a most authoritative manner by J. D. Jones, M.E.I.C., in his paper presented

before the Sault Ste. Marie Branch on December 22nd, 1922.

Mr. Jones has been general manager of The Algoma Steel Corporation since 1920. He was born at Castle Shannon, Pennsylvania, in 1881 and received his education at Pittsburgh, Academy. From 1907 to 1910 he was designing engineer with the Minnesota Steel Company at Duluth and the following two years was engineer with M. H. Treadwell Company on work in Illinois. In 1912 he joined the staff of the Algoma Steel Corporation as assistant chief engineer and was appointed chief engineer in 1914, resigning to accept the position of chief engineer of the Illinois Steel Company at Gary, Indiana, in 1916, Mr. Jones returned to the Algoma Steel Corporation as general superintendent in 1919 and the following year was appointed general manager.

Railway Electrification

A paper of considerable current interest entitled "Railway Electrification", was presented before the Montreal Branch on January eighteenth, by Arthur L. Mudge, A.M.E.I.C., consulting engineer associated with Kerry and Chace, Limited, of Toronto. This paper is a compilation of notes taken by Mr. Mudge, during a recent inspection trip over the Chicago, Milwaukee and St. Paul railway.

Mr. Mudge was born at Montreal, and was educated at the Montreal High School, graduating from McGill University in 1894 in mechanical engineering and the following year in electrical engineering. Subsequently Mr. Mudge spent some years in Canada and the United States, engaged in electrical testing, construction and estimating, and from 1899 to 1901 was electrical engineer to the Grand Trunk Railway, with headquarters at Montreal. In 1908 he joined the staff of the consulting engineering firm of Smith, Kerry and Chace, of Toronto and has for the past fifteen years devoted his attention mainly to water-power development and industrial electrical engineering. During this time he has acted as chief electrical engineer on such work as the following:—

The series of water power developments on the Trent river with several hundred miles of high voltage transmission line and a number of substations for supplying central Ontario with power.

Calgary Power Company 20,000 h.p., development at Horseshoe Falls.

Matabitchouan plant in Northern Ontario, 10,000 h.p., for the operation of mines at Cobalt and Kirkland Lake.

Calabogie Light and Power Company, 6,000 h.p. development on the Madawaska River.

Mr. Mudge has devoted considerable attention to the layout of electric power and lighting systems for factories and the improvement of existing systems in order to increase production, raise power factor and generally improve the efficiency and reliability of the power systems. In 1922, with S. B. Clement, M.E.I.C., and J. G. G. Kerry, M.E.I.C., he prepared a report on the electrification of the Temiskaming and Northern Ontario Railway and the development of water powers for supply of necessary power for same.

In connection with the Toronto Branch of *The Institute*, Mr. Mudge has been on the executive committee, and for several years acted as chairman of the library committee. Mr. Mudge, has also been chairman of the Toronto section of the American Institute of Electrical Engineers, and first vice-president of the Canadian Electrical Association.

The Cost of Industrial Power

Some interesting figures comparing the cost of steam power with that of electric power for industrial purposes have been presented in a paper entitled, "The Cost of Industrial Power", read before the Montreal branch by J. A. Burnett, M.E.I.C., on November 23rd, 1922. The author has treated the subject of industrial power cost in a very comprehensive manner, dealing with the comparison between steam and electric cost and giving various features of operation including a discussion of the effect of power factor.

Mr. Burnett was born in Montreal in 1973, and was educated at Fettes College School, Montreal. His first engineering work was with the Royal Electric Company, as draughtsman, from 1893 to 1897, and since that time he has constantly followed the electrical branch of the profession. In 1902 he was engaged in the construction of the Wellington Street sub-station for the Montreal Light, Heat and Power Company, and from 1908 to 1910 his work was in the construction of the Montreal and Southern Counties Railway. Later he installed the electrical equipment on the black Rock (Buffalo) swing bridge span, and for two years was engaged in the appraisal of all electrical equipment on the Grand Trunk Railway system in connection with the government arbitration in 1920-21. Mr. Burnett is now a consulting engineer, with offices at 211 McGill street, Montreal.

OBITUARIES

Lieutenant Colonel J. A. Hesketh, M.E.I.C.

Regret is expressed at the death of Lieutenant-Colonel J. A. Hesketh, C.M.G., D.S.O., M.E.I.C., which occurred at Winnipeg, on January 26th, 1923.

The late Colonel Hesketh was born in Aldershott, England on November 20th, 1863 and was the son of the late James Hesketh, who was a veteran of the Crimean war. From 1879 to 1882 he attended the Royal Military College, Kingston, Ontario, and on the completion of his course received his military qualification certificate. In civil life Colonel Hesketh was engaged almost continuously on railway engineering work. and was assistant engineer for the Canadian Pacific Railway at Winnipeg, Manitoba at the time of his death. His military service included the Northwest Rebellion in 1885, in which he served as Lieutenant in the 7th Fusiliers, and five years during the recent war, four of which were spent in France. During the late war he served first as Major and was later promoted to Lieutenant-Colonel, and for distinguished services was mentioned in despatches and awarded the D.S.O.

Colonel Hesketh has always been a very active member of *The Engineering Institute*, having been admitted as an Associate Member in 1893 and transferred to full membership in 1907.

W. Irving Young, A.M.E.I.C.

Word has been received of the death of W. Irving Young, A.M.E.I.C., at the home of his parents, at Brockway, York County, N.B., on February 12th, 1923.

The late Mr. Young was born at Brockway in 1882, and was educated at Fredericton High School, and the University of New Brunswick from which he received his degree of bachelor of science in 1910. For the past twelve years he was engaged in engineering and construction work in the province of New Brunswick. During the construction of the St. John and Quebec Railway he was for three and a half years instrumentman on preliminary work and from 1916 to 1919 he was resident engineer on construction. Following this Mr. Young was engaged in general contracting on highways and public works in the province of New Brunswick until he joined the staff of the New Brunswick Electric Power Commission in 1921. While with the commission Mr. Young was in charge of the erection of the power transmission line from the Nepisiquit to the Miramichi and later on the construction of the St. John-Moncton line. His membership in *The Engineering Institute of Canada* dates from September 23rd, 1919 when he was elected associate member.

The late Mr. Young is survived by his wife, who was Miss Kilburn of Kingsclear, and two children and by his parents and one sister.

George Dickson Addison, A.M.E.I.C.

The death of George Dickson Addison, A.M.E.I.C., in his forty-third year, at New Westminster on Thursday, November 30th, of pneumonia is reported with deep regret. Mr. Addison came from the Caledonia Railway Company of Scotland to the Canadian Northern Railway Company in 1905, and served this company in the capacities of draughtsman and chief draughtsman for fifteen years. In 1920, he was appointed to the position of chief draughtsman, in the chief engineer's office, Vancouver Harbour Commissioners, which position he occupied at the time of his death. Mr. Addison is survived by his wife and three children.

* * *

Prevention of "Dry Rot" in Buildings

The Forest Products Laboratories of Canada have made careful investigations in more than three hundred mills, factories, and other buildings in Canada and the United States in connection with the occurrence and prevention of "dry rot" and similar forms of decay in interior structural timber. Recommendations can be made as to the construction and maintenance of buildings with a view to securing immunity from decay. In buildings already constructed where decay has appeared, effective remedial measures can often be prescribed. The wide experience gained in such matters is placed at the disposal of engineers, architects, mill-owners, and others. A careful consideration of each individual case is offered, and not merely printed information of a general character. Inquiries should be directed to the Superintendent of the Forest Products Laboratories, 700 University St., Montreal, Quebec.

PERSONALS

Goria Lynch, A.M.E.I.C., is with the department of public highways of the province of Ontario at Durham, having been transferred from Westport, Ont.

John Paris, A.M.E.I.C., of Whitelake, Ontario is resident engineer on the Temiskaming and Northern Ontario Railway, with headquarters at Cochrane, Ont.

Major C. R. Crysdale, M.E.I.C., has returned from Gold Coast Harbours, Seccondee, British West Africa, and is again located in Vancouver, B.C.

C. G. J. Luck, A.M.E.I.C., is resident engineer with the Canadian Pacific Railway on construction of the Interprovincial and James Bay Railway.

W. M. Scott, M.E.I.C., chairman of the Greater Winnipeg Water District, is giving special lectures in connection with the municipal engineering course at the University of Manitoba.

Christopher E. Webb, A.M.E.I.C., of the Dominion Water Power Branch, Vancouver, is making rapid recovery from an operation for appendicitis, which he underwent on Saturday, January 27th.

C. C. Worsfold, M.E.I.C., district engineer, Department of Public Works of Canada, New Westminster, B.C. was in Ottawa for a few days consulting officials of the Department on departmental business.

John Wightman, S.E.I.C., of Digby, N.S. is on the engineering staff of the Consolidated Mining and Smelting Company at Kimberley, B.C., where he has been engaged on the construction of the Sullivan mill, since graduating last spring from McGill University.

R. L. Fairbanks, A.M.E.I.C., has been transferred to the Toronto office of the Canadian National Railways. Mr. Fairbanks was formerly located at Quebec, and has been engaged on railway location, maintenance and construction for the past seventeen years.

J. Alexander Walker, A.M.E.I.C., who had the misfortune to suffer a severe sunstroke while engaged on survey work in the interior of B.C., during the heat of last summer, has been convalescing at his home in Vancouver for the past six months. His friends will learn with pleasure, that he is now able to resume his professional work.

Dr. W. Bell Dawson, M.E.I.C., superintendent of tidal surveys will adrress the Royal Astronomical Society of Canada on March 13th on "The Influence of the Sun and Moon on the Ocean." On March 27th an address on "Myths of the Stars" will be given by C. R. Coutlee, C.E., M.E.I.C., of the Department of Public Works.

E. G. Ryley, A.M.E.I.C., for the last three years, branch manager and engineer for the Trussed Concrete Steel Company of Canada, Limited, at Calgary, has been appointed manager of the Toronto branch. Mr. Ryley received his degree of B.Sc., in civil engineering from McGill University in 1914, and since graduating has been associated with the above company in various capacities.

C. E. W. Dodwell, Hon.M.E.I.C., district engineer, Department of Public Works, Halifax, N.S. and J. E. St. Laurent, M.E.I.C., district engineer, Department of

Public Works, Winnipeg, Man., have been in Ottawa consulting with Arthur St. Laurent, M.E.I.C., chief engineer of the Department of Public Works, on departmental matters.

K. N. Cumming, Jr.E.I.C., has been appointed engineer in charge of the Marion, Mass. Trans-Atlantic station of the Radio Corporation of America. Mr. Cumming has devoted the past seven years, since graduating from the University of Toronto, to wireless work and has been in turn assistant to the engineer in charge, and assistant engineer, on the installation of the company's Marion station.

H. Alton Wilson, A.M.E.I.C., is senior partner of the firm of Wilson and Smith, Belleville, Ontario, recently organized to take over the operation of the J. C. Wilson Manufacturing Company. Mr. Wilson was for many years engineer for the latter company. The new firm will continue to manufacture water turbines, and will specialize in large gears and other power transmission machinery.

T. A. S. Munford, A.M.E.I.C., of Toronto, is inspector for J. N. Moore and Company, architects of London, Ontario, on the new Western University buildings now under construction in that city. Mr. Munford was born at Crewkerne, Somerset, England, and received his early education in the Old Country. Since coming to Canada he has been on the staff of the Canadian Pacific Railway Company on various works, except during the period of his overseas service from 1914 to 1919.

M. J. Rutledge, A.M.E.I.C., has been appointed town manager of Woodstock, N.B. Mr. Rutledge graduated from the University of New Brunswick in 1908 with the degree of B.Sc., and has been connected with various engineering works in the United States and Canada. During 1917 and 1918 he held the position of chief draughtsman on the construction of the Mount Royal Tunnel, Montreal, and has lately been with Henry Holgate, M.E.I.C., consulting engineer, Montreal.

H. A. Brazier, M.E.I.C., has resigned as city engineer of London, Ontario, to enter into partnership with W. J. Boss, under the firm name of Boss and Brazier Construction Company. Mr. Brazier graduated from the Manchester College of Technology in 1908 and after coming to Canada in 1911, he has been connected with the department of railways and bridges, city engineer's department, city of Toronto, as engineering assistant. He later accepted the position of assistant city engineer of London and was appointed city engineer in December 1914.

G. W. Craig, M.E.I.C., city engineer of Calgary, and A. I. Payne, M.E.I.C., representing the Alberta board of public utilities, have been engaged in the actual work of investigation into the desirability of rebonding certain utilities, whose probable life exceeds the life of the original bond issues, recently undertaken by the city of Calgary. Their joint report was presented to the board and on perusal, Mr. Justice A. A. Carpenter, of the board, gave high praise to them, stating that the report was accurate, complete and very impartial.

Alex. Larivière, A.M.E.I.C., of Quebec, has been appointed chief engineer of the Quebec Service Commission. Mr. Larivière is a graduate of Ecole Polytechnique Montreal, from which he received his degree of B.Sc. and C.E. in 1913, and E.E. in 1916. Immediately following graduation Mr. Larivière was engaged on highway engineering for the roads department of the province of Quebec, and for a short period on highway contracting. On the completion of his post-graduate course in 1916 in electrical engineering, he joined the staff of the Quebec Public Utilities Commission as electrical and road engineer.

H. L. Seymour, A.M.E.I.C., C.E., (University of Toronto), has opened an office in the Excelsior Life building, Toronto, for the practice of town planning, municipal developments and surveying. Mr. Seymour was until recently connected with the firm of Frank Barber and Associates, Limited, in charge of town planning and surveying. Mr. Seymour was for a number of years engaged in survey and municipal work in the province of Alberta, having reported on drainage, sewage, and waterworks for various towns and the Pigeon Lake gravity water system.

W. H. Winterrowd, A.M.E.I.C., for a number of years past, chief mechanical engineer of the Canadian Pacific Railway Company, has resigned to take over the position of assistant to the president of the Lima Locomotive Company, Incorporated, with headquarters at New York. Mr. Winterrowd joined the staff of the Canadian Pacific Railway Company in 1912 as mechanical engineer in charge of eastern lines, with headquarters at Montreal. Three years later he was promoted assistant to H. H. Vaughan, M.E.I.C., then chief mechanical engineer, and after the latter's retirement in 1918 he succeeded him as chief mechanical engineer.

D. M. Mawhinney, A.M.E.I.C., has been appointed junior engineer in charge of location for division 5, West Virginia Highway Commission with headquarters at Keyser, W.Va. Mr. Mawhinney was resident engineer on construction for the Winnipeg Selkirk and Lake Winnipeg Electric Railway, Stonewall branch, 1914 and became municipal engineer for Rockwood municipality in 1917 which position he resigned early in 1922 to take an appointment with the Minnesota highway department as resident engineer in charge of grading and paving work. Mr. Mawhinney drove through to West Virginia from Minnesota via Iowa, Illinois, Indiana, Ohio, Pennsylvania and Maryland, making the 1,400 mile trip in six days of travel. West Virginia has recently bonded for 50 million dollars for trunk highways.

S. J. Hungerford, M.E.I.C., has been appointed vice-president of the Canadian National Railways, to be in charge of operation and maintenance. Mr. Hungerford has hitherto occupied the position of vice-president and general manager of the Canadian National Railways.

Born at Bedford, Quebec, in 1872 his first railway work was as machinist apprentice with the Southeastern Railway and Canadian Pacific Railway at Farnham, Quebec. Since that date he has been with the Canadian Pacific Railway in various capacities at a number of points throughout the system until March 1910 when he joined the engineering staff of the Canadian Northern Railway, as superintendent of rolling stock with headquarters at Winnipeg. Following the organization of the Canadian National Railways, Mr. Hungerford was appointed, in November 1917, general manager of the eastern lines and the following year was chosen vice-president of the Canadian National and Canadian Government Railroads.

Honorary Member of Am. Soc. C.E.

Sir Maurice Fitzmaurice, M.E.I.C., formerly president of the Institution of Civil Engineers of Great Britain, has been elected Honorary Member of the American Society of Civil Engineers. Born in 1861, he was educated at Trinity College, Dublin, receiving his degrees of M.A., and M.E., from Dublin and LL.D. from Birmingham. After serving an apprenticeship under the late Sir Benjamin Baker, he was from 1901 to 1912 chief engineer to the London County Council, following which he served as chairman of the Admiralty Advisory Committee on Naval Works until 1918.

During the World War, in addition to holding numerous governmental positions, Sir Maurice was Lieutenant-Colonel of Engineers in the Engineer and Railway Staff Corps and on two occasions was requested by the War Office to advise on questions of drainage, in connection with the British Front in Flanders. Various consulting work upon which he has been engaged include that of the Forth bridge, questions regarding railways and docks in Canada, The Blackwell tunnel and the Nile reservoir dam at Assouan, Egypt, and naval harbours in Australia.

Sir Maurice Fitzmaurice has received various honours from the British Government as well as from the British Technical Associations. He is the author of the books, "Plate Girder Railway Bridges", "The Thames and Lea", "London County Bridges" and "Main Bridge of London" and is internationally prominent through his achievements in bridge engineering, irrigation and drainage work.

New Firm of Consulting Engineers in Winnipeg

P. Burke-Gaffney, B.E., B.Sc., A.M.E.I.C., and Captain T. W. Clarke, M.B.E., A.M.E.I.C., have established the firm of Burke-Gaffney and Clarke, consulting engineers, Winnipeg. Mr. Burke-Gaffney, who was born in Dunleary, Ireland, in January 1888, was educated at Belvedere College, Dublin, and graduated from the National University of Ireland in 1911 with the degree of B.Sc. in mathematics and geology, and in 1912 took first place with first class honours in the B.E. degree, as a result of which he was appointed assistant professor of civil engineering at University college. Coming to Canada in 1913 he was with the Canadian Pacific Railway on the construction of the Winnipeg east yards and with the straightening of the North Transcona elevator. In 1915 he was appointed bridge engineer for the provincial government, which position he held until resigning to go into partnership with Captain Clarke. Mr. Burke-Gaffney was a member of the first council of the Manitoba Association of Professional Engineers and did much toward the efficient organization of that body, and has been prominent in local Institute affairs.

Captain Clarke was born in Lurgan, Ireland, in November 1884; he was educated at Lurgan College and after serving a term of three years apprenticeship with the consulting firm of Johnson and Allan of Lurgan and Belfast, he joined the staff of S. McLelland, consulting engineer, London, England. He came to Canada in 1907, and was engineer with the Winnipeg Street Railway, and the City of Winnipeg, assistant City engineer of St. Boniface, engineer for St. Vital, and in 1915 was commissioned in the 78th battalion, and served with that battalion and the Canadian Railway Troops in France until demobilization. In 1919 he was appointed municipal engineer in Westbourne, Manitoba, which position he resigned in 1921 to join the contracting firm of Stewart and Cameron of which he was vice-president and general manager. After the appointment of James Stewart of that firm to directorship in the Canadian National Railways, the activities of the contracting firm were curtailed and Capt. Clarke has formed partnership with Mr. Burke-Gaffney for the prosecution of a general engineering practice.

Accepts International Rotary Position

Fred. W. Teele, M.Sc., M.E.I.C., chief engineer and assistant general manager of the Mexican Light and Power Company, has resigned his position in order to accept a post with International Rotary as special commissioner for rotary extension work. For the past two years he has been president of the Rotary Club of Mexico City.

FRED. W. TEELE, M. Sc., M.E.I.C.,

Born in Somerville, Mass., on December 5th, 1869, Mr. Teele was educated in the public schools and in electrical and mechanical engineering at Tufts College, graduating with the class of '91, with the degree of A.M.B., receiving his M.Sc. in 1903.

Following graduation his first experience was in power plant operation, and two years later he became erecting engineer for the Westinghouse Electric and Manufacturing Company with headquarters at Pittsburg. In 1901 he was made general manager for the Trinidad Electric Company, Port of Spain, Trinidad, and two years later was appointed general manager for the Demerara Electric Company, Georgetown, British Guiana. In 1906 he became president of the Porto Rica Railway, Light and Power Company, San Juan, acting then in a consulting capacity to other organizations. On March 21st, 1916, he was elected to membership in *The Institute*.

Since Mr. Teele's acceptance of the above position, in addition to the club he established in Mexico City, he has established clubs in Vera Cruz, Monterey and Guadalajara. It is proposed that five other clubs will be established in Mexico, and a number under his direction in Central America.

BRANCH NEWS

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

A meeting of the branch was held at the Public Library at 8 p.m. Tuesday, January 23rd, 1923, to hear an address by J. B. Carswell, A.M.E.I.C., on re-rolled steel.

Mr. Carswell's address was an argument in favour of the use of high carbon steel bars in re-inforced concrete. Twenty or thirty years ago, when re-inforced concrete came into use, mild steel bars of considerable toughness and ductility were used, similar to steel for bridges, but to-day it has been found that: — (1) No external stress can reach a single rod nor can it reach a group of rods at 100 per cent intensity; (2) the concrete has a deadening effect on the steel rods; and (3) the elastic limit of the steel becomes the governing factor. This leads to a specification for steel rods which was found to have characteristics similar to steel rails. This has lead to the development of an enormous industry. There are now nineteen mills in the business on this continent, rolling one million tons annually of old steel rails and involving an investment of $20,000,000. To get at the quality of steel in rods a study of the steel rail industry was carried out. The average life of rails was found to be about eighteen and one-half years, so that we would have to go to rails made in 1904 to find the quality of the material now being used for rods. We find that rail specifications were very rigid at that time. Rods rolled from steel rails must not be confused with those rolled from "faggot" iron, which if etched will usually indicate the presence of seams and slag. Professor W. K. Hatt, of Purdue University, conducted tests for the American Society of Testing Materials, from which their specifications were drawn up. Moving pictures were shown of the Burlington Steel Co.

Mr. Darling occupied the chair and opened the discussion. Mr. Adams asked if old rails were not liable to show signs of crystalization, but Mr. Carswell stated that there was no evidence of this from microscopic tests. Internal stresses are removed in the heating. Mr. Richardson advised having bars bent to exact shape required at the mill before shipment. The meeting closed with a hearty vote of thanks. The attendance was about fifty.

Victoria Branch

Hugh Peters, A.M.E.I.C., Secretary.

On Wednesday January 17th, an illustrated lecture was given by Major E. O. Wheeler, D.S.O., R.E., to the Victoria branch. The subject was the Mount Everest Expedition of 1921, of which expedition the lecturer was a member. He dealt chiefly with general points of interest observed en route through Thibet and traced the gradual change of scenery as the greater altitudes were reached. Finally Mount Everest and the neighbouring peaks were described with the aid of a series of magnificent pictures.

Major Wheeler avoided any reference to the physical discomforts encountered "on the roof of the world", and at the end of the lecture the questions indicated that the audience would have liked enlightenment on this point. He refused to commit himself further than to state that his own experience was that he felt no worse at an altitude of 14,000 feet than at 20,000 feet, but was of the opinion that 21,000 feet marked the limit above which a man's physical condition commenced to deteriorate whether resting or climbing. He also stated that the inner man must be well provided for, and added that should prohibition reach Thibet it would greatly reduce the likelihood of Mount Everest ever being conquered. In regard to the difficulties of cooking in these rarified atmospheres, he affirmed that he always managed to successfully fry sausages.

While moving a very hearty vote of thanks, F. G. Aldous, A.M.E.I.C., and H. M. Bigwood, A.M.E.I.C., congratulated the lecturer on the interesting and able manner in which the subject was treated and expressed the hope that if the summit of Mount Everest is ever reached that Major Wheeler would be a member of the successful expedition.

Lakehead Branch

Geo. P. Brophy, A.M.E.I.C., Secretary-Treasurer.

Since the organization of the Lakehead Branch, in September of last year, the branch has held regular meetings once every month. These meetings have been well attended and a great deal of interest taken in the business affairs of the branch, and the discussion of the various subjects presented by the speaker of each evening has been very keen.

On October 2nd, last, the regular meeting was held in the auditorium of the City Hall, Fort William. The speaker was G. H. Burbidge, M.E.I.C., and his subject was "The St. Andrews Dam, Winnipeg". Mr. Burbidge had been in charge of the construction of the dam in its latter stages, and spoke with a very full knowledge of his subject. He illustrated his lecture with diagrams, lantern slides, and a working model of the gates of the dam.

On November 7th, the meeting was held in the Port Arthur, city council chamber. The speaker for the evening was H. S. Hancock, A.M.E.I.C. Overseas, Mr. Hancock held the rank of lieutenant with a tunnelling company of the Royal Engineers, and took for his subject, "Military Tunnelling on the Western Front". His address proved very interesting, covering, as it did, various phases of tunnelling and many of his own experiences.

On December 4th, the meeting was held in Fort William, and was a straight business meeting, at which the most important subject brought up was a thorough discussion of the branch by-laws. The by-laws were adopted as originally drawn up.

On January 6th, the meeting was held in Port Arthur, the speaker being R. B. Chandler, A.M.E.I.C. Mr. Chandler's subject was "Grain Elevator Construction", and was fully illustrated by lantern slides. This subject proved of particular interest to the members at the Head of the Lakes, on account of the huge quantities of grain

that are handled here annually. Mr. Chandler is a member of the firm of C. D. Howe and Company, consulting engineers, and having had a great deal of experience in the construction of grain elevators, in Port Arthur, Saskatoon, Moose Jaw and Calgary, his address was very complete and greatly enjoyed.

On February 5th, the meeting was held in Fort William, the speaker being J. Antonisen, M.E.I.C., city engineer of Port Arthur. His subject was "Municipal Engineering and the Health of the Municipality". He treated his subject in a non-technical manner, and showed how, in many ways, the very important part the engineer plays in the life of a community, and the safe and sane building-up of a community. At this meeting, also, an informal discussion took place regarding the Ontario Association of Professional Engineers. Some misunderstanding among the members had come up regarding certain section of the act. These were cleared up, and it was the opinion of those present that it would be in the best interests of the profession to all join the association.

In December 1922, the Lakehead Branch received from the Ottawa Branch, the framed photographs of members of the Ottawa Branch, all past-presidents of *The Institute*, for which the Lakehead Branch is deeply grateful.

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

The January meeting of this branch was addressed by Professor E. O. Turner, A.M.E.I.C., professor of civil engineering at the University of New Brunswick, Fredericton, N.B., on "The advent of highway engineering as an important engineering project".

Professor Turner drew attention to the vast sums of money being expended on highway construction in North America. A large part of this expenditure was being made to satisfy the exigencies of the political situation, but in a great many cases prominent engineers had been engaged, large and efficient organizations had been built up, and rapid strides had been made in the construction of highways all over the continent. There still appeared to be, in many sections of the country, a lack of organization and control in highway construction, due to the vast army of small contractors operating, who have to learn their lessons at the expense of the engineer and the state.

Another problem is before us which is more technical. We were endeavouring to perfect a permanent pavement, but there is no such a thing, and efforts are now directed towards preserving the pavements that have been laid by regulating the traffic, especially where frost action is encountered. Experience has shown that in regions subject to frost, a flexible pavement of macadam or gravel, with regulated traffic, is preferable to a rigid cement concrete. Every highway engineer is faced with the great problem of economics. He must adopt the cheapest surface commensurate with durability. Good sound engineering judgment is necessary. The Romans had a good scheme for building roads, they raised an army, marched on some industrious neighbour, captured slaved and put them to work. The nearest approach to this method, at present in vogue, is the construction of roads by "chain gangs". Direct taxation always hurts, but it is the surest method of impressing on the average citizen that his highways are costing something.

In the future we hope for better administration of the large public funds going towards the construction of highways; better pay for the engineer who takes the responsibility of construction; more research in the field of road metals and their economic value; and lastly, a better understanding between engineer and contractor.

A vote of thanks to Professor Turner was moved by F. P. Vaughan, M.E.I.C., and seconded by G. E. Martin, A.M.E.I.C.

On the evening of Jan. 26th, the St. John branch held a very enjoyable dance and bridge when about 100 engineers and their friends participated. A feature of the evening was a radio concert transmitted from the private station of F. P. Vaughan, M.E.I.C. At the conclusion of the dancing, refreshments were served.

Visit to the University of New Brunswick at Fredericton, N.B.

An unique gathering of the St. John Branch took place on Wednesday, February 7th, when about thirty of its members went to Fredericton via C.P.R., and held a meeting in the library of the University of New Brunswick. Through the kindness of the U.N.B. Club of Fredericton, entertainment was provided for the party and about one hundred and twenty-five were present to listen to the programme Dr. C. O. Jones, chancellor of the University and E. O. Turner, A.M.E.I.C., professor of civil engineering welcomed the branch on behalf of the faculty and students.

A. G. Tapley, A.M.E.I.C., in replying to the addresses of welcome expressed his appreciation for the very cordial greetings. He was glad of the splendid representation from St. John and hoped that the innovation was a step in the right direction, and that the co-operation between our universities and practising engineers would be beneficial. He continued as follows:—

"It may be permissible for me to address a few remarks, more particularly, to the students present. To them I would say that the course of instruction which they are undergoing will form the foundation on which will be erected their professional reputations. Having so very efficient and capable instructors assures you that this foundation shall be well and truly laid.

"You will find that your period of study does not terminate with your graduation, for no matter which branch of engineering you may follow, the measure of your success will depend upon a thorough knowledge of everything pertaining to it, co-ordinated with hard work. In order to have a thorough mastery of your specialty, you will find it necessary to study incessantly, in order to keep abreast of the progress which is being made in all branches of engineering. Not only is it necessary to have a thorough knowledge of your own branch, but you must also have a good working knowledge of the other branches. Such knowledge, combined with common sense, experience and a capacity for work, will assure you of success. It is well to remember that knowledge did not spring full-armed from the brain of a god, it was slowly and painfully built up by the labour and suffering of men.

"The present generation of engineers have placed and maintained the profession on a very high plane, both in peace and war. That we have been able to attain our present standing, and to accomplish the things which we have, we owe in no small measure to our predecessors, for we inherited their work, and safeguarded ourselves by means to which they showed the path. So, too, shall you inherit from us, and we feel every assurance that you will farther advance the profession until Canadian engineers shall indisputably rank as the world's best.

"Yours, gentlemen, is a splendid heritage. While the full extent of the natural resources of this, your country, are not known, in fact

hardly guessed at, still sufficient of them have been located to rank this country as one of the most fortunate in this regard of any in the world.

"In the Republic to the south of us, industry is being carried on at a scale as never before known. Likewise they are tearing from the earth, and using up, their natural resources with a prodigality hitherto unknown. In a comparatively short time, many of their natural resources must be depleted, and their progress sharply halted. To mention one item alone, the United States, one of the largest oil producing countries in the world at the present time, is importing one and a half million barrels of oil annually. When their own natural resources are depleted, an intensive development of ours must follow.

"Yours, gentlemen, to perform your share in this development, and in so doing to greatly enhance the prestige of your country, and of your profession. When you go forth to the practice of your profession, I consider that I may safely assert that nine out of every ten executive engineers with whom you may be associated will prove to be members of **The Engineering Institute of Canada.** This very fact should impress upon you the advisability of early identifying yourselves with **The Institute.**"

Geoffrey Stead, M.E.I.C., the first engineering graduate of the U.N.B., recalled many interesting escapades of the students at the time he attended college. He had met many engineers since that time and could truthfully say that the standard of the U.N.B., graduate was high and they need not fear for the future if they lived up to the principles and practices of those who had preceded them.

G. G. Hare, M.E.I.C., city engineer of St. John, in speaking on the "Duties of the Municipal Engineer" reviewed the work of the various departments of civic activity over which the municipal engineer had considerable jurisdiction. In order to perform the duties in a thorough manner it was essential that he should have a broad engineering aducation and a knowledge of all branches of science. Consulting engineers should be employed in special cases, but it devolved upon the municipal engineer to marshal the information gathered in order to facilitate the work of the consultant. Mr. Hare then developed in detail the work involved in the providing and maintaining of an adequate water supply. He explained many of the difficulties encountered as well as the necessity for a continuous service in order to satisfy the needs of all the people.

Marine Engineering

Alexander Gray, M.E.I.C., engineer in charge of St. John harbour, spoke of the principles involved in the science of "Maritime Engineering". He said that the experience of most harbour engineers was ably expressed by an eminent English authority — "the only safe course for the engineer to pursue in designing sea works is for him to carefully investigate the locality, and having made himself familiar with the characteristics thereof, to adapt the design to the conditions and requirements of the case. The ability of the engineer is best tested by the manner in which he adapts the materials at his command, and the natural features of the site, to the particular circumstances of the case. Each place has its own definite characteristics, its peculiar defects, and its special advantages. There is no uniformity and very little similarity, therefore each case must be considered and dealt with on its own merits."

Mr. Gray dealt with the treatment of harbour conditions generally and the details required for efficient port facilities. The construction of harbour works involved almost every branch of engineering and the successful harbour engineer must have a working knowledge of all branches, must be a student, and must follow carefully investigations into the stability of various structures and the materials which he is compelled to use in his works.

Land Surveying

G. G. Murdoch, M.E.I.C., took as his subject "Land Surveying". After defining the art of surveying and explaining the difference between it and pure engineering Mr. Murdoch explained at some length the practices carried out in land surveying in New Brunswick from its earliest records. Rough surveys in the early settlements had resulted in innumerable errors and inaccuracies. These are perpetuated to this day and must remain so for all time. One of the chief functions of the successful surveyor of the present day is to re-trace these old surveys as originally made, no matter how roughly the work was done in the beginning. It is not likely that the method of laying out land, as adopted for the western provinces, will ever be used in New Brunswick, but an effort should be made to have transit lines run for important base lines instead of compass surveys at present in use.

Mr. Murdoch then described the methods used in laying out the original grants and his experiences in re-running a great many of these lines. He pointed out the necessity for locating the original marks and showed the meeting a sample of markings in spruce made in 1848 and found in good condition recently Before closing his very excellent paper, Mr.Murdoch described the methods adopted in making the recent survey of the city of St. John, and the difficulties which arose in finding the correct boundaries of lots in many cases. He described in detail the means employed to accurately measure the base lines and locate the buildings and other features.

Railway Maintenance Engineering

C. C. Kirby, M.E.I.C., district engineer for the C.P.R., read the last paper of the evening on "Railway Maintenance Engineering". He impressed on the students the necessity of maintaining transportation, for that, and that only, was the saleable article of all railway companies, and it was the duty of the maintenance engineer to provide all the facilities needed to allow the trains to proceed at all times without interruption.

The upkeep of tracks, a simple problem when looked at from the outside, involves a great variety of details. New roadbeds are usually unsatisfactory and require considerable work before they can be considered in good shape. Curves must be re-run, bad drainage conditions improved, super-elevation reduced, and other innumerable repairs made to keep traffic moving with a minimum of interruption or inconvenience. In addition to the track work, stations, water tanks, coaling plants, terminal facilities, engine houses and other necessary adjuncts must be maintained and improvements added, all tending to give interesting work for the maintenance engineer.

At the conclusion of the papers considerable discussion took place in which the student engineers took part. A vote of thanks to the speakers was moved by Professor A. F. Baird, A.M.E.I.C., and seconded by C. McN. Steeves, M.E.I.C., H. W. Fairlie, A.M.E.I.C., of the Montreal Branch, R. H. Cushing, M.E.I.C., and H. F. Bennett, A.M.E.I.C., briefly addressed the meeting. The ladies of

the faculty and the University of New Brunswick Club of Fredericton served refreshments at the close of the meeting.

The St. John members returned to the city on Thursday morning thoroughly satisfied with the success of the gathering. The committee in charge of the arrangements consisted of F.G. Goodspeed, M.E.I.C.,F.P. Vaughan, M.E.I.C., C. McN. Steeves, M.E.I.C., H. F. Morrisey, A.M.E.I.C., and C. S. Bennett, Jr.E.I.C., to whom the branch is indebted for their labours.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

The Montreal Branch started the new year with a meeting of its Executive Committee held on the 2nd of January, at which were invited the retiring members of the committee in addition to the newly elected members for the current year. E. A. Ryan, A.M.E.I.C., was re-elected secretary-treasurer for the year 1923. Various routine matters were attended to, namely: the appointment of a Reception Committee, Papers and Meetings Committee, Examining Committee, etc.

One of the members gave it as his opinion that the branch should take a more active part in public matters, particularly those having to do with engineering or allied works, and thus fulfill one of the objects of *The Institute* i.e.: "To enhance the usefulness of the profession to the public." This suggestion met with the approval of all those present.

Concrete Making

The first meeting of the winter session of the branch took place on January 8th, when the combined meeting of the Society of Chemical Industry and *The Engineering Institute of Canada* was held. A noted authority on "Scientific Methods of Making Concrete" in the person of Doctor Duff A. Abrams, M.E.I.C., was the lecturer. Doctor Abrams is in charge of the Structural Materials Research Laboratory of the Lewis Institute, Chicago, and he has carried out numerous investigations for the Portland Cement Association in the past few years, on cement and its uses. He showed numerous slides of the laboratory, methods of testing, etc., and he outlined in a general way the more important results of the investigations he had made. He made known to *The Institute* that the Lewis Institute is willing to forward to any of our members pamphlets describing the investigations, upon request. Any of the members desiring to avail themselves of this opportunity should communicate with the secretary-treasurer.

Railway Electrification

A. L. Mudge, A.M.E.I.C., of Toronto, was the lecturer on the 15th of January, when he read a paper entitled: "Notes on a trip over electrified sections of the Chicago, Milwaukee and St. Paul Railway". His paper was very interesting, and he quoted numerous instances where popular impressions, concerning the economy of electrified railways, were in error. He showed how two divisions of the Milwaukee Road had been electrically operated since 1916 with very satisfactory results, and stated that generally where traffic conditions were most severe, electrification made its best showing. The electric locomotives run with less frequent inspection, less train detentions, both in number and total time and lower cost of maintenance and repairs per unit of traffic handled than obtain under steam locomotive operation. Mr. Mudge's paper is published in full in this issue of *The Journal.*

Gas and Electric Meters

Another very interesting paper was that read before the Branch on January 25th by E. J. Turley, A.M.E.I.C., entitled "Gas and Electric Meters". Mr. Turley outlined the development of gas meters from the time in which gas was sold in England on a flat rate and consumers were allowed its use for lighting at certain hours in the evening only, the meter being a human one in the person of an employee of the Company who made the rounds of the consumers and tapped on the windows when it was time that the lights should be extinguished. Mr. Turley pointed out that the gas meter is one of the simplest and most accurate recording instruments in use to-day, although it is very much maligned for overcharging. Speaking of meter tests Mr. Turley said: "The number of gas meters for which customers required government tests during the year 1922 was 90; 38 of these were found correct, 45 had errors ranging from four to seven per cent, fast; five were over three per cent, slow; and four were found to be standing." With reference to electric meters he also gave the following information concerning the results of his experience "As in the gas meter, the biggest percentage of complaints are due to the customers themselves rather than the meters, and out of 30,000 electric meters tested in 1922, only 84 were found running fast or overcharging a customer, and the total amount of their overcharge was not sufficient to pay the Government charge of 60 cents a meter for making the tests."

Radio Use for Forest Fire Patrols

Through the courtesy of the Department of National Defense, Major W. A. Steel, M.C., of the Royal Canadian Signalling Corps, Ottawa, read a paper of timely interest on the employment of radio telegraphy and telephony in connection with forest fire patrols. Major Steel outlined the work of his department in the province of Alberta last year in the development of airplanes equipped with apparatus for quickly communicating with the Base the news of the start of a forest fire. These airplanes had during the three summer months covered a total of 90,000 miles and made 300 flights. As a result of their studies of conditions from the air, these flights had proved 90 per cent effective. That is during 90 per cent of the time the machines were in the air, they were able to make radio reports every 15 minutes to the ground stations.

As a result it had been found that the Alberta forest reserves had suffered very little from forest fires, while the nearby British Columbia forest reserves had suffered fire losses to the extent of millions of dollars. Major Steel said experience showed that if a forest fire was not discovered and dealt with within two hours of its start, it was invariably beyond human control. It was by the immediate discovery and prompt attack through aircraft and radio that these losses had been prevented, they being able to send exact and speedy information as to the location of any incipient fire.

So successful had these experiences proven, said Major Steel, that British Columbia, Ontario, Quebec, and all the Canadian forest provinces had asked the government to undertake similar protective work for them next year.

Executive Committee Meeting

The second meeting of the Executive Committee took place on February 2nd, 1923. At this meeting announcement was made of the appointment of the Papers and Meetings Committee for 1923 as follows:—

Chairman	H. W. Fairlie
Vice-Chairman	P. S. Gregory
Civil Section	
Electrical Section	C. V. Christie, A.M.E.I.C., Chairman
Mechanical Section	J. S. Cameron, A.M.E.I.C., Chairman
Railway Section	A. Crumpton, M.E.I.C., Chairman
Industrial Section	G. P. Cole, M.E.I.C, Chairman
Marine Section	I. J. Tait, A.M.E.I.C., Chairman.

Following the decision taken at the first meeting of this committee it was decided to make an investigation into the coal situation as applying in this district. For this purpose it was decided to form a special committee in accordance with the following resolution adopted and read before the branch "The Montreal Branch of *The Engineering Institute of Canada* having viewed with concern the increasing difficulties attendant upon the procuring and distribution of suitable fuels for domestic and other purposes so necessary to the conditions of life in this territory, authorize the Executive Committee to take immediate steps to appoint a committee to be known as 'The Fuel Investigation Committee". It shall be their duty to study and report on this question. The committee shall be charged with the duty of diligently securing by the means in its power all information relating to the various classes of fuel available and means and methods best suited for their utilization and generally such other matters relative to the subject to which its researches may lead after due investigation. It shall present its conclusions in the form of a report for the benefit of this branch and the public generally."

It was also pointed out that owing to the expected decrease in revenue of the branch occasioned by the diminution of the percentage of the members' fees returned by headquarters, it would be necessary to exercise great care in the running of the branch in order to live within its income. Suggestions were made for decreasing the expenditures, one of them being that the weekly post card notices of meetings be discontinued and replaced by some other less costly means of notice to the members. Objections were raised to this and the committee would appreciate an expression of opinion from some of the members of the branch concerning this matter. These communications should be addressed to the secretary.

On February 12th. a most interesting lecture and demonstration of Loud Speakers and Public Address Systems was given by H. J. Vennes, transmission engineer, The Northern Electric Company, Limited before the branch. After describing the principles of loud speakers, Mr. Vennes illustrated his talk with lantern slides, showing all details connected with the equipment, and showed many interesting views of practical application of loud speakers in connection with large outdoor meetings in the United States.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
Floyd K. Beach, A.M.E.I.C., Branch News Editor.

January 15th was made the occasion of Ladies' Night and a very largely attended meeting gathered in the assembly hall of the Institute of Technology to hear a brief address on the National Parks by Major C. J. Child, A.M.E.I.C., and to see a collection of slides showing the beauties of the parks and two films, "The Ascent of Mount Assiniboine" and "Banff in Winter". All the views, and especially "The Ascent of Mount Assiniboine" were greatly enjoyed, and at the conclusion refreshments were served.

Major Child in his address pointed out the inception of the National Park idea, arising first from the desire to mark and perpetuate monuments of Canadian history, such, for example, as the Heights of Abraham, and later, to make available to the people of Canada the beauties of our mountains. The parks are administered as a branch under the Department of the Interior, and at the more important ones a staff is maintained for the purpose of keeping up roads, game protection, forest preservation and similar duties. The parks are timber and game preserves. No timber outside of certain leases that antedate the formation of the park may be cut with the exception of dead trees. No firearms may be carried except under seal, and the possession of dogs and cats may be prohibited if they are found molesting game. As a result the wild animals are very tame and their fearless presence adds to the charms of the mountain scenery.

The Rocky Mountains Park, of which Banff is the central point, was set aside in 1885, following the discovery of a cave and hot sulphur springs. These springs are a great attraction in themselves, and last year 50,000 bathers took advantage of the baths that have been provided.

A little study of the geology of this region indicates that at one time there was a great inland sea lying to the east of the Selkirk mountains. Later an upheaval caused a slip in the earth's crust and laid folds of earlier formation over strata of later formation. The nature of the slip accounts for the general topography, with fairly gentle slopes arising eastward, and cliffs falling from their eastern edges. This park was increased in size in 1901 to some 2,750 square miles. It extends from Kananaskis lakes on the south to the Clearwater river at the north and from the continental divide eastward to include the mountain region.

Public utilities are owned and maintained by the government. Water supply for Banff is drawn from Forty-mile creek, sewers have been constructed; electric light is purchased from Bankhead and distributed by the government. Roads are built and maintained at some expense and next year it will be possible to motor through to Windermere. The roads are mainly a gravel surface and in many cases are oiled. It has been found that too much gravel is not desirable, the surface rolling up in waves, and a ten-inch thickness seems to be the desirable limit. Crushed rock from the talus of Mount Rundle has also been used. Owing to the fact that its use was started as an unemployment measure the cost was higher than it would otherwise have been, making the finished

surface cost about 75 cents per square yard. Gravel roads cost about $2,500 per mile, and for a sixteen-foot roadway. This runs to about the same figure per square yard. Where oiling is done, an asphaltic oil is used, a 40 per cent oil being used in the country and 60 per cent in town. From ⅓ to ½ gallon of oil per square yard is used. In town, a coarse sand dressing is spread after oiling, but this is too expensive a process for country roads, and the lighter oil is used in absence of a sand dressing.

G. W. Craig, M.E.I.C., in moving a vote of thanks for a most pleasing evening, paid a high tribute to Major Child and to his father, the first city engineer of Calgary. L. F. Fyles, A.M.E.I.C., seconded the vote of thanks, and expressed the appreciation of the gathering to J. H. Ross, A.M.E.I.C., for the courtesy extended in the use of the assembly hall and moving picture machine.

The Aeroplane

On January 29th last Major G. M. Croil, D.F.C., commanding the High River Air Station of the Department of National Defence, addressed a large gathering of the Calgary Branch and guests on "The Aeroplane". The speaker very clearly outlined the principles of flight, and illustrated their application to various types of planes by lantern slides. He touched on the work being done in Alberta by the High River air station in forest fire prevention, and in making reconnaissance for various other government departments, some of which are proving of great value, owing to the facility afforded in reaching out the way places and obtaining a comprehensive outlook over large areas. He gave also a very vivid account of several thrilling experiences that have overtaken some of the patrols, and showed a number of pictures taken from the air in the mountains.

W. B. Hutcheson, A.M.E.I.C., an old Air Force officer, in moving a vote of thanks paid tribute to the valued work done for the Irrigation office by Major Croil's staff. W. St. J. Miller, A.M.E.I.C., another veteran of the Air Force, seconded the vote of thanks.

On February 12th, a largely attended meeting listened attentively to two carefully prepared addresses on irrigation.

Irrigation in Alberta and Saskatchewan.

V. Meek, A.M.E.I.C., acting commissioner of irrigation, spoke very able on the extent of present and proposed irrigated lands in Alberta and Saskatchewan, the problems of colonization of irrigated lands, and the probable future of the country when all irrigated tracts are fully utilized. In outlining proposals for the development of further use of water he paid a very high compliment to Wm. Pearce, M.E.I.C., for his faith and foresight, which have been of greater influence in furthering development than that of any other one man in Alberta. Following this paper there was a very active discussion by a large number of members during which a number of points made by the speaker were further emphasized.

Maintenance and Operation of an Irrigation Scheme.

R. S. Stockton, M.E.I.C., superintendent of operation and maintenance for the C.P.R., department of natural resources at Strathmore, then presented a carefully prepared paper covering the engineering problems of maintenance and operation of a large irrigation scheme. His information was very practical and of value as a record of achievement. In spite of the late hour, a vigorous discussion followed, in which G. W. Craig, M.E.I.C., presented an interesting account of the life of the wood-stave pipe line supplying Calgary with domestic water. In conclusion A. S. Dawson, M.E.I.C., moved a note of thanks to the speakers, remarking that Mr. Stockton had done a great service to the branch, as he had presented many valuable contributions to the art of maintenance, which had never been included in his official reports. D. W. Hays, M.E.I.C., in seconding the vote of thanks paid tribute to the work done by the federal government in investigating water resources and their possible use.

Lethbridge Branch

G. S. Brown, A.M.E.I.C., Secretary-Treasurer.

On Saturday January 27th, W. S. Ball, city solicitor of Lethbridge, addressed the members of the Branch on "Law as applied to Contracts." In the absence of C. M. Arnold, M.E.I.C., the chair was occupied by Major H. B. Muckleton, M.E.I.C., chief engineer of the Lethbridge Northern Irrigation District, who introduced the speaker and expressed pleasure in having a member of a sister profession address the Branch.

Mr. Ball, in opening his address, paid high tribute to the engineering profession, and stated that it was a great privilege to address a body of engineers, and enlarged upon the work the engineer is doing on railroad, irrigation, road-building, etc., in this part of the country alone. The speaker, whose position has brought him in contact with the engineer, architect and contractor, made his subject very interesting and a lengthy discussion took place. Many questions were asked the speaker who took great pleasure in explaining all doubtful matters.

The address was preceeded by a dinner and social time, during which violin and vocal solos were rendered. A vote of thanks to the speaker was moved and the meeting was adjourned with the singing of the National Anthem.

This was the first meeting held by the Branch during January owing to the meeting of the Professional Engineers of Alberta held in Lethbridge on January 6th, when eighty members were in attendance.

Visit to No. 6 Galt Mines

On Saturday February 10th, a visit to the No. 6, Galt mines was arranged and about thirty-five members of the Branch were shown over the mine, power plant, tipple, screening plant, etc., also a trip into the workings was made. The party returned to the Y.M.C.A., at 6.30 p.m., where dinner was served, after which solos were rendered and chorus singing greatly enjoyed. The Lethbridge Branch orchestra made its first appearance at this meeting. The orchestra is made up of members of the branch and their selections were greatly appreciated.

Mr. W. Meldrum, Assistant Engineer, of No. 6, Galt mines, addressed the branch on "Coal Mining". This proved to be very interesting, and much discussion took place. A vote of thanks to the speaker, mining members, and to those who had assisted in making the trip to the mines so interesting was moved by Major Muckleston M.E.I.C. and seconded by Mr. Arnold.

Toronto Branch

O. M. Falls, A.M.E.I.C., Secretary-Treasurer.

During the past month there have been four regular meetings of the branch and it is a very conservative statement to say that those who attended these meetings benefited greatly in the acquirement of knowledge and interchange of ideas. The executive of the branch promises an interesting and varied programme for the remainder of the session and trusts that the membership will more fully avail themselves of the opportunity of hearing the splendid speakers who have at some sacrifice of time and energy consented to address the branch.

The regular weekly meeting of January 18th was to have been addressed by Arthur Crumpton, M.E.I.C., chief valuation engineer of the Grand Trunk Railway but an unexpected engagement necessitated its cancellation for that evening. Mr. Crumpton, however, has consented to address the branch later in the session and it is now expected that satisfactory arrangements will be made for March 8th.

Another regrettable change in the programme this month was the cancellation of the meeting called for January 25th owing to the illness of His Honour, Mr. Justice Riddell, who was to have addressed the branch on "The Giving of Expert Evidence". The executive is pleased to report however that His Honour has kindly consented to deliver this address to the branch at the beginning of the Fall session.

Report of Branch Committee on Fees.

The meeting of January 18th was devoted to a discussion of the report of the committee of the branch appointed some two years ago to investigate the question of fees, under the chairmanship of Frank Barber, M.E.I.C. Before calling upon Mr. Barber to introduce this report, the chairman announced that representatives of the Town Planning Institute of Canada were present and had requested an opportunity to present the claims of their society to the branch membership. The importance of this subject, together with the aims of the Town Planning Institute, were then very clearly presented by three of its ablest sponsors, Messrs. T. D. leMay, J. P. Hynes, A.M.E.I.C., and A. E. K. Bunnell, A.M.E.I.C.

Mr. Barber then read his report carefully explaining the purpose and application of the schedule of fees for consulting engineers. Charges were divided into four classes, namely, a per diem rate, a predetermined fixed fee, a percentage on the cost of the work, or reimbursement and a percentage on the cost of the work. Appended to the report were a series of general provisions advising uniform procedure in various matters affected by the schedule.

A very lengthy discussion followed the presentation of the report, during which various suggested revisions to the report were offered by the following members; P. H. Mitchell, M.E.I.C., F. G. Engholm, A.M.E.I.C., A. H. Harkness, M.E.I.C., A. E. K. Bunnell, A.M.E.I.C., H. J. Lamb, M.E.I.C., H. A. Goldman, A.M.E.I.C., R. O. Wynne-Roberts, M.E.I.C., and C. R. Young, M.E.I.C. On the motion of Messrs. Engholm and Young the report was then referred back to the committee to deal with the suggested revisions and report back to the branch before the end of the present session.

Open Meeting, February 1st.

The first open meeting of the session was held on February 1st, in the Mining building of the University of Toronto when Professor H. E. T. Haultain, M.E.I.C., of the department of mining, University of Toronto, favoured the branch with the presentation of two very interesting and instructive subjects. His addresses were preceded by the report of the branch Committee on the Revision of the Toronto Building By-laws, submitted by the chairman, J. M. Oxley, M.E.I.C. Before calling on Professor Haultain, the chairman of the branch welcomed to the meeting Walter J. Francis, M.E.I.C., one of the vice-presidents of *The Institute*, who spoke briefly in acknowledgment of the welcome.

Professor Haultain prefaced his address by showing three moving picture films illustrating the "Analysis of Ball Paths in Tube Mills by High Speed Photography" As the films proceeded Professor Haultain explained the various points and very cleverly brought out the remarkable difference between what the mathematical assumptions, as worked out by Professor Davis, would indicated these ball paths would take compared with what occurred in actual practice.

Professor Haultain then delivered a forty-minute talk, or sermon as he chose to call it, entitled "Some Recent Psychology", taking as his texts the 23rd Chapter of Proverbs and the seventh verse: "As a man thinketh in his heart so is he", and Sir J. M. Barrie's inaugural address as rector of St. Andrews University, Scotland, entitled "Courage". He very cleverly brought out the relationship between Barrie and McConachie and from that worked out many practical illustrations of what has been described as the subconscious personality. The address was delivered in Professor Haultain's own inimitable way and an interesting discussion took place.

Rainfall and Its Measurement.

At the meeting of February 8th, Sir Frederick Stupart, director of the Meteorological Service, delivered an informing address on the subject of "Rainfall and Its Measurement." In introducing the subject Sir Frederick briefly reviewed the growth of the Meteorological Service in Canada from its inception in the early seventies up to the present; during which time some 800 recording stations have been established throughout Canada. The construction of the various types of rain gauges was described and their accuracies compared with the English Snowdown gauge.

A theoretical explanation as to the cause of rain was set forth by the speaker as follows: The capacity of the air to hold moisture, as vapour, varies with the temperature and as the air in the low pressure area rises it cools through expansion and when its temperature passes the dewpoint rain commences to fall. The three main factors controlling rainfall the lecturer pointed out were the presence of moisture in the atmosphere, a movement of area of low pressures, and topography. He then very cleverly applied these factors to explain the variation in the annual rainfall throughout Canada.

As regards the moderating of the climate in Canada the speaker asserted his opinion that there had been no general trend in that direction, The winters of the 80's he pointed out had been the coldest, but records also show-

ed that the winters of the 40's had been the mildest. Sir Frederick in conclusion recommended all interested in this phase of the subject to read the book entitled "Climatic Changes" by Huntington.

G. W. Winckler, M.E.I.C., introduced the discussion by reference to an entry in his diary some thirty-seven years ago recording a visit to the village of Cherra Ponnge in Eastern Assam, India, where the record rainfall of some 700 inches per annum is recorded. R. O. Wynne-Roberts, M.E.I.C., related some interesting experiences with respect to rainfall in the vicinity of Cape Town, South Africa. He also quoted a number of useful formulae derived by himself applying to rainfall intensity in the vicinity of Toronto. In concluding a hearty vote of thanks to Sir Frederick Stupart for his most interesting and instructive address, the speakers expressed deep appreciation of the many services which Sir Frederick and his staff have always so generously extended to the members of the engineering profession.

Radials

Henry K. Wicksteed, M.E.I.C., formerly chief location engineer for the Canadian Northern Railway, delivered, at the regular meeting on February 15th, an address of absorbing interest to the members of the branch on the subject of "Radials", with special reference to the Toronto situation. Mr. Wicksteed's fifty years of experience in railway engineering were reflected throughout the whole of his discourse and his paper was replete with interesting details proving deep study and careful consideration.

Before entering the main subject Mr. Wicksteed ventured the opinion that engineers should devote more time to the discussion of the human rather than the entirely technical problems with which they are daily faced. A careful analysis of cost of rail transportation was presented by Mr. Wicksteed and the advantages of duplication of tracks rather than parallel separate construction clearly established. Electrification was then examined and its advantages weighed to determine under what condition its adoption is economical.

The speaker after presenting a brief resumé of the main Canadian Railways sketched the history of the various steam roads built into the city of Toronto. These included the Northern Railway, the Toronto Branch of the Great Western, and the Grand Trunk from Montreal; as well as the following radial lines, the Toronto and Nipissing, the Grey and Bruce and the Credit Valley Railroad. With reference to the local situation Mr. Wicksteed strongly opposed the building of more railways along the waterfront, but rather owing to the movement of population urged the diversion of all possible traffic to the North Toronto station, which he claimed was more central and more economical for all the railways. Toronto he considered should look after its own internal traffic before entering the field of external suburban traffic.

Before introducing the discussion on the subject the chairman called upon G. A. Mountain, M.E.I.C., chief engineer of the Board of Railway Commissioners for Canada and a past-president of *The Institute* who spoke briefly in response to the welcome of the Toronto Branch. In the discussion which ensued relative to this paper the following members took part, — W. G. Chace, M.E.I.C., E. W. Oliver, M.E.I.C., A. L. Mudge, A.M.E.I.C., A. C. Oxley, A.M.E.I.C., Norman D. Wilson, A.M.E.I.C., A. E. K. Bunnell, A.M.E.I.C.

The following meetings have been arranged for the remainder of the session:

February 22nd —Toronto Branch is invited to attend the meeting of the Canadian Section of the American Waterworks Association to be held at Carls-Rite hotel

March 1st —"Notes on Electrification of the Chicago-Mail waukee and St. Paul Railway", by Arthur L Mudge, A.M.E.I.C.

March 8th —"Railway Valuation", by Arthur Crumpton. M.E.I.C.

March 15th —Annual meeting.

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

The Chemistry of Insulating Varnish.

On January 28th, George S. Parlour, materials engineer for the Canadian General Electric Company, Limited, Peterborough, presented a paper entitled "The Chemistry of the Insulating Varnishes". This paper first pointed out the importance of insulating varnishes in the world to-day and then went on to classify them. Distinction was made between air-drying varnishes and baking varnishes and the main classification was made as to their composition. The paper pointed out the difference between a spirit varnish and oleo-resinous varnish and a synthetic resin varnish and later went on to give in some detail, the descriptions of the different materials used in the manufacture of each class and also described the manufacturing process for each in detail.

An interesting feature of the paper was the author's explanation of just how chemistry is involved in the manufacture and application of insulating varnishes. The chemical reactions — polymerization, oxidation, condensation were each discussed in turn and the importance of each, as it is involved in the manufacture and use of insulating varnishes, was pointed out. A complete section of the paper was taken up in discussing the drying of varnish films, the author pointing out how in many cases the increase in volume of the film while it is drying due to its absorption of oxygen is balanced against a decrease in volume of the film which takes place while polymerization is going on.

A description of the methods used in a chemical laboratory for checking up the quality and insulating value of these varnishes was next pointed out. The author also showed how the different properties of an insulating varnish are related and how carefully they must be guarded and looked after when in use. The paper ends with a vivid description of the mechanism of the breakdown of an insulating varnish when it is subject to a dielectric stress. It is also pointed out that the chemistry of insulating varnishes is really the chemistry of colloids and the author dwells on this in detail and shows that it is quite likely that the synthetic resin varnish will be the chief insulating varnish of the future.

A meeting of the branch held on February 8th., was addressed by Major Alexander C. Lewis, M.P.P., secretary of the Canadian Deep Waterway and Power Development Association, the subject of his address being "The Great Lakes St. Lawrence Waterway."

Great Lakes — St. Lawrence Waterway

In introducing his subject, Major Lewis emphasized the importance of this scheme being carried out by the governments of the United States and Canada, intimating that since it was a highly attractive one to private corporations, it should be jealously guarded by the public ownership interests of these two countries. The speaker traced through history the importance of water transportation, sketched the development of the St. Lawrence river in the pioneer days of Canada, and enlarged upon the tremendous asset which a waterway from lake Superior to the Atlantic would be to western Canada in particular and the adjacent states along the border, and also to Ontario and Quebec. He discussed the opposition which had been raised against the project, which he characterized as the nearsighted objections of sectional interests which could not see the benefits which would accrue to themselves.

From the harnessing of the St. Lawrence, Major Lewis drew a picture of the probable industrial expansion that would result throughout the greater part of Ontario from the utilization of 700,000 horse power at a cost of $12. or $13. "The Great Lakes - St. Lawrence Waterway cannot be divorced from the great transportation problem that Canada is facing at the present time", said Major Lewis. "Commerce which is barter, is based on three essential factors, production-transportation and consumption, and the greatest of these is transport, ation. Factories may turn out their goods and farmers produce their grain, but the labour is of no avail without proper carriage to their best markets".

Touching upon the railway communication between eastern and western Canada with the long hauls and comparatively little freight between intermediate points, and with freight rates two years ago 83 per cent higher than before the war, Major Lewis turned to the Water route on the Great Lakes. The canal and lock at Sault Ste. Marie were of ample depth and capacity for the type of ocean-going vessels of from three to seven thousand tons which would be accommodated by the proposed waterway. The present Welland canal, however, restricts navigation to vessels of fourteen feet draft. The new Welland canal, in process of construction, which will be completed in four years, will have a depth of thirty feet in the locks and permanent structures, and twenty-five feet in the stretches of canal, which could be deepened to thirty feet, providing for a maximum draft of twenty-eight feet. With a similar development in the St. Lawrence river, the crux of the project which has been proposed to the Dominion Government, vessels would have a passage from the sea to the Great Lake ports.

Under the existing transportation facilities the grain from western Canada was hauled by train to Fort William, loaded into barges and carried to the Georgian Bay elevators and there trans-shipped by rail to Montreal or to Port Colborne where it was transferred from the larger lake boats to those of shallower draft which could be accommodated by the Welland canal, or it was loaded at Port Colborne into freight cars. Another outlet was by way of Buffalo, either by rail or by the new barge canal to United States ports. Major Lewis said that six of the smaller vessels that could negotiate the Welland canal were required to handle the cargo of one of the big lake boats that brought the grain from the head of Lake Superior. Water freight rates, he said, to Port Colborne last summer were from one to two cents a bushel and from Port Colborne east five to seven cents a bushel. In November at the height of the grain shipping season the lake freights rose to six and eight cents a bushel, and the average from Buffalo was fifteen cents. It was clear, therefore, that the matter of transportation is a serious one to the west. A saving of five cents a bushel on the 245,000,000 bushels of grain exported last year would afford the farmers in the west $12,250,000 in transportation charges, which to many of them would have been the difference between a reasonable profit and no profit at all.

Another advantage the St. Lawrence river development would furnish the west was in the shipping of cattle. If dressed beef could be loaded into refrigerators at the head of Lake Superior, and transported directly to England as Australia ships her mutton, the Canadian farmers would be greatly benefitted. Australian mutton, shipped 5,000 miles in cold storage, virtually controls the British market.

Major Lewis illustrated the advantage which the proposed waterway would afford to Canadian importers, giving several instances showing how savings could be effected in the importation of various commodities. He also referred to the high grade bituminous coal of Cape Breton, which at present cannot be shipped further inland than Montreal in competition with United States coal on account of the small locks in the St. Lawrence. With the projected waterway complete the larger locks would enable this Canadian coal to be brought into the interior with a saving of $60,000,000 a year that is now going to the United States. The proposed waterway would reduce the twenty-six locks in the St. Lawrence to eight, and would attract what are called tramp vessels, which constitute 83 per cent of the registered tonnage of the world, and which draw an average of 21 feet. The larger passenger liners would not be included, largely on account of the element of time, but vessels of from 3,000 to 7,000 tons could profitably use this route. Canada's merchant marine would undoubtedly benefit by the waterway.

The speaker now turned to the question of the 1,464,000 horse power which could be developed on the international section of the St. Lawrence. This power would be the cheapest power in Canada and probably in the United States. Of that power production, one-half, or more than 700,000 horse power would be for distribution on the Canadian side, in the territory adjacent to the St. Lawrence. This development would usher in an era of wonderful industrial expansion because this country possesses the natural resources which could be adequately utilized by the cheap power. The cost of the scheme, as estimated by the International Joint Commission, after exhaustive investigations, would be $252,728,000. The cost of development would be approximately $80 a horse power, as compared with $100 to $120 at Niagara, which was regarded as cheap power. This would produce power at $12 or $13 per horse power.

Dealing with some of the objections which had been raised by-some of the opponents of the scheme, Major Lewis referred to the Manchester ship canal, which had cost more than $100,000,000 and had raised that city to a position second only to London as a shipping and industrial centre. "With our raw materials and with a great supply of power, there are no bounds to our development in the next twenty-five years." Major Lewis concluded.

Edmonton Branch

R. H. Douglas, A.M.E.I.C., Secretary-Treasurer.

A very pleasing feature in connection with the banquet of the Edmonton Board of Trade to Sir Henry Thornton was the address of welcome by Dean Boyle, of the University of Alberta, on behalf of the engineers of the province of Alberta. Dean Boyle in his happy style expressed the gratification of the engineers that Sir Henry Thorton, himself an engineer, had been chosen to head our Canadian National Railway System. In responding, Sir Henry Thorton thanked Dean Boyle for his welcome and stated that the position he now held was largely due to his training as an engineer.

Edmonton Branch is entertained by Applied Science Society of University of Alberta.

On Wednesday, January 17th, instead of the regular monthly meeting, the members of the branch, in response to an invitation from the Applied Science Society of the University of Alberta, attended at an evening of entertainment arranged by the applied science students and members of the Faculty.

An informal prelude to the evening's entertainment was pleasantly arranged as a reconnaissance survey of the menu of Athabasca dining hall, where the practising engineers of the province were favourably impressed with the gastranomic efficiency of the engineers-elect. Mr. Drummond, in his usual trenchant after-dinner style, regretted "that engineers, after their final training, did not effectively assume the responsibilities of broader citizenship and essay the conduct of public affairs in measure worthy of their highly specialized training and undoubted devotion to public service." Mr. Charlesworth drove home this dominant note that, "however important information and technical knowledge may be, they are of secondary importance to the cultivation of character, personality and judgment," and advised the students

not only to take advantage of the excellent technical equipment of the science laboratories, but also to avail themselves of the opportunity for personal contact with the members of the staff and to grasp the necessity for broadening their judgment and capabilities in a general direction.

Inspected Scientific Departments

After dinner, the members of *The Institute* made a rapid but comprehensive inspection of the scientific departments of the university. Dr. Lehman, assisted by the members of his staff, personally conducted the visitors through his many faultlessly equipped and excellently organized chemical laboratories, of which the muffle furnaces for the treatment of ore were of special interest to the party. The university power plant was then inspected, and here, under the aegis of Resident Engineer Robb, the visitors appreciatively surveyed the mechanically-stoked boiler units and the generating plant which supplies the "midnight oil" for half a thousand knowledge sleuths. The mechanical and steam engineers were obviously reluctant to abandon their contemplation of Watt's parallel motion and to turn a deaf ear to the mechanical allegro, con brio, of the power house, but they were urged on by a ruthless committee and an infrangible time-table. On they went, through the eerie geometric domain of Professor Adams; through the draughting and testing laboratories, where freshmen daily threaten the supremacy of Newton; past the torsian and hydraulics apparatus, and the water-ram, which, like the sophomore at breakfast, works without apparent effort; through the necromantic demisne of Mr. Kelso, the provincial analyst; and so into the mysterious confines of mining engineering. Here Dr. Clark demonstrated the extraction of bituminous products from Alberta tar sands, and Mr. Stansfield the carbonizing and briquetting of local coals. Washing of slack coal to remove the excess of ash was ably performed by Bill Jewitt, while Bob Hollies broadcasted useful knowledge on the efficient burning of local coals in domestic furnaces. The work being conducted by the mining department and under the auspices of the research council was of pertinent interest to a large group of the visiting engineers.

Physical Science Laboratories

The physical science laboratories stimulated great interest, for here were to be seen progressing experiments on the most advanced theories of matter and energy. Demonstrations with the X-rays and cathode rays threw light on the electron theory, and an ingenious apparatus showed where the senior students were challenging the mysteries of ionization. Of particular interest was the series of air pressure experiments conducted by Stanley Smith, who has already made valuable contributions to the science of aeronautics before the Royal Society of Canada.

In the geology laboratories the visitors inspected one of the finest collections in Canada. In the cases alone there is a showing of every known rock and mineral that is of commercial or scientific value, and the students take a justifiable pride in this superb exhibit. The visitors were shown microscopic views of thin sections (one-thousandth of an inch in thickness) of Athabasca iron ore, showing hematite and magnetic grains encased in a siliceous matrix.

Dinosaur Museum

Dr. Allan conducted the party through the new dinosaur museum, where specimens of unique interest were on exhibition. Among these, and from the Red Deer river area, was an excellent collection of turtles. One soft-shelled turtle (upper cretaceous) is the most perfect skeleton yet discovered in Canada, and, although it lived about eight million years ago, it is but slightly different from its living relatives in the streams of North America to-day. What particularly interested the visitors and what may be considered as the gem specimen of the collection, was a skeleton of a bird-footed dinosaur, a small plant-eating animal, the exhibited skeleton of which is the most complete yet discovered. It was first named and described in 1856 from a single tooth and was thought to belong to the extinct lizards. However, when this specimen was collected in 1921 by Geo. F. Sternberg for the University of Alberta, it was recognized as a dinosanian reptile. Dr. Allen indicated, by reference to several exhibits, the interesting relation between birds and reptiles. Professor Morrison was discovered gazing in awe at the appalling jaw of a tyrannosaurus and muttering to himself, "What an awful thing to have a tooth-ache in those days," to which Mr. Charlesworth, standing in front of a diplodocus, responded, "and corns."

A fine exhibition of Alberta's clay products was on display, in which Medicine Hat was predominently represented. Collections of crude petroleum, petroleum products, mineral salts, building stones and glass in many commercial forms, all of local origin or manufacture, were also to be seen.

From the geology laboratory to the refreshment room; from H. G. Wells' "Age of Mammals, Culminating in ice and hardship to man," to man culminating in chocolate-ice-cake and nicotine and coffee! Napoleon's armies almost conquered the world on their stomachs. But the same token, the coming engineers will fink-truss the moon to the earth.

Co-operation of Staff

Alex. Jackson, President of the Applied Science Society, and his committee spared no effort to make the whole affair a success. He received the active co-operation of the staff and the students, and may be well pleased with the happy results of the experiment.

Dr. Sheldon, who, as head of the mathematics department, had held himself in readiness to entertain the visiting engineers by pursuing a few elusive conics about the corridors, was discovered oscillating disconsolately on the outer edge of festivities and tactfully regretting the disappearance of his twelve-foot slide rule. He appeared somewhat mollified, however, by the rapid and skilful disintegration of cake at the hands of the class in mathematics '25'.

Dean Boyle happily expressed the pleasure of the Applied Science Society in entertaining the members of *The Institute*, and indicated the significance of the contact between the student and the practising engineer. Mr. Dimsdale thanked the Society on behalf of *The Institute*. The engineering students chanted their traditional paen of the "forty beers," and the first reception of its kind in Canada was over.

Quebec Branch

Hector Cimon, A.M.E.I.C., Secretary-Treasurer.

At the Château Frontenac, on Monday evening, January 29th, 1923, Julian C. Smith, M.E.I.C., vice-president of the Shawinigan Water and Power Company, greatly interested the Quebec engineers by a remarkable causerie on some topics in hydro-electric developments.

Recent Advances in Waterwheels Designs.

Mr. Smith briefly exposed the general factors governing the establishment and maintenance of hydro-electric plants. He then reviewed the different hydraulic motors from the earliest horizontal type to the modern high speed vertical wheel and discussed the problems involved in the design of same. The modern turbine with a comparative high speed has brought a decrease in the price of generators and a consequent economy in the development of water powers. The essential features of the new types of draft-tubes, runners and casings were clearly treated of and furthermore illustrated by means of lantern slides.

The speaker also touched upon the development by the engineers of the Shawinigan Water and Power Company of an electric steam boiler which affords the means of converting economically into steam any excess power available, thus making possible the immediate development of certain water powers which would otherwise have to remain undeveloped for several years to come, until such times as large mills were built in their vicinity to absorb the power produced. In concluding Mr. Smith described the transmission and generating system of the Shawinigan Water and Power Company.

A. R. Décary, M.E.I.C., presided the meeting and J. E. Gibault, A.M.E.I.C., proposed a vote of thanks to the lecturer, which was enthusiastically carried.

Visit of the General Secretary

On Monday noon, February 12th, 1923, at the Château Frontenac, a lunch was served to the members of the branch followed by a noteworthy speech by our guest Fraser S. Keith, M.E.I.C., general secretary of *The Institute.*

At the outset of his address, Mr. Keith summarily reviewed what the engineering profession has accomplished in the present period and outlined some of its future possibilities. Continuing, he indicated *The Institute*'s place in improving the conditions of the profession and defined the objects by which this aim could be attained.

Each of those objects was properly exposed and commented on by the speaker who finally concluded in stating that the profession has made considerable advance in recognition during the past few years and its future in Canada will be decided almost wholly by our activities at the present.

The lunch was presided by A. R. Décary, M.E.I.C., and a vote of thanks proposed by S. L. de Carteret, A.M.E.I.C., was given amidst cheers. E. A. Evans, M.E.I.C., also thanked the speaker and added a few appropriated remarks on the profession.

London Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmsted, A.M.E.I.C., Branch News Editor.

The annual meeting of the London Branch was held in the Blue Dragon tea rooms on the evening of Wednesday January 24th. During the dinner the members joined heartily in the singing of many lively songs. At the conclusion of the meal and after the chairman proposed a toast to the King, the secretary read the minutes of the last regular meeting, the meeting of the Nominating Committee, and the last executive meeting. As no business arose from these minutes, they were adopted as read. The chairman then called for the reading of the reports for the past year. The secreatry read his report which showed the growth of the membership of the branch of 36 per cent over the previous year, the number of meetings held during the year, and also, as treasurer, read the financial statement which showed conditions to be healthy. The chairman then gave a short but pithy resumé of the activities of the Branch during the year. E. V. Buchanan, M.E.I.C., chairman of the Membership Committee read his report which showed that there were very few if any, engineers in this territory, who were not within the fold of *The Institute.* W. J. Forbes-Mitchell, A.M.E.I.C. chairman of the committee appointed to aid the Militia Department in the reforming of a local unit of the 7th Field Company, Canadian Engineers, showed the difficulties he encountered in trying to arouse the interest of any local engineers who were qualified to accept commissions. Chairman R. I. Olmsted, A.M.E.I.C., of the advertising committee presented his report. These various reports after being thoroughly discussed, were unanimously adopted.

The business of the election of officers then took place. The office of honourary-chairman was not continued, as Dr. Barnett, M.E.I.C., who held it for the past year and who is at present quite ill in a local hospital, especially requested that he be allowed to withdraw. After the chairman had appointed four scrutineers, he announced that the nominating committee had nominated W. J. Forbes-Mitchell, A.M.E.I.C., for chairman. Two nominations were made for the office of vice-chairman but one of the candidates F. A. Bell, A.M.E.I.C., wished to have his name withdrawn so E. V. Buchanan, M.E.I.C., was given the office by acclamation. The secretary-treasurer for 1922, F. Jas. Bridges, A.M.E.I.C., was politely but firmly sentenced to put in another year at hard labour. The members of the executive elected were as follows:— H. B. R. Craig, M.E.I.C., R. I. Olmsted, A.M.E.I.C., W. C. Miller A.M.E.I.C., J. R. Rostron, A.M.E.I.C., and Chas. Talbot, A.M.E.I.C. H. A. Brazier, M.E.I.C., is member ex-officio.

Following the elections, with W. J. Forbes-Mitchell A.M.E.I.C., in the chair, a warm discussion was carried on in regard to the most unjust criticism which was being cast at the engineering department of the City of London by the newly-elected Mayor, most particularly, and also many of the aldermen, who it would seem, although men of various trades and businesses, would like to appear to know more about the engineering profession than does our past chairman, H. A. Brazier, M.E.I.C., the city engineer. Ways and means were discussed whereby the branch

could educate the city fathers as well as the general public, as to the true place and value of the professional engineer in the community.

After proposing many plans for the meetings of the coming year, the meeting was adjourned.

Kingston Branch

L. T. Rutledge, M.E.I.C., Secretary-Treasurer.

The first regular meeting of the Kingston Branch for the year 1923 was held on January 9th, at which meeting Professor Douglas Jemmett, A.M.E.I.C., professor of electrical engineering of Queen's University gave an interesting address on "The Influence of Power and Load Factors on Power Costs."

The Professor first gave very clear explanations of the more elementary principles of alternating current and defined lagging and leading currents, reactance, wattless current, power factor, and then outlined the action of induction motors, condensers and synchronous motors on the phase relationship of voltage and current. This was followed by the solution of a practical problem of an electric circuit supplying 100 k.w., of energy at 2,000 volts, first with unity power factor, then with 50 per cent power factor due to lagging current, and lastly with 50 per cent power factor due to lagging current, and lastly with 50 per cent power factor due to a leading current. The ohmic drop, reactance drop, terminal volts and current vectors were plotted on the blackboard for each case in proper phase relationship and the generator voltage was accordingly arrived at graphically.

The second part of the address dealt with the influence of load factors. A load factor was defined as the ratio of average station load expressed as a percentage of maximum load. The demand factor is the ratio of maximum demand of any consumer to his connected load, and the diversity factor for a given class of customer is the ratio of the sum of the individual demands to their combined demand. Professor Jemmett drew illustrative daily load curves and yearly load curves for an ordinary station and tabulated for different classes of load the diversity factors, for instance, between customers, between transformers, between feeders, etc. This was illustrated by an actual connected load and the reason for the variation in diversity factors were given.

A subject like the one discussed always presents some difficulty in presentation to an audience representative of all branches of engineering. However in the discussion which followed the lecture, it was clearly evident that the fundamentals were grasped by everyone present and the address was considered to have been a brilliant success.

It was the first occasion that the Branch has had the pleasure of having Professor Jemmett address them and it is hoped that the time will not be long till we again have a paper from him.

Modern Hydraulic Turbines of reaction Type

The next meeting was held on Feb. 5th. at which meeting H. S. Van Patter, A.M.E.I.C. hydraulic engineer on the staff of the Dominion Engineering Compnay Ltd., of Montreal, gave an illustrated address on "Modern Hydraulic Turbines of the Reaction Type". The two classes of reaction turbines discussed were the vertical shaft and the horizontal shaft types. The speaker referred to the great advances made in vertical thrust bearings of which the General Electric and the Kingsbury were two popular makes.

The open flue vertical shaft type of turbine for low heads, the concrete casing type, and the metal casing types were well illustrated. Excellent slides were shown illustrating the various parts of a turbine installation i.e. the scroll, the speed ring, the pitt liner, guide vanes and draft tube. The Francis type of runner and the unshrouded type for high speeds were discussed. The speaker went into details regarding the moulding, the core work relative to the moulding and the various machine operations on the parts of a large turbine and the balancing of the runner. Lastly in a general way Mr. Van Patter discussed the various makes of high speed turbine runners, for example, the Francis, Kaplan, Escher Wyss, Nayler and Moody. The address called forth a very interesting and lengthy discussion, and a hearty vote of thanks was tendered Mr. Van Patter.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The Moncton Branch held its monthly dinner meeting at the Barker House on Friday evening February 9th. Although the very severe winter conditions prevailing have somewhat curtailed attendance at recent meetings, some twenty-five members enjoyed a most bountiful repast and interesting evening. No little of the success of the evening was due to our gracious entertainers, Mrs. T. Walsh who sang Gordon's delightful little song "Fat Little Fellow with his Mammy's Eyes", and as an encore Kerjulf's "Last Night the Nightingale Woke Me"; and Mr. Tilman Melanson who recited "The Irishman's Toast" by Dr. Drummond and followed this in his inimitable fashion with "The Possum Hunt".

In view of the present world wide interest in matters pertaining to education and educational methods, the Branch was fortunate indeed in having as its speaker Professor H. W. McKiel, A.M.E.I.C., of Mount Allison University, Sackville who chose as his subject "Modern Tendencies in Engineering Education".

His address was in reality a carefully thought out plea for engineering courses that would produce men of broad human interests rather than mere technical machines and he used the present policies of the better engineering colleges of the United States and Canada as corroborative evidence supporting this plea. He first gave a historical sketch of the development of the engineer from the time of the pyramids down through the ages. In the first place engineering was the result of military endeavour but about 1750 arose a class which built bridges roads, buildings and general works for commercial purposes giving rise to the title of "Civil Engineer" as distinct from the military engineer of preceding times. Then came the development from the four main types of engineers of the mass of specialists practising to-day. With the advance in engineering arose the need of schools of engineering training which have now developed into institutions which turn out specialists in particular technical lines beyond which they are not equipped to venture.

The short-comings and limitations of engineers are recognized by the faculties of the better class of engineering schools, for the speaker gave convincing evidence of a general tendency on their part to correct this condition by standardization of the first two or three years of the course, stressing fundamentals and introducing the study of those subjects broadly classed as the Humanities — english, history, languages, etc., and specializing only in the last year of the course.

Curiously enough the necessity for the humanizing of the engineer has been recognized and advocated by exceedingly practical heads of large manufacturing concerns who deplore the limitations which the present day technical training promotes. A Boston business man gives the meat of the argument for broadening the engineering course when he says "A man does not go to college to learn to earn a living; he goes to learn to live". Yet in spite of this fact Professor McKiel showed that the course of most of the engineering schools have been designed to turn out the technical specialist. Just so long as this condition lasts the engineer will be but a machine and will be deprived of his share of leadership in world affairs to which the nature of his calling entitles him. His training must be broadened out if he is to obtain real professional dignity and public recognition.

General discussion of the paper followed, and after votes of thanks to Mrs. Walsh, Mr. Melanson and the speaker of the evening, the meeting adjourned.

EMPLOYMENT BUREAU

AND

MEMBERS' EXCHANGE

To make this department more valuable it is proprosed that in future advertisements of situations vacant should state salary, and give details of requirements.

Situations Vacant

Electrical Engineer

Electrical engineer with mechanical experience, graduate of a few years' standing, required for inspection work in Montreal. Apply Box 10-V.

Draughtsmen

First class experienced draughtsmen required for work on steam power plant and general engineering in Nova Scotia. Apply Box 16-V.

Civil or Mechanical Engineer

A pulp and paper company requires the services of an engineer capable of taking charge of the necessary repair work, efficiency work and improvements to the wood end of their mill. Apply Box 22-V.

Mechanical Engineer

Mechanical engineer wanted for pulp and paper plant in the province of Quebec. Technical graduate preferred, young man with at least three years' experience, able to design machinery and make layouts. Permanent position with a good chance of advancement. Experience in pulp and paper plant valuable but not essential. Give particulars as to education and experience. Apply Box 24-V.

Mechanical Engineer

Mechanical engineer, preferably a graduate, between 26 and 32 years of age, required by a large pulp and paper company in the province of Quebec. Applicant must be thoroughly experienced in mechanical draughting and shop work. Preference will be given to one with paper mill experience and whose ability has been proven. Apply Box 25-V.

Situations Wanted

Civil

Graduate McGill University, 1915, in civil engineering, 30 years of age, married, at present employed as wholesale salesman and organizer for automobile manufacturer, wants a position where technical education will be of greater assistance. Willing to accept moderate salary with well established firm, provided there is opportunity for advancement. Apply Box 58-W.

Mechanical

A Student of *The Institute*, who expects to graduate in mechanical engineering from the University of Toronto in April, desires a position with an engineering firm. Location, immaterial; opportunity the only requisite. Apply Box 63-W.

Mechanical

Position desired by a Student of *The Institute*, graduating April 30th, from Queens University; age 25, single. Experience, two years as draughtsman and designer on railway car plant construction and operation; three years machine shop, charge of repairs, also erection foreman; one year pulp-mill as field engineer and technical control. Apply Box 66-W.

Mechanical Engineer

Mechanical engineer, A.M.E.I.C., with fourteen years in practice in the following work; extensive experience in detailing and checking shop drawings, having good experience in foundry work and pattern making and shop practice. Apply Box 67-W.

Civil Engineer

Civil engineer, married, graduate of a recognized school desires a responsible position; 15 years' experience on construction work in both field and office work; would like to engage with contractor or consulting engineer. At present disengaged. Apply Box 68-W.

Members' Exchange

Standard Specifications for Cast Iron Water Pipes and Special Castings

The entire supply of these specifications has been exhausted, and as there is a considerable demand for the same, the Secretary would appreciate receiving any spare copies which the members may have.

Publication

The Structural Engineer's Pocket Book, by Ewart S. Andrews, B.Sc., Eng. (London), published by B. T. Batsford, Ltd. In this volume the author has given a digest of the various theories and methods of calculating, of value to structural engineers, as well as such of the various tables and data as seem to be essential in any book for use in general practice. The text-book contains approximately three hundred and fifty pages of data and is well illustrated with diagrams throughout It is divided into the following six sections under each of which the subject is treated in detail, — Mathematical tables, etc.; geometrical properties of figures; weights, loads and strength of materials; stresses in structures; calculation for columns, foundations and beams; structural details.

ELECTIONS AND TRANSFERS

At the meeting of Council held on February 16th, 1923, the following elections and transfers were effected:—

Members.

CAMSELL, Charles, B.A., (Univ. of Man.), deputy minister, Federal Dept. of Mines, Ottawa, Ont.

CONKEY, Charles Rolland, Eng. of Mines, (Univ. of Minnesota), ch. engr., Fyles Construction Co., Ltd., Fort William, Ont.

McLEISH, John, B.A. (Univ. of Toronto), director, Mines Branch, Dept. of Mines, Ottawa, Ont.

VERNER, Edwin Ernest George Hamilton, district engr., Dept. of Public Works, Prov. of B.C., Port Coquitlam, B.C.

Associate Members

ADAMS, Andrew Hepburn Syme, M.A., B.Sc. (Glasgow Univ.), teacher of applied mechanics and strength of materials, Central Technical School, Toronto, Ont.

ANDERSON, James William, district sales engr., Canadian Crocker Wheeler Company, Limited, St. Catharines, Ont.

ARMSTRONG, Douglas Bond, design'g. office, Dominion Bridge Coy., Ltd., Lachine, Que.

FARNSWORTH, Frederick DeWitt, ch. engr., Reid, Farnsworth and Shafner, Ltd., engrs, and contrs., Annapolis Royal, N.S.

FINLAYSON, Ernest Herbert, B.Sc. (Univ. of Toronto), forest protection specialist, third office, Forest Branch, Dept. of the Interior, Ottawa, Ont.

GREEN, Leonard, sales engr., Power Plant and Steam Speciality Dept., Crane Limited, Calgary, Alta.

IVEY, Charles H., B.Sc. (McGill Univ.), works engr. and chemist, Empire Brass Manufacturing Co., Ltd., London, Ont.

MACDONALD, Redmond Donald, engr., Forestry Branch, Dept. of the Interior, Ottawa, Ont.

McLAREN, William Alfred, instr'man, C.N.R., Charlottetown, P.E.I.

MULLIN, James Walter, B.Sc. (McGill Univ.), engr.-in-charge, Marconi 6 k.w. ship stn. and new stn. for intercity work being erected Glace Bay, N.S.

PALMER, John, B.Sc., (London Univ.), dist. engr., Canadian Westinghouse Co., Montreal, Que.

STEPHEN, John, asst. to structrl. engr., Hydro-Electric Power Commn. of Ontario, Toronto, Ont.

SUTHERLAND, Mitchell Scobie, res. engr., Temiskaming and Northern Ontario Rly., James Bay Extension, of Cochrane, Ont.

WILSON, James Alexander, design'g. special drying plant for John Lumsden, Lumber Manufacturer, Ottawa, Ont.

WOOLLEY, Arthur, Statistician, Royal Commission, known as Survey Board, for Southern Alberta.

Juniors.

CARPENTER, Gordon Victor, mech. dftsman., J. M. Robertson, consulting engr., Montreal, Que.

DINGLE, James Christian, B.S., C.E., (Univ. of Manitoba), engr. for contractors, taking rock of channel leading to the Backus Brooks power house, Kenora, Ont.

Transferred from the class of Associate Member to that of Member.

CUMMIFORD, Shirley Armstrong, chief engr., Toronto and Hamilton, Highway Commn., Toronto, Ont.

GREEN, William Harvey, C.E., (Univ. of Toronto), acting city engr., building inspectr., and supt. of waterworks, Moose Jaw, Sask.

HUNTER, James Henderson, engr., Canada Starch Coy., St. Paul Land and Hydraulic Coy., and consulting engr., Corn Products and Refinery Coy., U.S.A., of Westmount, Que.

THERIAULT, Louis Leon, B.Sc., (Sacred Heart Coll.), and N.B.L.S., distr. highway engr., Dept. of Pub. Wks., New Brunswick, Fredericton, N.B.

WAY, William C., M.Sc. (Queen's Univ.), supervisor of surveys laboratory, Topographical Surveys Branch, Dept. of Interior, Ottawa, Ont.

Transferred from the class of Junior to that of Associate Member.

ALLINGHAM, Ralph, engr. in chg. constrn. country elevators in South Africa, A. W. Menkins, Durban, S. Africa.

HENDERSON, John Archibald Hamilton, B.Sc. (Queen's Univ.), observer, primary triangulation B.C., for Geodetic Survey of Canada, Ottawa, Ont.

MACINTYRE, W. Bryce, B.A.Sc., (Univ. of Toronto), in chg. sewer design, Barber Wynne-Roberts and Seymour, Toronto, Ont.

MITCHELL, Humphrey George, B.Sc., (Univ. of Manitoba), distribution engr., Winnipeg Hydro-electric System, Winnipeg, Man.

MOORE, Ulric Robert, instr'man., Hydro-Electric Power Commn., Niagara Falls, Ont.

THURBER, George Henry, Dept. of Public Wks. Canada, St. John, N.B.

WHITMAN, Clyde Oliver, B.Sc. (N.S. Tech. Coll.), asst. master, Baron Byng High School, Montreal.

Transferred from the class of Student to that of Member.

NARRAWAY, Athos Maxwell, B.Sc., (McGill Univ.), controller of surveys, Topographical Surveys Branch, Dept. of Interior, Ottawa, Ont.

Transferred from the class of Student to that of Associate Member.

DUGUID, Arthur Fortescue, B.Sc., (McGill Univ.), Col. on staff, Director of Historical section, General Staff, Militia Hdqrs., Ottawa, Ont.

McCAFFREY, Walter Rayner, B.A.Sc., (Univ. of Toronto), sales engr., National Fireproofing Co. of Canada, Ltd., Toronto, Ont.

Transferred from the class of Student to that of Junior.

ALLEN, Gerald Nicholson, rodman on constrn., C.N.R. Moncton, N.B.

FOX, Edward Cecil Evans, dftsman., McGregor & McIntyre, Toronto, Ont.

PYBUS, Ralph Carr, B.Sc., (C.E., Univ. of Manitoba), demonstrator in civil engr'g., Univ. of Manitoba, Winnipeg, Man.

WALLACE, Archer McKay, B.Sc. (Queen's Univ.,), foreman on reinforced concrete constrn., Canadian Des Moines Steel Coy., Chatham, Ont.

Recent visitors at Headquarters from out of town

J. B. Barnum, A.M.E.I.C., Breakeyville, Que., Peter Gillespie, M.E.I.C., Toronto, Ont., Chas. A. Norris, S.E.I.C., Toronto, Ont., R. W. Leonard, M.E.I.C., St. Catharines, Ont., E. C. Evans Fox, S.E.I.C., Toronto, Ont.,A. Gray, M.E.I.C., St. John, N.B., J. B. Carswell, A.M.E.I.C., Toronto, Ont., W. S. Lawson, M.E.I.C., Ottawa, Ont., C. M. Low, A.M.E.I.C., Cochrane, Ont., Wm. Smaill, M.E.I.C., Vancouver, B.C., L. L. Brown, A.M.E.I.C., Victoria, B.C., M. W. Maxwell, A.M.E.I.C., Alice Arm, B.C., Ira P. Macnab, A.M.E.I.C., Halifax, N.S., A. L. Mudge, A.M.E.I.C., Toronto, Ont., C. Ben Bate, A.M.E.I.C., Ottawa, Ont., C. N. Shanley, A.M.E.I.C., Chicoutimi West, P.Q., A. Babin, A.M.E.I.C., Matane, Que., E. Fortin, Jr.E.I.C., Sudbury, Ont., Edw. A. Evans, M.E.I.C., Quebec, Que., D. W. McLachlan, M.E.I.C., Ottawa, Ont., Wm. P. Anderson, M.E.I.C., Ottawa, Ont., R. C. Flitton, A.M.E.I.C., Peterborough, Ont., J. W. Hayward, A.M.E.I.C., New York, N.Y., Victor E. A. Belanger, M.E.I.C., Hawkesbury, Ont., C. E. W. Dodwell, Hon. M.E.I.C., Halifax, N.S., Horace L. Seymour, A.M.E.I.C., Toronto, Ont., G. Ernest Booker, A.M.E.I.C.,, St. Annes de Bellevue, Que., B. J. Saunders, M.E.I.C., Edmonton, Alta., S. J. Chapleau, M.E.I.C., Ottawa, Ont., H. E. Bates, A.M.E.I.C., Grand Mere, Que., Charles H. Keefer, M.E.I.C., Ottawa, Ont., T. C. Keefer, A.M.E.I.C., Ottawa, Ont., J. W Roland, M.E.I.C, Halifax, N.S., J. D. Tully, S.E.I.C., Calgary, Alta.

Publication

Belt Conveyors and Belt Elevators, by Frederick V. Hetzel, M.E., published by John Wiley and Sons, Inc. This textbook contains three hundred and twenty pages of descriptive matter and important data and is intended by the author, who has for the past thirteen years been chief engineer of one of the largest companies engaged in this business, for use as a practical book. The material has been divided into two principal sections, the first dealing with belt conveyors and the second with belt elevators, the chapters in each of these sections treating at some length the various details and types of equipment.

OTHER SOCIETIES NEWS

Councillors and Officers of Associations of Professional Engineers in the various Provinces of Canada.

For the information of the members of the Institute there is given below a list of the councillors and officers of the associations of professional engineers in the various provinces in Canada, together with a summary of the membership of each organization.

The Association of Professional Engineers of Alberta 1922-23

President	R. G. Drinnan, Edmonton.
Vice-President	W. B. Trotter, A.M.E.I.C., Calgary.
Past-President	R. A. Brown, Calgary.
Representative on the Senate of the University of Alberta	A. S. Dawson, M.E.I.C., Calgary.
Councillors:	
Civil	L. C. Charlesworth, M.E.I.C., Edmonton.
	*F. W. Alexander, M.E.I.C., Edmonton.
Electrical	*T. Schulte, Strathmore.
	H. J. McEwen, A.M.E.I.C., Calgary.
Mechanical	*C. A. Robb, A.M.E.I.C., Edmonton.
	R. S. Trowsdale, A.M.E.I.C., Calgary.
Mining	*B. L. Thorne, M.E.I.C., Calgary.
	Wm. Stevenson Jr., Hillcrest.
Registrar	R. S. L. Wilson, A.M.E.I.C., University of Alberta, Edmonton, Alta.
Secretary-Treasurer	W. M. Fife, Jr.E.I.C., University of Alberta, Edmonton, Alta.

*To retire in 1923.

Registration of Members.

Civil 213; electrical 21; mechanical 33; mining 54.

The Association of Professional Engineers of the Province of British Columbia

President	A. E. Foreman, M.E.I.C., Vancouver.
Vice-President	Chas. Brakenridge, M.E.I.C., Vancouver.
Registrar and Secretary-Treasurer	E. A. Wheatley, A.M.E.I.C., 930 Birks Bldg., Vancouver, B.C.
Councillors:	Jas. Muirhead, M.E.I.C., Vancouver.
	D. O. Lewis, M.E.I.C., Vancouver.
	E. E. Brydone-Jack, M.E.I.C., Victoria.
	F. Sawford.
	E. G. Matheson, M.E.I.C., Vancouver.
	H. L. Robertson.
	F. W. Guernsey.
	J. R. Grant, M.E.I.C., Vancouver.
	Patrick Philip, M.E.I.C., Victoria.

Registration of Members.

Civil 313; mining 84; electrical 59; mechanical 77; structural 18; railway 21; chemical 12; logging 7; forest 3; municipal 3; telephone 2; geographical 1; hydrographic 1; hydraulic 1; irrigation 1.

The Association of Professional Engineers of the Province of Manitoba

President	A. A. Young, A.M.E.I.C., Winnipeg.
Vice-President	E. V. Caton, M.E.I.C., Winnipeg.
Secretary-Treasurer and Registrar	Geo. L. Guy, M.E.I.C., 503 Tribune Bldg., Winnipeg, Man.
Councillors	E. P. Fetherstonhaugh, M.E.I.C., Winnipeg.
	A. J. Taunton, A.M.E.I.C., Winnipeg.
	F. H. Martin, M.E.I.C., Winnipeg.
	C. H. Fox, M.E.I.C., Winnipeg.

Registration of Members.

Chemical 2; civil 163; electrical 48; mechanical 79; mining 14.

The Association of Professional Engineers of the Province of Ontario

President	Willis Chipman, M.E.I.C., Toronto.
Vice-President	F. R. Ewart, M.E.I.C., Toronto.
Past-President	C. H. Mitchell, C.B., C.M.G., M.E.I.C., Toronto.
Registrar and Secretary-Treasurer	R. B. Wolsey, 96 King St. W., Toronto.
Councillors:	
Civil	A. W. Gray, A.M.E.I.C., Ottawa.
	*A. H. Harkness, M.E.I.C., Toronto.
	H. J. Lamb, M.E.I.C., Toronto.
Mechanical	H. H. Angus, Toronto.
	Frederick Burnett, Toronto.
	*A. K. Spotton, Gault.
Chemical	D. J. Huether, Toronto.
	*J. Watson Bain, Toronto.
	E. T. Sterne, Brantford.
Electrical	S. E. M. Henderson, Toronto.
	*A. B. Lambe, A.M.E.I.C., Ottawa.
	M. J. McHenry, Walkerville.
Mining	J. A. Reid, M.E.I.C., Cobalt.
	*George R. Mickle, Toronto.
	D. E. Keeley, Schumacher.

*Appointed by Lieut-Governor in Council.

Registration Members

Civil 287; mechanical 38, electrical 90; chemical 14; mining 50.

Corporation of Professional Engineers of Quebec

President	A. R. Decary, M.E.I.C., Quebec.
Vice-President	K. B. Thornton, M.E.I.C., Montreal.
Secretary-Treasurer	Frederick B. Brown, M.E.I.C., Montreal.
Registrar	A. Mailhoit, Room 75, No. 294 St. Catherine St. E., Montreal.
Councillors:	
Montreal District	Frederick B. Brown, M.E.I.C., Montreal.
	C. N. Monsarrat, M.E.I.C., Montreal.
	J. M. Robertson, M.E.I.C., Montreal.
	Arthur Surveyer, M.E.I.C., Montreal.
	K. B. Thornton, M.E.I.C., Montreal.
Quebec District	A. R. Decary, M.E.I.C., Quebec.
	J. E. Gibault, A.M.E.I.C., Quebec.
	A. B. Normandin, A.M.E.I.C., Quebec.

Total membership 905.

The Association of Professional Engineers of the Province of New Brunswick

President	B. M. Hill, M.E.I.C., Fredericton.
Vice-President	G. G. Murdoch, M.E.I.C., St. John.
Secretary and Registrar	J. A. W. Waring, A.M.E.I.C., Asst. Engr., C.P.R., St. John.
Councillors:	
St. John District	Frank P. Vaughan, M.E.I.C., St. John.
	Harry F. Bennett, A.M.E.I.C., St. John.
Moncton District	J. D. McBeath, M.E.I.C., Moncton.
	K. S. Pickard, A.M.E.I.C., Sackville.
Chatham District	R. J. Sandover Sly, A.M.E.I.C., Campbellton.
Fredericton "	E. O. Turner, A.M.E.I.C., Fredericton.

Registration of Members.

Civil 150; electrical 9; mechanical 8; chemical 1; civil and mining 1; civil and mechanical 4; civil, mechanical and mining 1; civil, electrical and mechanical 2; electrical and mechanical 1.

The Association of Professional Engineers of Nova Scotia

President	C. E. W. Dodwell, Hon.M.E.I.C., Halifax.
Vice-President	A. R. Chambers, M.E.I.C., New Glasgow.
Secretary and Registrar	W. P. Morrison, M.E.I.C., P.O. Box 225, Halifax.
Councillors:	R. P. Donkin, Halifax.
	R. W. McColough, A.M.E.I.C., Halifax.
	W. P. Morrison, M.E.I.C., Halifax.
	*D. W. Robb, M.E.I.C., Amherst.
	*W. A. Hendry, A.M.E.I.C., Halifax.
	*F. H. Sexton, Halifax.
	*F. W. W. Doane, M.E.I.C., Halifax.
	*T. J. Brown, M.E.I.C., Halifax.
	*L. H. Wheaton, A.M.E.I.C., Halifax.
	*J. L. Allen, M.E.I.C., Dartmouth.
	F. R. Faulkner, M.E.I.C., Halifax.
	K. H. Smith, M.E.I.C., Halifax.
	C. H. Wright, M.E.I.C., Halifax.
	A. F. Dyer, A.M.E.I.C., Dartmouth.

*Appointed by Lieut-Governor in Council.

Registration of Members.

Civil 156; mechanical 47; mining 20; electrical 16; chemical 1.

American Water Works Association

The mid-winter meeting of the Canadian Section of the American Water Works Association, was held in Toronto on Thursday and Friday, February 22nd and 23rd, with headquarters at the Carls-Rite hotel. This meeting proved to be one of the most interesting of the section and in addition to the business sessions which occupied the forenoon of the first day of the meeting, the following interesting papers were presented — "Water Works Intakes" by Prof. R. W. Angus, M.E.I.C.; "Preparation of Water for Filtration" by A. V. DeLaporte, A.M.E.I.C., and F. A. Dallyn, A.M.E.I.C.; "Waterworks Records and Accounting" by Mr. Henderson, the Peterborough Utilities Commission; "Chlorination Apparatus and its Control" by G. A. H. Burn and A. E. Berry, A.M.E.I.C.; "Special Water Works Tools and Equipment" by Alexander Milne, A.M.E.I.C.; "Application and Operation of Gasoline Auxiliary Pumps" by S. L. Fear, M.E.

University of Toronto Engineering Alumni Pacific Coast Branch.

The Pacific Coast Branch of the University of Toronto Engineering Alumni Association held a very successful annual dinner in the University Club, Vancouver, on Saturday, January 27th, this being the sixth occasion on which "Schoolmen" on the coast have foregathered for the annual liberation of "Toike Oike" enthusiasm.

The menu-card problem is becoming increasingly acute, year by year, owing to the competition between committees, each of which considers itself in honour bound to produce a design which is new and startling. The designs of the past two or three years have been quite unique in arrangement and contain a very original line of wit. Therefore the task facing this year's committee was no easy one: but notwithstanding, the design evolved was quite the equal of its predecessors, being in the nature of a prospectus for a mining concern, in which the "Toike Oike Development and Improvement Company" gave a report of the "Sixth Annual General Meeting of Shareholders".

The evening passed very pleasantly, being, as usual, marked by the absence of undue formality. Prominent among the after-dinner speakers was J. H. Kennedy, M.E.I.C., who was recently made a life member of *The Institute*, and who enjoys the further distinctions of being the oldest living graduate of the "School" and honorary president of the Pacific Coast Branch. Another speaker of special interest was Major Cecil R. Crysdale, M.E.I.C., recently returned to Vancouver on an extended furlough, from the Gold Coast, where he has been engaged on the construction of railways and harbour works at Seccondee, for the past year. Mr. Kennedy's speech was in reply to the toast to the "Old Red School", and partook of the nature of very valuable fatherly advice to the younger "schoolmen" present. who will undoubtedly profit much thereby. Major Crysdale's remarks were directed to his experiences on the Gold Coast and a general explanation of the work in progress there, all of which were heard with very good interest.

About thirty-five were present at the dinner. T. H. Crosby occupied the chair, being president of the Branch for the year 1923. The dinner was made the more lively by numerous songs and yells, in which every son of the "School" knows well how to make himself heard.

Association of Professional Engineers of the Province of New Brunswick.

The annual meeting of the Association of Professional Engineers of the Province of New Brunswick was held in St. John on January 26th, C. C. Kirby, M.E.I.C., vice-president, occupied the chair and presented the report of the council and the financial statement for the year ending December 31st, 1922. It was shown that there are 177 registered members and seven licenses have been issued during the year. The financial statement showed a surplus of assets over liabilities of $3,373.13.

Association of Professional Engineers of the Province of Manitoba

On Thursday, January 18th, the Association of Professional Engineers of Manitoba held their Annual Meeting. The chief business of the evening was the election of members of Council and officers for the year 1923. D. A. Ross, M.E.I.C., retiring president, presided. While the scrutineers were counting the ballots, Professor Wright, Ph.D., of the department of Philosophy of the University of Manitoba addressed the meeting on "Professional Ideals". He took as his text Kipling's poem "The Sons of Martha" which expressed the popular impression that the technicians — the Sons of Martha actuated on a lower plane than the intellectuals — the Sons of Mary.

This impression is founded on two notions which the professor stated were fallacious and based on an explored philosophy.

Dr. Wright made a strong plea to engineers who are peculiarly well situated to do so, to strive for the education of the workers that they might be given the opportunity to participate in the social and moral standing which is now the prerogative of the professional classes, to teach them to depend on the higher satisfactions which professional men enjoy, the satisfaction of the professional ideal, creative in its end. Co-operative in its relations.

After Dr. Wright's lecture, the scrutineers reported that A. U. S. Taunton, A.M.E.I.C., F. H. Martin, M.E.I.C. and Harry Fox, A.M.E.I.C. had been elected to fill the vacancies in council. Subsequently A. A. Young, M.E.I.C., was elected president, E. V. Caton, M.E.I.C., vice-president, and Geo. L. Guy, M.E.I.C., re-elected registrar.

A vote of congratulations was extended to W. E. Hobbs, A.M.E.I.C., who had been appointed deputy provincial secretary, and to Douglas L. McLean, A.M.E.I.C. appointed deputy minister of public works.

Wallace Leppard, a third year student in the University, who won the Association's scholarship, was presented to the meeting and met with a hearty reception.

On the motion of P. Burke-Gaffney, A.M.E.I.C., and seconded by C. S. Landon, A.M.E.I.C., the following resolution was passed — "That a deputation interview the Provincial Government with the request to eliminate the provision of gratuitous engineering service on projects upon which the Government has no direct financial interest". It was pointed out that owing to the fact that the Government maintained large engineering staffs for carrying out projects undertaken in conjunction with Municipalities, that municipal officials had grown to

believe that these staffs were available for any engineering service whatsoever, which resulted in engineers in the public service being called upon to do work outside their duties to the detriment of engineers in private practice.

On the motion of W. P. Brereton, A.M.E.I.C., the council was instructed to enforce the by-laws in so far as they related the engineers not in good standing who were practising.

Growing out of the president's address, a lengthy discussion arose as to the relation between *The Institute* and the Association of Professional Engineers; while no action was taken towards defining the relationship it was agreed that a condition existed which could not continue indefinitely, and a solution would have to be sought in the near future.

The retiring president gave an address covering the history of the formation of the Association in Manitoba; the work accomplished by the organization to date, and the aims of the Association. He dealt at length with the relation of *The Institute* to the Association, and accurately outlined the jurisdiction of each. He dealt with certain criticisms which had been aimed at the operations of the Association, in that no immediate benefit was being derived. He recited what had been achieved and the part that this Association played with respect to the final scheme of a Dominion-wide organization. He pointed out that all the fees paid in Manitoba were less than those charged in some provinces by the Association alone. He discussed suggestions for the holding of the annual meeting of the Association to make it more interesting and attractive to the members. He thanked the membership at large for the high honour they conferred on him in electing him twice to the council and finally to the presidency, and expressed his warm appreciation of the helpful advice and the work of the members of council and the board of examiners and officers of the Association.

Publications

The Building Labour Calculator; by Gordon M. Tamblyn, author and publisher, Denver, Colorado. This ready reference calculator is published in loose leaf form in order that the monthly service, which is carried on in connection with it, may provide the owner with a book based on the most recent information available.

British Standard Specification. Specification No. 99-1922 on the subject of copper-alloy pipe fittings for pipe sizes from ⅛ inch to 4 inches has just been issued by the British Engineering Standards Association. The report deals with the material to be employed, testing and dimensions for equal and reducing sockets, elbows, tees, plugs, crosses, return bends, etc., and both short turn and long sweep fittings are included. It also contains numerous tables for equal fittings and the methods to be adopted for calculating the dimensions of reducing fittings, accompanied by explanatory figures in each case. Tables of centre to face dimensions for reducing fittings are given and also the standard sizes of these fittings in both short and long sweep varieties. Each type of fitting dealt with is illustrated by a figure. Some notes follow on the design of the fittings, accompanied by a diagram illustrating the method of setting out the curves. The report concludes with appendices regarding screw threads and British Standard test pieces.

List of Specifications and Reports The British Engineering Standards Association has issued a list of specifications and reports published by the Association to November 1922. This list also includes the names of the specifications and reports which have been translated into French, Italian, Portuguese and Spanish.

CORRESPONDENCE

Interesting Letter from Argentina

In view of the interesting information contained in a letter just received from Verne Leroy Havens, M.E.I.C., New York, editor, Ingenieria Internacional, it is being published in the knowledge that it will be read with interest by members of *The Institute* throughout Canada.

Buenos Aires Argentina
January 14th, 1923.

Dear Mr. Keith:

It was indeed with great pleasure that I learned of my election to membership in *The Engineering Institute of Canada* and I hope that time and opportunity may permit me to be of some service to that honourable institution. You of course understand that the delayed reply to your notification was caused by my travels in South America, your communication only having been received a few days ago. My check for the amount due has gone in a separate communication.

I was especially pleased to meet Dr. O. Temple Piers, A.M.E.I.C., member of *The Institute*, at the International Engineering Congress in Rio de Janeiro. I had known him previously but was not sure that his work at McKenzie College would permit him to be present at the congress. He presented a paper there that was very well received by both Brazilians and foreigners, on his method of teaching surveying. Dr. Piers is held in very high esteem in Brazil and the graduates of McKenzie College enjoy a very high measure of success.

The first issue of the Revista da Club de Engenharia since 1913 was published about a month ago and a copy of it was sent to my office in New York for transmission to you. It contains a very extensive report on the International Engineering Congress but does not reproduce the papers presented. As far as I know the only place these papers will be available for a year at least, will be in Ingenieria Internacional and only in Spanish as we do not publish in English.

The congress was very successful from many points of view, but being the first incident of the kind in the history of South America it did not proceed as smoothly nor as rapidly as one might desire. I think these meetings are of great value in developing friendship and understanding between the engineers of the western world and have reason to believe that there will be many such in the coming years.

I want to thank you for your personal message of October 26th and regret exceedingly that it was not my good fortune to see you in New York in December.

Sincerely Yours,
V. L. HAVENS, M.E.I.C.

Trade Publication

De Laval Steam Turbine Co. Small single-stage centrifugal pumps for motor or belt drive are described in a leaflet and in an instruction manual issued by this company. These publications give very complete tables and instructions for selecting pumps for different conditions, and explain how to determine the proper speeds and how to select piping, valves, fittings, and driving pulley or motor to secure an efficient and satisfactory installation.

Preliminary Notice

of Applications for Admission and for Transfer

19th February, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his eferences.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in March, 1923

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineers' office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements ,or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BRANCH—ALEC JOHN, of Lethbridge, Alta. Born at London, England, Apr. 26th, 1889. 1905-06, and 1907-10, asst. to arch't. and surveyor, London, experience in drftng. (Archt'rl.), specifications, quantities and genrl. bldg. constrn.; 1910-14, asst. engr., waterworks and sewers dept., G. H. Altham Macleod, city engr., constrn. all waterworks and sewers, construct'g. new lines in C.L. pipe, inspectr. for town of MacLeod on constrn. water filtration plant; 1914-19, 1st field coy., Can. Engrs.; 1919 (July-Nov.), leveller and topogr., Dominion Irrig. Dept. survey on irrig. project, Cardston dist.; 1920 (May-Nov.), and May 1921 to date, instr'man. and inspectr., constrn., Lethbridge Nor. Irrig. project, Lethbridge Northern Irrigation District, Lethbridge, Alta.

References: H. B. Muckleston, C. M. Arnold, F. S. Dyke, F. M. Wood, E. I. H. Ings.

BRIMER—LAURENCE FREDERICK, of Winnipeg, Man. Born at Toronto, Ont., Jan. 31st, 1896. Educ., B.Sc., (E.E.), Univ. of Man., '22; 1917 (May-Dec.), leveller, Dominion Topographical Surveys; 1918 (May-Oct.), dftsman., Winnipeg Hydro.; 1919 (July-Oct.) and 1921, (May-Oct.), journeyman, maintenance, Winnipeg Hydro, Pointe du Bois, Man.; at present, distribution dept., Winnipeg Hydro-Electric System, Winnipeg, Man.

References: E. V. Caton, E. P. Fetherstonhaugh, J. W. Dorsey, N. M. Hall, J. N. Finlayson, C. A. Clendenning.

CROOK—WESLEY, of Brooks, Alta. Born at Winnipeg, Man., Oct. 30th, 1895. Educ., 1st yr. Arts, Wesley Coll., Winnipeg, 1913-14, and senr. matric. for engr'g., 1st yr. engr'g., Univ. of Manitoba, 1919-20, 3½ yrs. Canadian Engineers, France, 2¾ yrs., rodman and leveller, engr'g. branch, C.P.R., Dept. Natural Resources, Brooks; 1922, field work in connection with seepage and drainage, Eastern Section, C.P.R., Irrigation Block; at present, leveller, C.P.R., Dept. Natural Resources, Brooks, Alta.

References: F. G. Cross, C. C. Elliott, S. H. Frame, E. P. Fetherstonhaugh, R. W. Moffatt, C. A. Pope.

CUMMING—ROBERT EGERTON, of Quebec, Que. Born at Brixton, England, April 28th, 1873. Educ., Thanet Coll., 1890; 1st class cert., Society of Science, London, England; 5 yrs. appr'tceship, 2 yrs. service, Thomas & Thomas, consulting engrs., London; 1904-06, constrn. and surveying, Chibougamau Mining Co., P.Q.; 1907, asst. to Dr. De Romeau, collecting specimens and geological data, Chibougamau region; 1908-09, contrn. engr. on constrn., N.T.Rly. and 1910-12, asst. engr.; 1912-13, res. engr., and 1914 (June-Oct.), constrn. engr., N.T.Rly.; 1913-14, asst. engr., Dept. Pub. Wks., Quebec; 1915-18, 60th and 9th Can. Inf. Bde.; 1918-19, commn., Can. Engrs.; 1919 (Aug.-Dec.), contrs. engr., C.N.R.; 1920 to date, engr., design and constrn. rly. trestles, bldgs., wharves, bridges etc., Brown Corporation, Quebec, P.Q.

References: G. Grant, A. E. Doucet, J. E. Gibault, S. L. de Carteret, A. Ferguson, A. Dick, I. Vallee, J. C. Kemp, D. S. Scott.

ELMSLIE—GORDON ALEXANDER, of Lasalle, Que. Born at Boston, Mass., Feb. 21st, 1897. Educ., pvte tuition, engr'g., Alex. Hamilton, business course; 1912-13, drawing and estimating, Dominion Bridge Co., Ltd.; 1913-15, bridge and struct'l. work, Quebec Brdge.drawing and templet making; 1916, chg. riding-sch., Shorncliffe, England; 1916-17, France; 1917 (July-Oct.), military sch. and coll., Oxford and Denham, Eng.; 1918 (Jan.-Sept.), Flight Commdr., R. A. F. and 1918-19, Capt. on staff; 1920-21, plant engr'g. work bldg. design and constrn., Dom. Engr'g. Wks., Ltd., and Dom. Bridge Co., Ltd.; 1921-22, bldg., constrn and estimating; at present, in chg. Dept., Dominion Bridge Co., Ltd.

References: F. P. Shearwood, L. R. Wilson, D. C. Tennant, A. Peden, C. H. Timm, P. L. Pratley.

HOGG—ROBERT, of Thorold, Ont. Born at Glenosheen, Ireland, July 17th, 1895. Educ., Kilkenny Coll., 1908-12; 1912-14, chemist Imperial Varnish and Color Co., Toronto, 1912-14; 1914-18, active service; 1918 (Oct.-Dec.), chemist, British Acetones, Toronto; 1919-20, chemist, Ontario Paper Co., Thorold; 1920, rodman, Welland Ship Canal; 1921 (six mos.), course, paper mill chemistry under Dept. Soldiers Civil Re-establishment; to date, asst. to the tester of building materials and, at present, senior laboratory assistant, Welland Ship Canal, Testing Laboratories, Thorold, Ont.

References: A. J. Grant, W. H. Sullivan, F. S. Lazier, C. W. West, E. P. Murphy.

HOLE—JOHN, of Toronto, Ont. Born at Bradninch, England, Jan. 23rd, 1874. Educ., Tech. scholarship to Finsbury Tech. Coll., and 2 years., engr'g. course; six yrs. prelim. engr'g. work till 1898; 1898-07, in chg. estimating and supt'g. bldgs., E. C. Christmas, Forest Hill, London, England; 1907-10, Darling & Pearson, and Storey & Van Egmond, arch'ts., Regina, and asst. drainage engr., Pub. Wks. Dept., Sask.; 1910-12, engr. in chg. re-modelling coal handling plants and all engr'g. work, Elias Rogers Coal Co., Ltd., Toronto; 1912-16, asst. ch. dftsman., topgr'l, mech. and arch'tl. drawing, and engr'g. layouts and design, Toronto Harbour Commrs.; 1916-18, asst. supt. constrn.; 1919-20, arch't. and engr., Toronto Housing Commn.; 1920-22, res. architect and engr., Toronto Harbour Commnrs.; to date, pvte. prtce., constrn. engr'g., design and supt'ce., housing develop'mt., design'g. and organizing industrial layouts, valuation and erection of bldgs., 167 Yonge Str., Toronto.

References: E. L. Cousins, G. T. Clark, N. D. Wilson, J. G. R. Wainwright, H. A. Goldman, A. E. K. Bunnell, J. M. Oxley.

HOPPER—ALFRED EDWARD, of Westboro, Ont. Born at Darlington, Eng., July 20th, 1870. Educ., engr'g., Kendrew St. Science Sch., Darlington, and Marine Academy, Hartlepool; 6½ yrs., engr. appr'tce., works and drawing office, Nor. Eastern Rly. Co., Darlington; 1891-92, G. T. Rly., Montreal; 1892-98, sea-going engr., foreign; 1898-1910, senr. engr., C.P.R. Co.'s .Trans. Pac. service.; 1910-18, steamship inspectr., inspect'g. hulls, equip'mt., boilers and machinery of steamships, Vancouver, B.C.; 1919 to date, Principal Inspectr. of boilers and machinery, passing on plans of same, also supervising repairs, Dept. of Marine and Fisheries, Ottawa, Ont.

References: F. McDonnell, J. G. MacPhail, B. H. Fraser, V. W. F. Forneret, W. H. Carson.

LIVINGSTONE—ROBERT, of Lethbridge, Alta. Born at Youngstown, Ohio, U.S.A., Dec. 9th, 1872. Registered holder under Mines Act Prov. of Alberta, 3rd class No. 7, 2nd class No. 6 and 1st class No. 161, Mine Surveyor's certificates; 38 yrs. experience in coal mining as follows:—1896-99, in chg. underground work, Alberta Rly. and Irrig. Co., Galt Mines; 1900-06, Pit Boss, in chg. underground work, Galt Mine No. 3; 1907, mine mgr. and engr., Standard Coal Co., Edmonton, Alta.; 1908, distr. inspectr. of mines, and 1909, chief insstectr. of mines, Prov. of Alberta; 1910 to date, mine manager and engineer, Galt Mines, Lethbridge, Alta.

References: L. Stockett, B. L. Thorne, C. Raley, S. G. Porter, C. M. Arnold.

MANBEY—BERNARD FREDERICK, of 818, 6th Ave., S., Lethbridge, Alta. Born at Acton Green, England, Dec. 15th, 1886. Articled pupil to munic. engr., and asst. on constrn., 3 years.; 1906-07, asst. clerk for works on extensn. to boiler house, generating stn., and large storm water sewer system, etc.; 1907 (six mos.), chainman, G.T.P. main line, Headingly, Man.; 1907-09, asst. to ch. dftsman., and 1909 (Jan.-May) transf. to constrn. office, C.P.R., Winnipeg, Man.; 1909 (May-Dec.), checker and grader, East Kootenay Lumber Co., Jaffray, B.C.; 1910-11, dftsman., Manitoba Govt. Telephones, Winnipeg; 1911-12, dftsman., Alberta Central Rly., Red Deer, Alta.; 1912-16, ch. dftsman., Alberta Govt. Telephones, Edmonton, Alta.; 1916-22, army, C.E.F., and Y.M.C.A. work, latterly Genrl. Secy., Lethbridge; 1922 to date, dftsman., Lethbridge Northern Irrigation District, Lethbridge, Alta.

References: W. R. Pearce, H. B. Muckleston, P. M. Sauder, F. S. Dyke, G. N. Houston, G. S. Brown, C. Raley.

MEDFORTH—GEORGE TAYLOR, of Amherst, N.S. Born at Burton, England, Dec. 7th, 1888. Educ., Hull Tech. Coll., 1904-05, and evening courses, elec. engr'g., Leeds Univ., 1906-07; 1906-07, workshop training, A. Dickinson & Son, elect. engrs., Leeds, 3 mos. in drawing office; 1908-09, junr. asst. engr., Newcastle-on-Tyne Electric Supply Co., Ltd.; 1910-11, senr. chg. engr., Gateshead-on-Tyne sub-stn., 4000 k.w. capacity, lighting power and traction with steam elec. standby, 9 mos., Bankfoot power stn., 3000 k.w. steam-elec. with equip'mt. being installed to bring capacity up to 6000 k.w.; 1911-12, alternating and direct current design, Hull Tech. Coll.; 1912-13, chg. constrn. work, Chapman & Walker, Toronto, Ont.; 1914-15, supervising changing over of plant and system, Charlottetown Elec. Light Co.; P.E.I.; 1915-17, Canadian Engrs., France; 1917-19, Lieut., field Coy., Royal Engrs.; 1919-20, elec. engr., Maritime Electric Co., 1920 to date, mng. engr., Canada Electric Co., Ltd., Amherst, N.S., and consltg. engr., Maritime Rly. and Power Co., Ltd., Foggins Mines, N.S.

References: G. E. Newill, D. W. Robb, J. Cumbertord, J. F. Wightman, A. L. Mieville, J. A. Burnett.

PATRICK—PAUL WALLACE, of Brooks, Alta. Born at Augusta, Mo., U.S.A., Aug. 22nd, 1901. Educ., I.C.S.; one season, rodman, Strathmore C.P.R., D.N.R.; 3 yrs., rodman and asst. hydrographer, C.P.R., D.N.R., Brooks, Alta., and at present, asst. hydrographer

References: A. L. Ford, G. P. F. Boese, G. A. Patrick, P. A. Fetterley, C. A. Pope.

[illegible]—WILLIAM WORTH, of 27 [illegible] St., Toronto, Ont. Born [illegible] [illegible] N.Y. [illegible] Hardie's [illegible] N.Y. [illegible] engr. and contr., N.Y.; 1906-12 [illegible] engr. and contr., N.Y.; 1908-13, chief engr. and Vice Pres., Radley Steel Construction Co., N.Y. [illegible] large bldgs. in N.Y. [illegible] 1913-19, City Architect for Toronto [illegible] hundred million dollars of structural work; to date, Business Administrator and Sec.-Treas., Board of Education, Toronto, Ont.

References: P. Gillespie, J. M. Oxley, R. J. Marshall, A. Harkness, G. G. Powell.

SANDWELL—PERCY, of Powell River, B.C. Born at Holloway, Middlesex, England, Nov. 7th, 1888. Educ., secondary High School, London; 1904-09, app'tice, G. Aston and Sons, Engrs., London, N.; 1909-11, erectr. and management of steam [illegible] plant, Hale's Ltd., London, N.; 1911-13, ch. mech. dftsman., design and constrn. of machinery and bldgs., under regulation of London County Council, Shepherds Bush, [illegible] Ltd., London, W.; 1913-14, engr. in chg. works dept., [illegible] and reconstrn. existing mills and plant layout and equipment new mills, steam plant, etc., Gilbey [illegible] and Spencer, Ltd., Millers and Seed Mfrs., Rotherhithe, London, S.E.; 1914-16, staff Sergt., in chg. ordnance and machinery, 72nd Bde., R.F.A., France; 1916-20, Lieut. R.E., special employ; inspectr. of works, 1918, Divn. Officer R.E., 1919; staff officer, C.R.E., Boulogne 1920; 1920 to date, engr. and dftsman., design of machinery and layout of plant extensions and new bldgs., under R. Bell-Irving, Powell River Company, Ltd., mfrs. of newsprint, Powell River, B.C.

References: W. G. Swan, R. Bell-Irving, E. A. Jamieson, C. T. Hamilton, J. T. Fullerton.

VENNES—HAROLD J., of Westmount, Que. Born at Throndhjein, Norway, Sept. 16th, 1888. Educ., B.A., Univ. of Man., '16, 1915-16, research asst., physics, Univ. of Minn.; 1916-19, asst. in develop'mt. of carrier current telephone and equipment, etc., using vacuum tubes, Western Electric Co., New York; 1919-22, direct supervision of same and its application to commer. telephone and telegraph service, Western Electric Co., New York; 1922 to date, transmission engr., in chg. transmission work and manufacture vacuum tubes, Northern Electric Co., Ltd., Montreal.

References: W. C. Adams, J. D. Hathaway, P. F. Sise, C. P. Edwards, B. C. Nowland.

VIPOND—WILLIAM STANLEY, of Montreal, Que. Born at Hudson, Que., April 30th 1887. Educ., B.Sc., and M.Sc., McGill Univ., '08, post grad. course and demonstrator, '09; 1909-14, in chg. engr'g. dept., Wire and Cable Co.; 1915-19, asst. chief engr., Northern Electric Co.; 1918, overseas, Lieut. R.A.F.; 1919 to date, cable engr., in chg. cable engr'g dept., also chemical and electrical research laboratories, Northern Electric Co., Montreal, Que.

References: W. B. Cartmel, W. C. Adams. J. D. Hathaway, P. F. Sise, L. A. Herdt, K. B. Thornton, W. H. Eastlake, J. S. Cameron.

WALSH—MICHAEL, of St. Johns, Nfld. Born at Tuam, Ireland, May 13th, 1898. Educ., Bach. of Engr'g., National Univ., Ireland, '20; 1920-21, lecturer in maths physics and engr'g. drawing, Sir John Deane's Grammar Sch., Northwich, England; 1921 to date, asst. city engr., genrl. munic. engr'g., includ'g. waterworks and sanitary engr'g., surveying, levelling and constrn., St. Johns, Nfld.

References: F. H. Balfour, J. W. Morris, J. B. Baird, J. B. Gilliatt, J. H. Morley.

WORCESTER—WOLSEY GRANT, of Saskatoon, Sask. Born at Oberlin, Ohio, Oct. 9th, 1876. Educ., Ceramics, Ohio State, '99, also special work in geology; 1899-02, ceramist in clay plants in U.S.; 1902-06, ceramic engr., designer and constructing engr., on two clay plants in Ohio and one in Virginia W.; 1907-09, instructr. in ceramic engr'g., Ohio State Univ.; 1910-11, ceramic engr. in full chg. plant of Detroit Roofing Tile & Terra Cotta Co.; 1912-14, ceramic engr., designing and construct'g., 100,000 daily capacity brick plant, Calgary, Alta; 1915-20, genrl. ceramic engr'g. and geological work in consltg. capacity to the industry; 1921 to date, Professor of Ceramics Univ. of Saskatoon, and Provincial Ceramic Engr., Saskatchewan Government.

References: A. C. Garner, R. N. Blackburn, C. J. Mackenzie, G. M. Williams, A. R. Greig.

WRIGHT—GEORGE WILLIAM GRANT, of Regina, Sask. Born at Leicester, England, Aug. 21st, 1881. Educ., Munic. Tech. Sch., Leicester; 1899-03, junr. partner, Wright & Son, genrl. contrs., Leicester; 1904-11, senr. member, Wright & Co., arch'ts and builders, Regina, Sask.; 1912-13, dftsman. and checker, Regina Munic. Rly.; 1914, dftsman. and checker, Sask. Govt. Surveys Br. (L.T.O.); 1915-17, active service; 1918 to date, dftsman. and inspector, underground telephone system constrn., 1919-20, supervising inspectr., and asst. to constrn. engr., and at present, head drftsman., and inspector, Dept. of Telephones, Saskatchewan Govt., Regina, Sask.

References: D. W. Houston, T. McGuinness, S. R. Parker, A. C. Garner, M. B. Weeks, L. A. Thornton.

YERBURY—BERTRAM STUART, of St. Lambert, Que. Born at Poole, England, Mar. 2nd, 1881. Educ., evening course, mech. engr'g., Univ. Coll., Nottingham, England; 1897-03, pupil, Goddard, Massey & Warner, Nottingham; 1903-04, erect'g. pumps, engines etc., Davey, Paxman & Co., Colchester; 1904-05, dftsman, on extens. blast furnace dept., Frodingham Iron and Steel Co., Sydney, N.S.; 1911-13, dftsman., Algoma Steel Corp., Sault Ste. Marie, Ont.; 1913-16, 1 yr. dfting., 2 yrs. asst. res. engr., St. Lawrence Bridge Co., Montreal; 1916-18, overseas; 1918 (8 mos.), plant engr. (munitions), Symes Corp., Montreal; 1919 (Jan.-Aug.), design'g. and checking on 110" plate mill, Dominion Iron and Steel Co.; 1919-21, squad leader on new structrl. mill, Algoma Steel Corp.; 1921 (Apr.-Dec.), res. engr., Dominion Engr'g. and Inspection Co., Montreal; to date, design'g., estimating and assist'g., plant engr., Dominion Bridge Coy., Montreal, Que.

References: D. C. Tennant, G. F. Porter, F. Smallwood, K. H. Marsh, C. Stenbol, B. E. Barnhill, A. W. Sinnamon.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

CODE—ABRAM SILAS, of Alvinston, Ont. Born at Alvinston, Sept. 18th, 1873. O.L.S., '06; 1896-1923, general municipal engineering practice on following work:—1896-02, genr'l. munic. engr'g., drainage and dredge works, bridges, walks, sewers, etc., surveys and sub-divns., continued to 1923, when not otherwise engag'd., 15 townships and other municipalities. - - 1902-07, Northern Ont., township outlines, Ontario Govt.;1908-09, perche and pulse drainage schemes, Sarnia township; 1910; base Meridian lines, New Ont. for Ont. Govt.; 1911-12, valuation, Sarnia Gas and Electric Co.; 1913, township sub-divns., and 1919, township outlines, New Ont. for Ont. Govt.; for several years to 1920; county engr., for Lambton Co.; to date, general municipal engineering practice, Alvinston, Ont.

References: W. Chipman, E. R. Gray, P. Gillespie, J. A. Bell, J. J. Newman, G. A. McCubbin, W. A. McLean.

FOWLER—CHARLES ALLISON DEWITT, of Halifax, N.S. Born at Amherst, N.S., Nov. [illegible] 1890. [illegible] A. F. Reid & Co. [illegible] dept. of [illegible] Nova Scotia; 1916, instr'man., Halifax Ocean Terminals; 1916, [illegible] engr., Nova Scotia Tramways and Power Co., Halifax; 1917-18, constr. supt., new gas works and [illegible] generating plant, N.S. Tramways and Power Co.; 1919-20, asst. [illegible] engr. in chg. constrn., Halifax Shipyards Ltd.; 1921, to date, private practice, [illegible] Halifax Shipyards Ltd. in chg. [illegible] constrn., repairs, replacements, etc.; by Provincial Govt. to investigate and [illegible] Halifax Tramway Valuation, before N.S. Public Utility Board to determine fair value for rate making, retained by St. Joseph's Orphanage Co., in chg. constrn. orphanage, preparation of plans, supervisn. etc., under name of C. A. Fowler & Co., Architects and Engineers, Halifax, N.S.

References: F. R. Faulkner, I. P. MacNab, O. S. Cox, C. H. Wright, F. A. Bowman, P. A. Freeman, H. Donkin, W. P. Morrison.

JACKSON—WALTER, of Niagara Falls, Ont. Born at Buffalo, N.Y., Aug. 22nd, 1883. Educ., B.Sc., Univ. of Toronto, '09 transmission line surveys, transitman, transitman on coal lands of Western Alberta, field office dftsman., O.P.Co.'s. Power Development, 1907, chief of party on transmission line surveys 1908, asst. City Engr., Niagara Falls and Chief of party on blvd. location and constrn. along Niagara River, 1910-14, ch. of party and field dftsman. on O.P.Co.'s Power Development, 1915-16, asst. to consltg. engr., in Winston-Salem, N.C.; 1914-16, res. engr. on pumping and filtration plant constrn., City of Columbus; 1916-18, res. engr., O.P. Co.'s Power Development; 1918 to date, divisional engr., on portion of the canal, forebay, screen house, power house and Q. and P. H. Rly., for the Queenston Plant of the Niagara Development for the Hydro-Electric Power Commission of Ontario.

References: W. J. Francis, H. G. Acres, T. H. Hogg, N. R. Gibson, A. C. D. Blanchard, H. Bucke, C. H. Mitchell.

McKIEL—HAROLD WILSON, of Sackville, N.B. Born at Gananoque, Ont., Sept. 4th, 1888; Educ., B.A., B.Sc. (Chem. Eng.), Queen's Univ., '08, '12; one year post graduate work; chemist, Canada Cement Co. and consulting engr., Crown Paving Co., Calgary, Alta.; research chemical engr., British Chemical Co., Trenton, Ont.; Professor of Chemistry, and Director Collegiate Dept., Mount Royal College, Calgary; 1913-19, Prof. of Mech. Engr'g., Mount Allison Univ.; 1915 to date, secretary of Faculty of Applied Sci., and Registrar, also member, Committee on Engineering Education, Canadian Universities Conference; 1919 to date, Senior Professor of Engineering, Mount Allison University, Sackville, N.B.

References: D. W. Robb, I. P. MacNab, F. R. Faulkner, H. S. Johnston, F. S. Keith, J. D. McBeath, R. G. Gage, G. C. Torrens, C. S. G. Rogers.

PROCTOR—EDWARD MOORE, of 20, Rosemount Ave., Toronto, Ont. Born at Sarnia, Ont., May 11th, 1888. Educ., B.A.Sc., Univ. of Toronto, '09; 1907 (summer surveys, C.P.R., irrigation dept.; 1908 (summer), surveys, N.T.R. location surveys; 1909 (summer and fall), res. engr., waterworks, for Willis Chipman; 1910-12, structrl. dftsman., Canada Foundry, Toronto; 1912-16, bridge and structrl. designer in rly. and bridge dept., City of Toronto; 1916 to date, manager, chg. design and constrn., waterworks, sewers, and structrl. designs, James Proctor and Redfern, Consulting Engineers, Toronto, Ont.

References: G. G. Powell, E. A. James, M. E. Brian, E. R. Gray, G. T. Clark, W. A. McLean, F. A. Dallyn.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

COLLINS—WILLIAM SCOTT, of Great Falls, Man. Born at Miami, Man., Aug. 10th, 1888. Educ., B.C.E., Univ. of Manitoba, '14; 1911 (May-Oct.), rodman, Nat. Transc. Rly.; 1912 (May-Oct.), dftsman., C.N.R.; 1913 (May-Oct.), rodman, Dominion Public Works Dept.; 1914 (May-Aug.), instr'man., Good Roads Board; 1914-19, overseas; 1920 (Feb.-Sep.), 1st. asst. to munic. engr., Munic. of Rockwood; 1920-21, munic. engr., Munic. of St. Anne, Good Roads Board; 1921 (Apr.-Nov.), engaged on contract work on concrete road bridges and culverts; at present, engr'g. staff, instr'mt. work and inspectn., on concrete dam, rock excavation for channel, Rock Fill Dam, in chg. of party on field surveys for dykes and flooded area, determination of monthly quantities of rock excavation, etc., Manitoba Power Co., Great Falls Development.

References: B. S. McKenzie, A. J. Taunton, E. P. Fetherstonhaugh, C. N. Mitchell, D. M. Mawhinney.

OULTON—AUBREY ERNEST, of Moncton, N.B. Born at Jolicure, N.B., Mar. 21st, 1893. Educ., N.S. High School and pvte. tuition; 2 yrs., Robb Engineering Co., Amherst, N.S.; 1912-13, Divg. office, Dominion Bridge Co., Lachine, Que.; 1913-20, field and office bridge experience, Canadian Government Rlys., Moncton, N.B.; 1920-21, chg. of field survey of bridges, rated draughtsman; 1921 to date, asst. engr., bridge dept., C.N.R., Moncton, N.B.

Refrences: C. B. Brown, W. A. Duff, R. O. Stewart, A. F. Stewart, F. B. Tapley, C. S. G. Rogers.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

McCLELLAND—WILLIAM RAYMOND, of 152 Durocher Str., Montreal, Que. Born at Halifax, N.S., Jan. 16th, 1896. Educ., B.Sc. (Met. Eng.), McGill Univ., '22, 1916-17, inspectr. of gauges, munitions and rectifies at munition works of Record Foundry and Machine Co., Moncton, N.B.; 1918, (4 mos.), invoice clerk, reconstruction dept., Halifax Relief Commn.; 1920 (4 mos.), chemist in chg. laboratory at paint and varnish works, Brandram-Henderson, Ltd., Halifax, N.S.; 1922 (2 mos.), Rondelle Dept., International Nickel Co. of Canada, Port Colborne, Ont.; at present on post grad. work and research, Dept. of Metallurgy, McGill University, Montreal, Que.

References: A. Stansfield, F. A. Bowman, J. N. Finlayson, C. M. McKergow, H. B. Pickings, W. P. Copp.

McCONVILLE—CECIL A., of Iroquois Falls, Ont. Born at Kingston, Ont., May 26th, 1896. Educ., B.Sc. (honours) Queen's Univ., '21. 18 mos., machinist, erect'g. shop, Canadian Locomotive Co., Kingston; 6 mos., bolter up and fitter, Collingwood Shipyard; 1920 (Jan.-Apr.), instructr. in steam and gas engr'g., Vocational Training School, Kingston; 1920, planning man, Mold and Core Dept., Goodyear Tire and Rubber Co., New Toronto; Nov. 1921 to Mar. 1922, Canadian Paperboard Co., Frankford, Ont.; 1922 (Mar.-Dec.), asst. to efficiency engr., and 1922 to date, recording instrument engr., Abitibi Power and Paper Co., Iroquois Falls, Ont.

References: L. M. Arkley, L. T. Rutledge, W. P. Wilgar, W. L. Malcolm, A. Macphail.

SCOTT—MORRIS ALEXANDER, of 165, Wilson Ave., Montreal, Que. Born at Regina, Sask., Dec. 12th, 1886. Educ., R.M.C., Kingston,'07; 1907 (summer), ch'mn, rodman and instr'man., G.T.P. Rly., Prairie W., Div. Res. 48; 1908, chainman on timber limit surveys and chainman and instr'man., sub-divn. surveys, Driscoll & Knight, D.L.S., Edmonton, Alta.; 1909 (June-Sept.), asst. engr. on constrn., Edmonton Radial Rly., Edmonton; 1910, instr'man, res. No. 2, Calgary branch, and res. No. 9, Mountain Divn., G.T.P.C. Rly.; 1911-12, res'engr., res. No. 7, Mtn. Div., 1912-13, res. No. 24, Mtn. Div., and 1913-14, res. engr. in chg. concrete tunnel lining at Mile 109, B.C., G.T.P. Rly.; 1914-16, Lieut., Capt. and Major, 1st Canadian Motor Machine Gun Bde.; 1918, Lieut. Col., in cmmd. 4th Battn. Can. Machine Gun Corps., to 1919, demobilized; Aug. 1919-Dec. 1920, Soldier Settlement Bd., Edmonton, (7 mos.), Lockwood Greene & Co. of Canada, Ltd., Montreal, (2 mos.), and valuation dept., G.T.Rly., Montreal (3 mos.); 1920 to date, engr. in chg. constrn., aqueduct enlargement, Montreal Water Board, Montreal, Que.

References: C. J. Desbaillets, C. M. Morssen, A. S. Dawes, J. A. Heaman, F. J. George, R. W. Jones, W. P. Wilgar, H. F. Meurling.

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A

ABRASIVE WHEELS

POLISHING WHEELS. Polishing Wheels, Bradford H. Divine. Machy. (N.Y.), vol. 29, no. 5, Jan. 1923, pp. 372-375, 6 figs. Manufacture of compress polishing wheels.

ACETYLENE

GENERATORS. A New Acetylene Generator on the Immersion System (Ein neuer Acetylenentwickler des Eintauch-Systems). Acetylen, vol. 25, nos. 8 and 9, Aug. and Sept. 1922, pp. 43-46 and 49-51, 6 figs. Describes apparatus made by Weberwerke Co. for containers with a capacity of 90, 125, 180 and 350 liter for 2, 4, 6 and 10 kg. of carbide.

AERODYNAMICS

MODEL AND FULL-SCALE TESTING. The Co-relation of Model and Full Scale Work, R. McKinnon Wood. Aeronautical Jl., vol. 26, no. 144, Dec. 1922, pp. 480-497 and (discussion) 497-501, 10 figs. Factors in relation between wind-tunnel and full-scale tests; use of model tests; theories.

AIR COMPRESSORS

DIESEL-ENGINE. Calculating Injection Air Compressors for Diesel Engines (Die Bemessung des Einspritzluftkompressors einer Dieselmaschine), Arthur Balogh. Fördertechnik u. Frachtverkehr, vol. 15, no. 26, Dec. 22, 1922, pp. 327-332, 9 figs. Describes new method for finding size of compressor, giving examples and calculations.

LUBRICATION. Efficient Lubrication of Air Compressor. Power House, vol. 15, no. 24, Dec. 20, 1922, pp. 25 and 28. Destructive nature of carbon deposit; affects proper operation of valves; danger of vapor ignition; cleaning compressor and piping system.

Lubrication of Air Compressors (Le graissage des compresseurs d'air), René Pérot. Génie Civil, vol. 81, no. 25, Dec. 16, 1922, pp. 569-570, 4 figs. Discusses lubricating films, its qualities, temperature, etc.

TYPES. Some Elements of Economy in Air Compression, Wm. Carter. Power House, vol. 15, no. 23, Dec. 5, 1922, pp. 24-26. Steam-driven air compressors of single and compound types; electrically driven machines; methods of lubrication and governing; cooling by water jacket and intercoolers; types of valves, etc.

AIR CONDITIONING

TESTS. Relation of Temperature, Humidity and Circulation in Air Conditioning, James Mackay. Domestic Eng., vol. 101, no. 12, Dec. 23, 1922, pp. 523-527, 7 figs. Results of tests conducted in schools and industrial buildings. Gives psychrometric table, embracing usual ranges of dry-bulb temperatures in heating and ventilating work, with wet-bulb up to 100 per cent humidity.

AIRCRAFT CONSTRUCTION MATERIALS

STEELS. Special steels and Airplane Construction. Les aciers spéciaux et la construction des aéropanes). Usine, vol. 31, no. 49, Dec. 9, 1922, pp. 21-29, 6 figs. Discusses special metals produced by Jacob Holtzer Co., their composition, and mechanical and chemical properties.

AIRPLANE ENGINES

DEVELOPMENT. The Problem of the Airplane Engine (Le problème du moteur d'aviation), J. Ville. Revue Générale des Sciences, vol. 33, no. 2, Jan. 30, 1922, pp. 48-55. Effect of continually increasing altitudes; density of air; coefficient of compression; adaptation of explosion engine to airplanes, its safety of operation.

FUELS, DOPED. The Effect of Doped Fuels on the Fuel System—II. Air Service Information Circular, vol. 4, no. 383, Nov. 1, 1922, 3 pp., 1 fig. Investigation for purpose of giving a more complete idea of corrosive effect of various doped fuels on materials used or proposed for use in fuel systems.

AIRPLANE PROPELLERS

CHARACTERISTICS. The Prediction of Propeller Characteristics from the Blade Element Analysis, William H. Miller. Aerial Age, vol. 15, nos. 19 and 21, Oct. and Dec. 1922, pp. 500-502, and 590-592, and 598, 8 figs. Résumé of propeller theory. Simple method of approximating characteristics of airscrew over working range.

PARAGON ADJUSTABLE AND REVERSIBLE. The Paragon Adjustable and Reversible Propeller. Aviation, vol. 14, no. 1, Jan. 1, 1923, p. 19, 1 fig. Change from full speed ahead to reverse made in 3 sec. See also Flight, vol. 14, no. 45, Nov. 9, 1922, pp. 657-658, 3 figs.

AIRPLANES

COMMERCIAL USE. Commercial Use of Airplanes, Edward P. Warner. Boston Soc. Civ. Engrs.—Jl., vol. 9, no. 10, Dec. 1922, pp. 285-301, 11 figs. Present position of aerial transport in Europe and America and problems met with by those seeking to use airplane for commercial purposes.

CONSTRUCTION. Present Tendencies in Airplane Construction (Tendances actuelles de la construction des avions), P. Grimault. Aéronautique, vol. 4, no. 43, Dec. 1922, pp. 387-394, 7 figs. Discusses materials, including wood, duralumin, steel, extra-light metals; framework; fuselage.

CONTROL, MONOPLANE. New Monoplane Control Proves Successful. Aerial Age, vol. 16, no. 1, Jan. 1923, pp. 20-21, 2 figs. New invention by Grover Loening, called lateral "pressure equalizer" is mounted on extreme tip of each wing. Tests proved successful.

STRESSES. Analysis of Stresses in German Airplanes, Wilhelm Hoff. Nat. Advisory Committee for Aeronautics, Report no. 143, 1922, 52 pp., 52 figs. Aerodynamics principles and their use in determining strength of airplanes; other considerations; analysis of strength qualities of construction materials; calculated strength and strength tests; conversion formulas of A. Betz; classification of military airplanes; calculation for wing spars. Bibliography.

ALCOHOL

MOLASSES AS SOURCE. A Report on the Manufacture of Industrial Alcohol from Hawaiian Molasses, W. L. McCleery and H. P. Agee. La Planter & Sugar Mfr., vol. 69, nos. 25, 26 and 27, Dec. 16, 23 and 30, 1922, pp. 449-450, 468-470 and 487-490. Report of Committee on Manufacture of Sugar and Utilization of By-Products to Hawaiian Sugar Planters' Assn.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

BEARING METALS. *See Bearing Metals.*

BINARY, SOLIDIFICATION OF. Cored Crystals and Metallic Compounds, Edgar C. Pain. Chem. & Met. Eng., vol. 28, no. 2, Jan. 10, 1923, pp. 65-69, 6 figs. Each cored dendrite contains many small crystals with similar lattices but slightly different in composition and dimension; intermetallic compounds usually have complex lattices giving little opportunity for slip, hence are brittle.

BRONZES. *See Bronzes.*

CARBONLESS. Some Considerations in Connection with "Carbonless" Alloys, J. Kent Smith. Metal Industry (Lond.), vol. 21, no. 26, Dec. 29, 1922, pp. 597-598. Use of manganese question of solubility.

COBALT-TUNGSTEN. Cobalt Tungsten Alloys, Karl Kreutz. Metal Industry (N.Y.), vol. 20, no. 12, Dec. 1922, pp. 463-464, 1 fig. Some physical, chemical and electrical properties of this mixture. Abstracted from Metal u. Erz, Mar. 22, 1922, pp. 137-140.

COPPER. *See Copper Alloys.*

IRON. *See Iron Alloys.*

NON-FERROUS. The Wrought Non-Ferrous Alloys in 1922, W. H. Bassett. Jl. Indus. & Eng. Chem., vol. 15, no. 1, Jan. 1923, pp. 31-32. Notes on copper alloys; improvements in quality; electric melting of alloys; corrosion.

ALUMINUM ALLOYS

ALUMINUM BRONZE. Casting of Aluminum Bronze, Charles Vickers. Foundry, vol. 50, no. 23, Dec. 1, 1922, pp. 958-960, 4 figs. Method of gating peculiar to this class of casting must prevent lathering of metal, horn gates used with large end toward casting, heavy risers needed to feed shrinkage.

Methods of Making Aluminum Bronze Castings. Air Service Information Circular, vol. 4, no. 376, Oct. 15, 1922, 16 pp., 21 figs. Investigation to determine mechanical properties and casting qualities of several compositions with varying iron and aluminum content, and to obtain experience in foundry so as to be prepared to make castings of these alloys.

[illegible]

AUTOMOBILE ENGINES

[illegible]

New York Show. [illegible] Design Shows Service Influence, [illegible]. Automotive Industries, vol. 48, no. 2, Jan. 11, 1923, pp. [illegible], 7 figs. Features of design at New York show.

AMMONIA

SYNTHETIC. The Production of Nitrogen and Hydrogen for Synthetic Ammonia Manufacture, [illegible] S. Taylor. Chem. & Met. Eng., vol. 27, no. 26, Dec. 27, 1922, pp. [illegible]. Efficiencies of various methods of production and their future developments. Paper read before Am. Inst. Chem. Engrs.

AUTOMOBILE FUELS

TYPES. Motor Fuels in France (Étude de la question des carburants en France), A. Grebel. Génie Civil, vol. 81, nos. 24 and 25, Dec. 9 and 16, 1922, pp. 537-541 and 558-563, 3 figs. Comparative value of different motor fuels and liquid fuels, their calorific power, alcohols from beet sugar, molasses and grain; tabulation of fuels produced from mineral and vegetable material.

AUTOMOBILES

A. C. SIX-CYLINDER. A Two-Litre "Six". Autocar, vol. 49, no. 1415, Dec. 1, 1922, pp. 1140-1141, 2 figs. Test of A. C. car with modern type six-cylinder engine. Acceleration, speed and tractability on top gear are marked features.

BELSIZE-BRADSHAW. The Belsize-Bradshaw Four-Seater. Autocar, vol. 49, no. 1416, Dec. 8, 1922, pp. 1191-1193, 5 figs. 9-hp. two-cylinder oil-cooled engine; describes steering and springing, gear changing, and other details.

BUGATTI. The Eight-Cylindered Bugatti. Auto-Motor Jl., vol. 27, no. 49, Dec. 7, 1922, pp. 1049-1050, 6 figs. 17.8-hp. two-liter model; horizontal Zenith carburetors, single high-tension magneto with variable firing point for ignition; lubrication of engine by pressure.

BODIES. Body Production System Combines Progressive and Group Methods, J. Edward Schipper. Automotive Industries, vol. 47, no. 25, Dec. 21, 1922, pp. 1221-1224, 11 figs. Methods of production of Oakland 6-44 roadster and coupe bodies; work is passed along a line wherever possible, but efficiency of individual operations is always considered.

Rise of Service Coupes and Sport Models a Feature of Show, George J. Mercer. Automotive Industries, vol. 48, no. 2, Jan. 11, 1923, pp. 77-82, 21 figs. Use of fabric in body construction gains converts; closed bodies show great similarity of line; standard phaetons and roadsters few in number.

CONSTRUCTIVE SUGGESTIONS. Engineering Practice Leaves Much to be Accomplished, Henry M. Crane and Herbert Chase. Automotive Industries, vol. 48, no. 2, Jan. 11, 1923, pp. 61-63, 3 figs. Constructive suggestions based on critical survey of New York show. It is claimed that much can still be done toward making engine and chassis parts more accessible, improving brakes, steering gears and control connections.

LIGHTING. Report of Committee on Motor Vehicle Lighting 1921-1922. Illuminating Eng. Soc.—Trans., vol. 18, no. 1, Jan. 1923, pp. 29-32 and (discussion) 32-35. Revised specifications; rear-lamp specifications; standard colors of traffic signals.

RESISTANCE TO TRANSLATION. Resistance to the Translation of Motor Vehicles, T. R. Agg. Iowa State College of Agriculture & Mechanic Arts Official Publication, Bul. no. 64, vol. 20, no. 53, May 31, 1922, 32 pp., 18 figs. Deals with abortive attempts to measure so-called tractive resistance and describes methods finally adopted. Results seem to show that rolling resistance is about half of total resistance to translation when vehicle with good tires is operated on hard, smooth road surfaces, and resistance due to impact is very small on such surfaces.

AVIATION

ALTITUDE INDICATORS, NIGHT. An Optical Altitude Indicator for Night Landing, John A. C. Warner. Nat. Advisory Committee for Aeronautics, Tech. Notes, no. 123, Jan. 1923, 5 pp., 3 figs. Details of Jenkins night altitude indicator. German types similar in principle.

B

BEAMS

STEEL, CALCULATION. Restraining Value of Beam Connections, P. L. Pratley. Can. Engr., vol. 43, no. 25, Dec. 19, 1922, pp. 631-634, 4 figs. Proposed modification in present practice of calculating structural steel beams to take advantage of actual end restraint provided by standard connections; maximum positive moment diminished by from 8 to 14 per cent.

BEARING METALS

BABBITT, MICRO-STRUCTURE OF. The Micro-Structure of Babbitt Metal, R. W. Irwin and A. McArthur Johnston. S. African Instn. Engrs. Jl., vol. 21, no. 5, Dec. 1922, pp. 82-84, 8 figs. Authors' reply to discussion.

BEARINGS

ANTI-FRICTION. Anti-Friction Bearings for Electric Cars, Oscar R. Wikander. Elec. Ry. Jl., vol. 60, no. 25, Dec. 16, 1922, pp. 935-940, 15 figs. Review of results obtained from use of anti-friction bearings in United States and abroad, with description of some of principal types; economies effected and troubles experienced.

LUBRICATION. Bearings and Their Lubrication (I sopporti e la loro lubrificazione). Elettrotecnica, vol. 9, no. 29, Oct. 15, 1922, pp. 698-703. Discusses manual and forced feed lubrication for journal, ball, roller, and other bearings; choice and tests of lubricants.

Oil Flow in Ring-lubricated Bearings, A. Fisher. Machy. (Lond.), vol. 21, no. 532, Dec. 7, 1922, pp. 311-312, 9 figs. Results of author's experiments compared with experiments on high-speed bearings made by O. Lasche in 1903.

BEARINGS, BALL

BALL MANUFACTURE. Making Steel Balls, [illegible]

DEVELOPMENTS. How Ball Bearings Can Reduce [illegible] Costs, [illegible]

ROLLER AND BALL. [illegible] Roller Bearings with [illegible], [illegible]

[illegible] Power Losses in Mines by the Use of Ball and Roller-Bearings, [illegible]. Iron & Coal Trades Rev., vol. 105, no. 2859, Dec. 15, 1922, p. 888. (Abstract.) Paper read before North of England Inst. Min. & Mech. Engrs.

BELT DRIVE

TRANSMISSION LOSSES. Belt Transmission (Notes sur les transmissions par courroies), G. [illegible]. Revue Générale de l'Électricité, vol. 12, no. 25, Dec. 23, 1922, pp. 975-988, 8 figs. Calculation of various transmission losses, [illegible] speed and tension, life of belts, etc.

BLAST FURNACES

PROGRESS 1922. Ironmaking Progresses in 1922, Ralph H. Sweetser. Iron Trade Rev., vol. 72, no. 1, Jan. 4, 1923, pp. 57-58. Increased use of [illegible], general adoption of [illegible] plant, reduction in use of [illegible], and exceptional production records, are among signs of advance in blast-furnace practice.

BOILER FEEDWATER

AIR REMOVAL FROM. Removal of Air from Feed Water. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 47-49, 3 figs. Methods in use to reduce corrosion caused by dissolved oxygen.

HARDNESS, TESTS OF. Causes of Hardness in Water and How to Find Them. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 39-43, 12 figs. Tests for [illegible], treatment required, apparatus used and results which may be secured by proper care.

OIL-REMOVING FILTERS. Filters for Removing Oil from Boiler Feed Water, Leonard A. Day. Am. Water Works Assn.—Jl., vol. 10, no. 1, Jan. 1923, pp. 145-146, 1 fig. Method successfully in use for about 20 years at St. Louis water works.

REGULATORS. Principles Governing Automatic Regulation. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 54-56, 5 figs. Feedwater valve control, pump governors, value of high and low-level alarms.

TREATMENT. A Review of Feed-Water Treatment. Power, vol. 56, no. 26, Dec. 26, 1922, pp. 1018-1020. Outstanding facts about various methods of treatment.

Boiler Feed Water Should Be Freed From Impurities, C. E. Joos. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 34-36, 3 figs. Those most commonly found, their effects in boiler and corrective treatment.

BOILER FURNACES

DRAFT CONTROL. Draft Control Essential to Use of Moist Fuels, Zuce Kogan. Power Plant Eng., vol. 27, no. 2, Jan. 15, 1923, pp. 118-120, 4 figs. Air must be supplied through fuel bed and into gas space; means employed for control of draft.

OIL-FIRED. Korting Oil-Burning Furnace (Die letzte Entwickelung der Korting-Oelfeuerungen), Pradel. Gewerbefleiss, vol. 101, no. 11, Nov. 1922, pp. 313-318, 4 figs. Specially suitable for marine purposes and chemical and metallurgical plants. Discusses burners and atomizers, including air-pressure and steam-jet centrifugal atomizers.

BOILER OPERATION

FEEDING, EFFECT ON. Effect of Boiler Feeding on Operation. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 53-54, 3 figs. Effect of varying water level; irregular and regular methods of feeding.

INSTRUMENTS. New Devices for Controlling Operations (Neue Betriebskontrollapparate). Wärme- u. Kälte-Technik, vol. 24, no. 22, Nov. 15, 1922, pp. 257-261, 11 figs. Describes apparatus built by Hydro Apparate-Bauanstalt, for measuring consumption of gas, air, etc., and for determination of specific gravity; distance control of apparatus.

BOILER PLANTS

POWER, COST OF. Reducing the Cost of Power Generation (Réduction des dépenses de force motrice), Ch. Molette. Outillage, vol. 6, no. 45, Nov. 11, 1922, pp. 1522-1525. Boiler-house conditions, fuels, steam raising, stoking, etc.

BOILER PLATE

COLD WATER ON RED-HOT, ACTION OF. Exploding an Old-Time Boiler Fallacy, W. B. Roberts. Power House, vol. 15, no. 24, Dec. 20, 1922, pp. 19-21, 5 figs. Analysis of theory that cold water sprayed upon a red-hot boiler plate instantly generates an uncontrollable volume of steam.

STRESSES. The Stress of Sheet Iron Due to Riveting and the Brittleness of Mild Steel Resulting from the Heating of Crushed Material (Beanspruchung der Bleche beim Nieten und die Sprödigkeit von Flusseisen als Folge der Erwärmung gequetschten Baustoffes), Richard Baumann. Stahl u. Eisen, vol. 42, no. 51, Dec. 21, 1922, pp. 1865-1868, 3 figs. Stress of sheet metal beyond stretching limit under high riveting pressures, but also under normal pressure due to heat stresses; injurious effects; devices for reducing stresses.

BOILER ROOMS

LOSSES, PREVENTION OF. Analyzing the Prevention of Boiler Room Losses, E. M. Eliot. Indus. Management (N.Y.), vol. 65, no. 1, Jan. 1923, pp. 46-48, 1 fig. Outlines method of analyzing various boiler-room efficiency devices from standpoint of immediate importance to individual plant.

BOILERS

BAFFLING. Tests of a Large Type W Stirling Boiler, Paul W. Thompson. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 25-31 and 44, 15 figs. Deals with extensive tests on large boiler at Connors Creek power house of Detroit Edison Co.; four different arrangements of boiler baffling were employed and results obtained with each are shown. (Abridged.)

LOCOMOTIVE. See *Locomotive Boilers*.

MAGAZINE FEED. Tests of a Magazine Feed Boiler, Special Method of Supplying Secondary Air, John Blizard, J. Niel and A. Pineus. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 28, no. 9, Dec. 1922, pp. 833-842, 5 figs. Tests carried out by fuel section of U.S. Bur. of Mines on boiler made by Reck Heating Co., Copenhagen, Denmark, to determine its thermal efficiency and other importance factors when fired with various fuels.

BORING MACHINES

VERTICAL. The Modern Vertical Boring Mill. British Machine Tool Engineering, vol. 2, no. 18, Nov.-Dec. 1922, pp. 557-564, 12 figs. Details of machines as built by Geo. Richards & Co., Ltd., Manchester, Eng.

WORK-HOLDING SCHEMES FOR. Work-Holding Schemes for Boring and Turning Mills. Eng. Production, vol. 5, no. 116, Dec. 21, 1922, pp. 580-584, 19 figs. Refers to number of work-holding arrangements devised to meet conditions largely peculiar to this class of tool.

BRAKES

AIR. Railway Shop Kinks. Ry. & Locomotive Eng., vol. 36, no. 1, Jan. 1923, pp. 20-22, 6 figs. Special devices used for testing and maintaining air-brake equipment.

BRIDGE STRENGTHENING

METHODS. Strengthening Old Bridges, Lewis E. Moore. Boston Soc. Civ. Engrs.—Jl., vol. 9, no. 9, Nov. 1922, pp. 223-233 and (discussion) 233-236, 3 figs. Describes types and methods of strengthening.

BRIDGES

LONG-SPAN. Bridges With Long Spans (Puentes de gran luz), Charles Evan Fowler. Ingeniería Internacional, vol. 9, no. 2, Feb. 1923, pp. 59-63, 4 figs. Fundamental principles of construction; describes as example Detroit bridge, Hell Gate bridge, and others.

BRIDGES, CONCRETE

ARCH. The City of Ottawa's Latest Bridge. Contract Rec., vol. 36, no. 52, Dec. 27, 1922, pp. 1252-1254, 8 figs. Cummings bridge over Rideau River, is reinforced-concrete arch structure, 615 ft. long; deck on grade of 2½ per cent; cableway used for handling and placing materials.

GIRDER. A Long Span Reinforced Concrete Girder Bridge at Cohasset Narrows (Mass.), Barzillai A. Rich. Boston Soc. Civ. Engrs.—Jl., vol. 9, no. 9, Nov. 1922, pp. 237-247, 4 figs. Consists of five spans of 56 ft. 6 in. each in clear between copings of piers; it has 26-ft. roadway and 5-ft. walk.

PRE-CAST SLAB. Construction of a Pre-Cast Concrete Slab Bridge at Central Street, Lowell, S. Stanley Kent. Boston Soc. Civ. Engrs.—Jl., vol. 9, no. 9, Nov. 1922, pp. 213-222, 3 figs. Conditions called for type of bridge which could be erected in minimum of time and thrown open to traffic as soon as completed.

BRIDGES, HIGHWAY

CONCRETE. Continuous Frame Design Used for Concrete Highway Bridges, Arthur G. Hayden. Eng. News-Rec., vol. 90, no. 2, Jan. 11, 1923, pp. 73-75, 4 figs. Flat-arch types over Bronx Parkway roads have reinforced-concrete frame with cut stone facing; economical construction.

DESIGN. Present Tendencies of Highway Bridge Design and Construction, Llewellyn N. Edwards. Can. Engr., vol. 43, no. 24, Dec. 12, 1922, pp. 617-619, 3 figs. Major factors influencing modern bridge design and construction; radical change in character of traffic and loads outstanding feature affecting design. Paper read before Am. Assn. State Highway Officials.

BRIDGES, LIFT

CONTINUOUS-TRAFFIC. Continuous-Traffic Lift Bridges Proposed for Allegheny River at Pittsburgh, A. A. Henderson. Engrs.' Soc. West. Pa.—Proc., vol. 38, no. 6, July 1922, pp. 227-240 and (discussion) 241-265, 6 figs. Superstructure of proposed bridge would be placed 33 ft. above ordinary stage of water, known as pool-full stage.

VICTORIA, CAN. Superstructure of Johnson Street Bridge, Victoria, F. H. Allwood. Can. Engr., vol. 43, no. 24, Dec. 12, 1922, pp. 611-613, 5 figs. Layout consists of two separate bridges resting on same piers; movable portion of single-leaf Strauss bascule type.

WOODEN. Canadian National Builds An Ingenious Lift Bridge. Ry. Maintenance Engr., vol. 18, no. 12, Dec. 1922, pp. 421-422, 5 figs. All-timber structure over Sumas river in British Columbia fulfils requirements at unusually small expenditure; trestle 405 ft. long, having maximum height of 38 ft. from bottom of river to rail level.

BRIDGES, RAILWAY

ARCH. Michigan Central to Build New Bridge at Niagara. Ry. Age, vol. 74, no. 2, Jan. 13, 1923, pp. 176-180, 7 figs. Plans for new 640-ft. arch to replace cantilever bridge; will be of two-truss, two-hinged spandrel-braced type, with lower chords conforming to parabolic curve and top chords horizontal. See also description by H. Ibsen in Can. Engr., vol. 44, no. 3, Jan. 16, 1923, pp. 139-142, 4 figs.

CANTILEVER. New Cantilever Bridge Across St. John River. Can. Engr., vol. 43, no. 23, Dec. 5, 1922, pp. 592-593, 5 figs. Completed within one per cent of estimate and in less than specified time.

LOCOMOTIVE LOADINGS. Locomotive Loadings for Railway Bridges. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 1, Jan. 1923, pp. 131-136. Discussion of paper by D. B. Steinman.

STEEL SPECIFICATIONS FOR. Specifications for Design and Construction of Steel Railway Bridge Superstructure. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 1, Jan. 1923, pp. 53-111, 6 figs. Final report of special committee on specifications for bridge design and construction.

BRIDGES, STEEL

MOVING. Moving a 740-Foot Steel Bridge. Elec. Ry. Jl., vol. 60, no. 27, Dec. 30, 1922, pp. 1007-1009, 4 figs. Structure, 1000 tons in weight and 152 ft. high, was moved 75 ft. down stream by Pittsburgh railways.

BRONZES

ANALYSIS. The Analysis of Bronze, E. W. Sheel. Metal Industry (Lond.), vol. 21, no. 24, Dec. 15, 1922, pp. 553-554. Determination of tin, lead, copper, iron, manganese, zinc, phosphorus, and alternative method for determination of lead.

BUILDING CONSTRUCTION

DETERMINING DATE OF COMPLETION. A Graphical Method of Determining the Approximate Date of Completion of a Building Operation, Richard P. Wallis. Eng. & Contracting, (Buildings), vol. 58, no. 3, Dec. 27, 1922, pp. 127-128, 1 fig. Method of plotting graph.

DURANT MOTOR PLANT. Durant Motor Plant Extension, Leaside, Ontario. Can. Engr., vol. 43, no. 26, Dec. 26, 1922, pp. 651-655, 9 figs. Describes large reinforced-concrete buildings, designed to Am. Concrete Inst. specifications, shipping building of steel, shipping platforms, bridges, roofing, etc.; methods of construction; cost and quantities.

C

CABLES, ELECTRIC

SINGLE- AND MULTI-CORE. Some Factors Affecting Bulk Underground Transmission, P. Dunsheath. Elecn., vol. 89, no. 2324, Dec. 1, 1922, pp. 624-625, 2 figs. Discusses uses of single-core and multi-core cables in alternating-current systems.

UNDERGROUND. Recent and Prospective Developments of Underground Cable, D. W. Roper. Elec. World, vol. 81, no. 1, Jan. 6, 1923, pp. 7-8, 5 figs. Samples of cable have been made and tested successfully at 250 kv.; possibilities of cables for 110-kv. operation; points to consider in specifications.

CABLEWAYS

SYSTEMS. Aerial Wire-Rope Conveyors (Transporteurs aériens à cables), F. Cretin. Génie Civil, vol. 81, nos. 22, 23 and 24, Nov. 25, Dec. 2 and 9, 1922, pp. 486-491, 510-512 and 532-534, 46 figs. Describes cableways of various systems; construction of lines; rolling equipment; operation and control coupling stability of cars.

CAR LIGHTING

SYSTEMS. Some Train Lighting Systems, Cyril T. Cocks. S. African Instn. Elec. Engrs.—Trans., vol. 13, part 8, Oct. 1922, pp. 167-179, 10 figs. on supp. plate. Discusses straight storage-battery, head-end and axle generator systems; systems in use in various countries; auto cut-in switch used on described Liliput machine; accumulators and belting.

CAR WHEELS

CHILLED-IRON. An Investigation of the Properties of Chilled Iron Car Wheels—II, J. M. Snodgradd and F. H. Guldner. University of Ill. Bull., vol. 20, no. 12, Nov. 20, 1922, 58 pp., 46 figs. Wheel fit, static load, and flange pressure strains; ultimate strength of flange.

TIRES, BRAKE-SHOE FORCE ON. Measuring the Force Exerted by a Brake Shoe on the Tire of a Wheel (Mesure pratique de l'effort exercé par le serrage d'un sabot-frein contre le bandage d'une roue de wagon), Alexandre Grison. Revue Générale des Chemins de Fer des Tramways, vol. 41, no. 6, Dec. 1922, pp. 385-392, 6 figs. Application of crushers; describes a hydraulic dynamometer, its construction and operation.

CARBON MONOXIDE

POISONING. The Treatment of Carbon Monoxide Poisoning, R. R. Sayers and H. R. O'Brien. Can. Foundryman, vol. 13, no. 12, Dec. 1922, pp. 22-23. Fumes from cupola, gas engine, leaky stove or any place where carbon gas is present, are injurious to health, on account of effect on blood. Article prepared for U.S. Pub. Health Service.

CARS

OSCILLATION. Oscillation of Railway Cars in Relation to the Track (Schwingungen am Eisenbahnwagen in ihrer Beiziehung zum Gleis), Saller. Zentralblatt der Bauverwaltung, vol. 42, no. 99, Dec. 9, 1922, pp. 608-610, 1 fig. Danger of coincidence of several periods of oscillations; variation of length of rails to avoid coincidence; vertical oscillations; calculations.

CARS, COAL

GONDOLA. 100-Ton Gondola Car with Four-Wheel Trucks. Ry. Mech. Engr., vol. 97, no. 1, Jan. 1923, pp. 23-25, 4 figs. High-capacity experimental car built by Pressed Steel Car Co. carried 77.2 per cent revenue load.

CARS, FREIGHT

NARROW-GAGE LINES. Freight Cars for Narrow-Gage Lines (Matériel à marchandises des réseaux à voie étroite), M. Michaut. Revue Générale des Chemins de Fer et des Tramways, vol. 41, no. 6, Dec. 1922, pp. 378-384, 4 figs. Difficulties due to difference in tires and couplings of separately-owned rolling stock, and efforts made by French Minister of Public Works to secure uniformity so as to be able to pass rolling stock from line to line.

CARS, TANK

ROTARY. A Rotary Tank Car for Transportation of Bulk Materials, Rudolph Welcker. Ry. Rev., vol. 71, no. 26, Dec. 23, 1922, pp. 902-904, 6 figs. Designed to reduce time and expense for handling, loading and unloading grain, cement, ballast, etc.

CASE-HARDENING

STEEL. Notes on Case-Hardening, Ernest J. Davies. Metal Industry (Lond.), vol. 21, no. 26, Dec. 29, 1922, pp. 607-608. Steel to be used; heat treatment of case-hardening steels; cementing medium.

CAST IRON

METALLOGRAPHY. The Metallography of Grey Cast Iron, Francis W. Rowe. Metal Industry (Lond.), vol. 21, nos. 24 and 25, Dec. 15 and 22, 1922, pp. 563-565 and 583-584, 13 figs. Outlines fundamentals and present trend of ideas regarding metallographic nature of this complex material.

SAMPLING. Sampling Cast Iron (Prelevamento dei campioni nelle ghise), Luigi Losana and Carmelo Cumino. Giornale di Chimica Industriale ed Applicata, vol. 4, no. 11, Nov. 1922, pp. 521-525, 4 figs. Discusses the various constituents of melt, and method of taking samples for analysis, variation of graphite in melt.

SPECIAL METALS, EFFECT OF. The Effect of Special Elements on Cast Iron, O. Smalley. Foundry Trade Jl., vol. 26, no. 331, Dec. 21, 1922, pp. 519-523, 3 figs. Deals with carbon problem of cast iron; presents exploratory experiments on effect of various special metals such as Cu, Ni, Cr, Mo, W, etc., on quantity and form of graphite, and considers commercial possibility of direct manufacture of alloy malleable from cupola.

CEMENT

CAUSTIC MAGNESIA. Caustic Magnesia Cement. U. S. Bur. of Standards, Circular no. 135, Oct. 16, 1922, 14 figs. Brief summary of discovery, early history and later application of reaction of caustic magnesia with solutions of magnesium chloride, result produces quick hardening cement used in stucco, flooring and ship-decking trade. Notes on one used methods of calculating formulas for several types of products.

CENTRAL STATIONS

GENNEVILLIERS, FRANCE. The Gennevilliers Central Station. Unión de las centrales productoras de energía eléctrica en la región de Paris. La nueva central de Gennevilliers), Felix Yagüe Moreno. Asociación de Ingenieros del Instituto Católico de Artes e Industrias-Anales, vol. 1, no. 5, 1922, pp. 382-391, 14 figs. General description of construction work, buildings for machinery; the 40,000-kw. turbo-alternator units, safety in operation, etc.

LIVERPOOL, ENGLAND. The Liverpool Electricity and Tramway Undertakings. Elec. Rev., vol. 91, no. 2351, Dec. 15, 1922, pp. 906-909, 7 figs. Plant now comprises one 10,000-kw. Brit. Westinghouse turbo-alternator, two 6,000-kw. and two 3,500-kw. Brit. Thomson-Houston turbo alternators and two 2,000-kw. Brit. Westinghouse d.c. turbo-generators. Automatic substation.

COAL HANDLING

PIERS. Coal Wharf and Machinery of the North-Western Fuel Company of America. Engineer, vol. 134, nos. 3493, 3494, and 3495, Dec. 8, 15 and 22, 1922, pp. 595-596, 4 figs., partly on p. 608, 623-624, 1 fig., and 653-656, 8 figs. partly on p. 666. New coal pier for railway, steamship and cart service, built at Duluth, on Lake Superior, provides for receiving, shipping, screening and storage of anthracite and bituminous coal in large quantities at very low cost by extensive use of machinery.

PNEUMATIC, SUCTION METHOD. British Practice in Handling Coal by Suction, C. H. S. Tupholme. Am. Gas. Jl., vol. 117, no. 28, Dec. 9, 1922, pp. 645-649, 9 figs. General description and operation of pneumatic coal-handling plants.

SCRAPER LOADING. Some Recent Developments in Scraper Loading Methods, J. S. Housman. Coal Age, vol. 23, no. 2, Jan. 11, 1923, pp. 51-57, 19 figs. Scraper used for storage and reclaiming of coal on surface; self-transporting chute for loading cars underground, with equipment for operating scraper and illuminating face; keeps ropes off heading.

COAL

CHEMICAL CONSTITUTION. Some Economic Aspects of the Chemical Constitution of Coal, S. Roy Illingworth. S. Wales Inst. Engrs.—Proc., vol. 38, no. 6, Nov. 18, 1922, pp. 499-523 and (discussion) 528-542, 4 figs. Aspects of recent chemical work on coal, and its more important technical and economic significance. Notes on thermal stability of coal; bituminous coals; influence of constitution of coal on its value as fuel.

COAL MINES

ELECTRICALLY-OPERATED. Electrically Operated Coal Mines, Frank Sawford. Can. Inst. Min. & Metallurgy—Bul., no. 128, Dec. 1922, pp. 1229-1253. Describes equipment at mines operated by Can. Collieries (Dunsmuir) Ltd., Comox district, Vancouver Island, B.C., including central hydro-electric power plant, transmission system and substations.

COAL MINING

CUTTING MACHINES. Regulations Safeguarding Coal-Cutting Machines, L. C. Ilsley. U. S. Bur. of Mines Reports of Investigations, no. 2419, Dec. 1922 9 pp. Compilation of rules and regulations issued by different states covering coal-cutting machines or trailing cables used with them.

VANCOUVER ISLAND, B.C. Coal Mining in Comox District, Vancouver Island, Charles Graham. Can. Inst. Min. & Metallurgy—Bul., no. 128, Dec. 1922, pp. 1254-1262. General geology; mining operations; mining methods; screening arrangements.

COLD STORAGE

WAREHOUSE. A Massive Cold Storage Warehouse. Contract Rec., vol. 36, no. 52, Dec. 27, 1922, pp. 1233-1240, 9 figs. One of largest buildings of its kind in world; floors of flat-slab construction; fire-proof precautions; cold-storage equipment; insulation of storage rooms; power house.

COMBUSTION

CONTROL. Combustion Control Apparatus. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 8-11, 5 figs. Automatic regulation of damper position, fuel feed, and under-grate pressure conducive to higher furnace efficiency.

TESTS. Tests for Good Combustion and Heat Transfer. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 25-27, 5 figs. Regulation of air supply; ensuring mixture of gases and high temperature; tests of temperatures and analysis of flue gases.

CONCRETE

PROPORTIONING. Promoting the Art of Making Good Concrete, D. A. Tomlinson. Ry. Maintenance Engr., vol. 18, no. 12, Dec. 1922, pp. 414-416, 3 figs. Laboratory studies and experiments in practice show that proper proportioning may double strength of mixture. Shrinkage of aggregates after mixing.

CONDENSERS, STEAM

JET. Modern Jet Condensers in Small Lighting Plants, R. E. Hellmer. Gen. Elec. Rev., vol. 26, no. 1, Jan. 1923, pp. 55-60, 8 figs. Describes variety of installations of type manufactured by Schutte & Koerting Co.

CONDUITS

PENSTOCKS, CEMENT-GUN COVERING. Guniting Steel Penstocks to Eliminate Trouble due to Ice Formation, J. A. McCrory. Can. Engr., vol. 44, no. 2, Jan. 9, 1922, pp. 125-126, 3 figs. Penstocks should be covered to prevent loss of heat and consequent formation of ice on shell which in spring thaw under certain conditions would damage turbines.

CONVEYORS

ROPE-TYPE. Roe's Patent Rope Conveyor. Iron & Coal Trades Rev., vol. 105, no. 2857, Dec. 1, 1922, p. 808, 4 figs., partly on p. 809. Success of described conveyor is said to be due entirely to fact that slats or carrying members are attached to one rope only, their other end merely resting upon and receiving support from other rope or ropes.

WORKSHOP. Methods of Conveying in the Workshop. Machy. (Lond.), vol. 21, no. 531, Dec. 14, 1922, pp. 321-327, 15 figs. Overhead runways, suspended runways and traveling cranes, electric and pneumatic hoisting gear, portable cranes.

COPPER ALLOYS

MANGANIN. The Electrical Resistivity and its Temperature Coefficient of Manganin, S. Kimura and K. Sakamaki. Electrotechnical Laboratory, Researches, no. 111, Sept. 1922, 10 pp., 2 figs. Investigation of copper-manganese alloys and effects of other elements such as Ni, Fe, Al and S upon them.

CORROSION

PROBLEMS. Problems of Corrosion, B. D. Saklatwalla. Jl. Indus. & Eng. Chem., vol. 15, no. 1, Jan. 1923, pp. 39-40. Points out importance of study of physical nature of constituent aggregates and forces governing their reaction activity.

TECHNICAL PHASES. The Economic Aspect of Corrosion from an Engineering Standpoint, B. D. Saklatwalla. Raw Material, vol. 5, no. 11, Dec. 1922, pp. 425-426. Sets forth what has been done to overcome losses from corrosion and what it is hoped to accomplish in future.

COST ACCOUNTING

FACTORY. The Engineer and Manufacturing Costs, F. C. Lawrence. Instn. Elec. —Jl., vol. 61, no. 213, Dec. 1922, pp. 52-58. Example of methods of calculating job costs; proportions of components of factory costs of various engineering products; use of mechanical appliances in various calculations to give accuracy and save time in arriving at costs.

RELATIVE COST NUMBERS. The Relation of Overhead to Direct Labour Cost, J. H. Simpson, Jr. Indus. Management (N.Y.), vol. 65, no. 1, Jan. 1923, p. 12. Points out benefits afforded by use of relative cost number, as developed by Taylor and others.

VALUATION OF INVENTORIES. Valuation of Inventories, W. A. Paton. Jl. of Accountancy, vol. 34, no. 6, Dec. 1922, pp. 432-450. Deals with actual cost, replacement cost and selling price.

CRANES

STEAM. Standard Steam Cranes and Their Employment (Normale Dampfkrane und ihre Verwendung), H. Benedict. Schiffbau, vol. 24, no. 11, Dec. 13, 1922, pp. 171-173, 3 figs. Describes standard cranes as constructed by German Machine Factory, Inc., Duisburg (Demag), and its use.

WRECKING. High-Capacity Steam Breakdown Cranes. Ry. Gaz., vol. 37, no. 23, Dec. 8, 1922, pp. 753-755 and 757, 7 figs. Constructed by Craven Bros., Manchester, England, for S. African and Egyptian state railways.

CYLINDERS

FOUNDING. Scientific Control in Motor Cylinder Founding, G. H. Judd. Foundry Trade Jl., vol. 26, no. 332, Dec. 28, 1922, pp. 528-530. Author concentrates on part played by works' chemist or metallurgist.

D

DAMS

GROUTING. The Use of Groutt in Cut-Off Trenches and Concrete Core Walls for Earthen Embankments, H. J. F. Gourley. Surveyor, vol. 62, no. 1615, Dec. 29, 1922, pp. 413-417, 3 figs. Discusses present methods with view to reducing cost of dam foundations and saving time without sacrificing watertightness or stability. See also Engineering, vol. 114, no. 2974, Dec. 29, 1922, pp. 812-815, 11 figs. Paper read before Instn. Water Engrs.

MASONRY. The Design of Masonry Dams, Edward Wegmann. Eng. & Contracting, (Water Works), vol. 58, no. 3, Dec. 13, 1922, pp. 121-127 and vol. 59, no. 1, Jan. 10, 1923, pp. 81-88, 11 figs. Historical examples and evolution of theory of design. Paper, slightly condensed, presented before Int. Congress of Engrs., Rio de Janeiro.

DIE CASTING

ALUMINUM AND BRASS. Die Casting, Sam Tour. Jl. Indus. & Eng. Chem., vol. 15, no. 1, Jan. 1923, pp. 25-28, 7 figs. Alloys used for casting; life and thermal fatigue of dies; aluminum and brass die castings.

DIES

SECTIONAL. Sectional Blanking and Piercing Dies, Fred R. Daniels. Machy. (N.Y.), vol. 29, no. 5, Jan. 1923, pp. 339-343, 10 figs. Advantages of sectional dies and methods used in their construction.

DIESEL ENGINES

FOUR- VS. TWO-STROKE-CYCLE. The Relative Advantages of the Four-Stroke and Two-Stroke Cycle Marine Diesel Engine, A. S. Watkinson. Engineering, vol. 115, no. 2975, Jan. 5, 1923, pp. 28-30. Consideration of weight, space occupied, fuel consumption, cost of machinery, cylinder covers, pistons, lubrication, valves, etc., and mechanical and structural considerations.

OPPOSED-PISTON. The Opposed-Piston Principle for High-Power Diesel Engines. Power, vol. 57, no. 2, Jan. 9, 1923, pp. 56-57, 3 figs. Deals with British practice.

DRAINAGE

IRRIGATED LAND. Special Features on the Drainage of Irrigated Lands, Walter W. Weir. Agricultural Eng., vol. 3, no. 11, Nov. 1922, pp. 182-186. Discusses problems in irrigated regions in and beyond the Rockies.

DRILLING MACHINES

MULTIPLE-SPINDLE. Single Hole Drilling on a Multiple-Spindle Machine, W. F. Sandmann. Am. Mach., vol. 57, no. 26, Dec. 28, 1922, pp. 989-990, 5 figs. An example of interchangeable fixture and machine set-up for single-hole work is that used for drilling and reaming of drop-forged plier halves.

DRY DOCKS

ESQUIMALT, B.C. New Esquimalt Dry Dock. Can. Engr., vol. 43, no. 26, Dec. 26, 1922, p. 655, 1 fig. Progress on work on new government dock; will be 1,150 ft. long, 135 ft. wide and 40 ft. deep at high water; concrete construction with granite sills.

E

EDUCATION

TECHNICAL SCHOOL AND PRACTICAL TRAINING. The Training of Engineers (Zur Ingenieurerziehung), G. Lippart. Zeit. des Vereines deutscher Ingenieure, vol. 66, no. 50, Dec. 16, 1922, pp. 1109-1113. Discusses demands made upon technical schools for practical requirements of engineers in general and mechanical engineers in particular; what practical experience does for the engineer; and how co-operation between technical school and practical engineering can best be achieved.

TRAINING FOR INDUSTRIES. Helpful Relations Between the College and the Industries, R. L. Wales. Eng. Education, vol. 13, no. 3, Nov. 1922, pp. 136-146. Deals with problem of mutual helpfulness of colleges and industries.

EDUCATION, ENGINEERING

FRANCE. On the Education of Engineers in France, A. E. Kennelly. Eng. Education, vol. 13, no. 3, Nov. 1922, pp. 89-118, 2 figs. Emphasizes differences between French and American teaching of applied science, leaving aside very many matters in which two are alike. Bibliography.

ELECTRIC ARC

STATIC CHARACTERISTIC. A New Equation for the Static Characteristic of the Normal Electric Arc, W. B. Nottingham. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 12-19, 7 figs. Equation is developed to represent static characteristic of normal arc without apparent systematic error.

ELECTRIC CONDUCTORS

ALUMINUM. Experiences with Aluminum Wires (Erfahrungen mit Aluminiumfreileitungen). Elektrotechnische Zeit., vol. 43, no. 49, Dec. 7, 1922, pp. 1458. Describes practically copperless substation for smelting works, receiving its power over four 3-phase lines of steel aluminum, each with total cross-section of 105 sq. mm., of which 25 sq. mm. are steel, at voltage of 110,000. Rubber-insulated wires used for distribution of light. During 4½ years of use, no electrolytic trouble.

ELECTRIC CURRENT

CONVERSION. Conversion of Electrical Power, J. Elliot Cannell. Power, vol. 57, no. 2, Jan. 16, 1923, pp. 88-90, 7 figs. Practical methods by which alternating current may be changed to direct current or vice versa for commercial purposes; mercury-vapour rectifiers, motor-generator sets and synchronous converters.

ELECTRIC CURRENTS, ALTERNATING

MEASUREMENT. Balance Methods in Alternating Current Measurement, Perry A. Borden. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 35-41, 9 figs. Describes null and semi-null methods of measurements. Bibliography.

ELECTRIC DISTRIBUTION

UNDERGROUND, SYSTEMS. Merits of A.C. Underground Distribution, M. T. Crawford. Elec. World, vol. 80, no. 26, Dec. 23, 1922, pp. 1375-1380, 7 figs. Outline of conditions affecting underground distribution in Seattle and description of system installed; relative merits and costs of various systems.

ELECTRIC DRIVE

LUMBER INDUSTRY. Motor Applications in the Lumber Industry, Gordon Fox. Power Plant Eng., vol. 27, no. 2, Jan. 15, 1923, pp. 130-132, 2 figs. Because of its lower cost of power and absence of fire risk, electric motor is rapidly displacing donkey steam engine.

PAPER MILLS. Improving the Efficiency in the Paper-Industry (Beitrag zur Verbesserung des Leistungs. faktors in der Papierindustrie), Max Rimmelspacher Elektrotechnischer Anzieger, vol. 39, nos. 191 and 192, Nov. 30 and Dec. 2, 1922, pp. 1494-1495 and 1501-1502, 6 figs. Discusses utilization of electric power to best advantage and compares different types of electric machinery from this point of view.

STEEL MILLS. Electric Power in Iron and Steel Works. Elecn., vol. 89, no. 2323, Nov. 24, 1922. Contains following articles: Advantages of Generation and Transmission by Alternating Current Emphasized, A. Davidson, pp. 594-596. Alternating Current and Iron and Steelworks Practice, J. Percy Hodges, pp. 507-600, 7 figs. Selection of Electrical Systems for Iron and Steelworks, J. Macsheehy, pp. 601-607, 3 figs.

ELECTRIC FURNACES

ARC. Characteristics of Arc Furnaces, Especially the Heroult Furnace (Karakteristieke forhold ved lysbueovner, spesielt Héroultovner), S. Selmer-Olsen. Teknisk Ukeblad, vol. 69, no. 47, Nov. 24, 1922, pp. 427-428, 4 figs. Power consumption; current variation; load factor; etc.

BRASS. Electric Brass Furnace Practice, H. W. Gillett and E. L. Mack. U.S. Bur. of Mines, Bul. no. 202, 1922, 334 pp., 71 figs., 55 tables. Monetary saving possible; work of Bur. of Mines; different types of electric furnaces, theoretical and practical advantages; differences between brass and steel melting, types of steel furnaces and their drawbacks for brass melting; types of brass furnaces; terminology and fundamental electric principles; crucible, hearth-type, and arc furnaces; furnaces in which metal itself is resistor; testing furnaces, future Development. Bibliography.

HEAT-TREATING. Electric Furnaces for Heat Treatment of Steel, A. W. Lamont. Eng. Jl. (Eng. Inst. Can., vol. 6, no. 1, Jan. 1923, pp. 3-6, 7 figs. Special features of design and operation, with particular reference to furnace of Transcona shops of Can. Nat. Rys.

INDUCTION. A New Induction Furnace, J. Murray Weed. Metal Industry (Lond.), vol. 21, no. 23, Dec. 8, 1922, pp. 523-533, 3 figs. For melting non-ferrous metals; possesses some features which differ radically from those found in any previous furnace and affords great flexibility of design and broad scope of application. Summary from paper read before Am. Inst. Metals.

NON-FERROUS. Application of Electric Furnaces to Melting of Non-Ferrous Metals and Alloys (L'application des fours électriques à la fusion des métaux et alliages non ferreux), A. Billaz. Vie Technique et Industrielle, vol. 4, nos. 37 and 38, Oct. and Nov. 1922, pp. 21-31 and 91-101, 30 figs. Reverberatory, direct-arc and indirect-arc furnaces including types used in United States; heat balance and heat losses; power consumption, induction furnaces; comparess results obtained with principle types, including power consumption, consumption of electrodes, power factor, etc. Bibliography.

REDUCTION. Electric Reduction Furnace Iron for a Steel Making Base, R. C. Gosrow. Jl. Electricity & West. Industry, vol. 50, no. 1, Jan. 1, 1923, pp. 16-17. Points out economy of its use for production of steel from steel pig.

RESISTANCE TYPE. Heat in Resistance Furnace. Foundry, vol. 50, no. 23, Dec. 1, 1922, pp. 956-957, 2 figs. Describes graphite-resistor-type furnace at plant of Bario Metals Corp., developed by J. Ryan & Co., having holding capacity of 125 lb. per heat and capable of melting and refining alloy mixtures in from 30 to 40 min.

STEEL. Electric Steel Industry After Ten Years, Edwin F. Cone. Iron Age, vol. 111, no. 1, Jan. 4, 1923, pp. 80-83. American industry credited with 406 furnaces against only 19 in 1913; Canadian and world's industry.

ELECTRIC GENERATORS, D.C.

REVERSED POLARITY. Causes of Reversed Polarity in Direct Current Generators, Clarence Lynn. Power, vol. 57, no. 2, Jan. 9, 1923, pp. 51-53, 6 figs. Discusses conditions that may cause reversal of polarity on d.c. generation; how to correct reversed polarity.

VOLTAGE REGULATORS. Automatic Voltage Regulator for Direct Current Generators. Engineering, vol. 115, no. 2975, Jan. 5, 1923, p. 23, 2 figs. Device manufactured by Isenthal & Co., likely to be particularly useful for application to dynamos driven by gasoline engines, speed of which is subject to considerable fluctuations.

ELECTRIC LAMPS, INCANDESCENT

NEON GLOW-DISCHARGE. Neon Glow-discharge Lamps on D.C. Circuits, J. T. Macgregor-Morris, M. J. Dowty and B. J. Privett. Elecn., vol. 89, no. 2324, Dec. 1, 1922, pp. 626-628, 8 figs. Work carried out to study behaviour and determine statical characteristics of two types of neon lamp with view to further possible applications. Photographs of spectra of lamps.

TUNGSTEN FILAMENT. The Relative Performance of Tungsten Filament Lamps under Test upon Alternating and Direct-Current Circuits, John W. Lieb. Illuminating Eng. Soc.—Trans., vol. 18, no. 1, Jan. 1923, pp. 5-18 and (discussion) 18-28, 15 figs. Facts as to differences in a.c. and d.c. performance disclosed by tests carried out in lamp-testing work of Assn. Edison Illuminating Cos. Bibliography.

ELECTRIC LOCOMOTIVES

4,000-HP. 4,000-Hp. Electric Locomotives for N. & W. Elec. Ry. Jl., vol. 60, no. 27, Dec. 30, 1922, pp. 1012-1015, 4 figs. Four double-unit locomotives are under construction for Norfolk & West. Ry's Elkhorn grade and electrified extension.

MAIN-LINE. Electric Locomotives for Main Line Railways. Beama, vol. 12, no. 6, Dec. 1922, pp. 830-833, 2 figs. Types of locomotives ordered from British manufacturers for South Africa and New Zealand.

ELECTRIC RAILWAYS

ENGINEERING PROGRESS. Electric Railway Engineering Progress of the Past Year. Elec. Ry. Jl., vol. 61, no. 1, Jan. 6, 1923, pp. 11-22, 3 figs. Analysis of accomplishments made in track, car, power-plant, power-distribution and heavy-traction engineering, together with some comments on relation of engineering to general problems of transportation.

TROLLEY-WIRE PROTECTION. Some Practical Experience with Troughwork Construction, G. H. McKelway. Elec. Ry. Jl., vol. 60, no. 25, Dec. 16, 1922, pp. 941-942, 5 figs. Protecting metal construction so as to safeguard trolley wire and connections from being grounded.

ELECTRIC RAILWAYS, TRACK

DEVELOPMENTS 1922. Track Extensions and Reconstruction Work Increased. Elec. Ry. Jl., vol. 61, no. 1, Jan. 6, 1923, pp. 51-53. Amount of new track built in 1922 showed small increase over that reported for 1920 and 1921; track reconstruction shows considerable increase.

ELECTRIC TRANSMISSION LINES

INTERCONNECTION. Economies of Interconnection. Elec. World, vol. 81, no. 1, Jan. 6, 1923, pp. 19-21, 2 figs. Vast possibilities for safeguarding service and producing electricity with minimum of fuel, water, money, material and human endeavour. Typical examples taken from actual practice.

QUALITATIVE ANALYSIS. Qualitative Analysis of Transmission Lines, H. Goodwin, Jr. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 48-57, 8 figs. Critical load for transmission lines is introduced with simple formula for determining it and rules are given for variation of power-factor voltage, etc., of line by relating actual load to critical load. Most important parts of Percy H. Thomas' presentation are abstracted, showing fundamental physical and mathematical basis for this method of analysis.

ELECTRICAL INDUSTRY

DEVELOPMENTS. Some Developments in the Electrical Industry During 1922, John Liston. Gen. Elec. Rev., vol. 26, no. 1, Jan. 1923, pp. 7-51, 87 figs. Developments in turbines, electric propulsion, electric railways, automatic stations, waterwheel generators, steel mills, transformers, radio, switching apparatus, induction voltage regulators, lighting, new induction furnace, electric steam generator, Magnar battery charger, magnetron, pallophotophone, etc.

ELECTRIC WELDING, ARC

CAST IRON. Electric Arc Welding of Cast Iron, W. H. Namack. Am. Welding Soc.—Jl., vol. 1, no. 11, Nov. 1922, pp. 7-33, 13 figs. Committee report of tests carried out on conclusions arrived at, preparation of parts to be welded, slag inclusions, current values, method of deposition, length of arc, nitrogen theory, specifications for testing commercial electrodes, size and preparation of samples, method of welding, testing.

STORAGE TANKS. Report of the Committee for the Electric Welding of Storage Tanks. Am. Welding Soc.—Jl., vol. 1, no. 12, Dec. 1922, pp. 16-19, 1 fig. Advantages of welded over riveted tank are set forth. Recommendations and suggestions.

ELECTRIC WELDING, RESISTANCE

Butt Welding. Butt Welding, A. T. De Losw. Am. Mach., vol. 58, no. 2, Jan. 11, 1923, pp. [illegible], 10 figs. Process of spot welding; hand and automatic machines; welding pieces of different sizes; tie welding and other applications.

EMPLOYEES' REPRESENTATION

Rockefeller Plan. Experimenting with the "Human Mechanics" of Industry, Jerome Davis. Indus. Management (N.Y.), vol. 65, no. 1, Jan. 1923, pp. 23-29. Labour representation in the Colorado Fuel & Iron Co.

ENGINEERING

Brazil. Development and Actual State of Engineering in Brazil (A evolucao e posição actual da engenharia no Brazil), Revista Brasileira de Engenharia, vol. 4, nos. 4 and 5, Oct. and Nov. 1922, pp. 200-222 and 255-263. Articles by different authors on present state of railroad, hydraulic, sanitary, telegraph and telephone engineering, bridges, and streets, and engineering activities in the various states.

ENGINEERS

Production. The Production Engineer, H. E. Honer. Eng. Production, vol. 5, no. 115, Dec. 14, 1922, pp. 578-579. His status and duties. Paper presented to Instn. Production Engrs.

ENGINEHOUSES

Erie R. R. Erie Builds New Enginehouse at Jersey City, N.J. Ry. Mech. Engr., vol. 96, no. 12, Dec. 1922, pp. 719-722, 4 figs. Old structure destroyed by fire is replaced without interference with locomotive operations.

EVAPORATORS

Vapour Recompression Systems. Vapour Recompression Systems for Evaporators, W. L. Badger, Chem. & Met. Eng., vol. 28, nos. 1 and 2, Jan. 3 and 10, 1923, pp. 26-31 and 73-78, 14 figs. Survey of advantages and shortcomings of regenerative evaporation; technical history of its development and analysis of recorded data on test runs. Comparison of operating economies with single- and multiple-effect evaporators. Bibliography of patents and literature.

F

FACTORIES

Metal-Stamping Plant. 15,000 Tons of Material Consumed at the Pedlar Plant. Can. Machy., vol. 28, no. 26, Dec. 28, 1922, pp. 122-125 and 142, 10 figs. processes, layout and equipment of plant of Pedlar People, Ltd., Oshawa. Shows line of drop presses for stamping steel ceilings, sidings, trimmings, etc.

Small. Establishing a Small Engineering Works, A. Whitehead. Indus. Management (Lond.), vol. 8, nos. 6, 9, 10, 11 and 12, Oct. 5, Nov. 16, 30, Dec. 14 and 28, 1922, pp. 191-192, 286-287, 314-316, 343-345 and 382-384, 6 figs. Principles adopted in appointing staff, organization and functions of production office.

FANS

Exhaust Work, for. The Design of Exhaust Systems, H. W. Pfeffer. Heating & Vent. Mag., vol. 19, no. 12, Dec. 1922, pp. 53-57, 5 figs. Data covering standard practice, based on experiments.

FEEDWATER HEATERS

Types. Plant Economy pp. Demands Feed Water Heating. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, 1 p. 49-52, 8 figs. Types of heaters and their installation; saving effected.

FERROALLOYS

Industry 1922. The Ferroalloy Industry in 1922, Robert J. Anderson. Iron Age, vol. 111, no. 1, Jan. 4, 1923, pp. 58-61. Technical developments and market conditions reviewed.

FILTERS, SAND

Slow and Rapid. Twenty Years of Filtration Practice at Albany, George E. Willcomb. Am. Water Works Assn. — Jl., vol. 10, no. 1, Jan. 1923, pp. 97-126. Slow evolution of slow into rapid sand type; introduction of scrubber units; future possibilities.

FLOW OF AIR

Measurement. Measurement of Air Flow. Power Plant Engr., vol. 27, no. 1, Jan. 1, 1923, pp. 15-16, 2 figs. Methods of determining amount of air passing in forced-draft installations.

FLOW OF FLUIDS

Theory. The Flow of Fluids in General (Etude sur l'écoulement des fluides en général), A. Lebrasseur and F. d'Espine. Chaleur et Industrie, vol. 3, nos. 27, 28, 29, 30, 31 and 32, July, Aug., Sept., Oct., Nov. and Dec. 1922, pp. 1432-1437, 1528-1535, 1608-1613, 1689-1696, 1787-1792 and 1870-1874, 28 figs. Fuel combustion; production, transportation and utilization of calorific energy; flow of gases; velocity and vicosity; coefficient of roughness in pipes; flow of compressible fluids; friction and expansion; formulas and equations.

FLOW OF GASES

Pipes. The Flow of Gases and Steam (L'écoulement des gaz et vapeurs). Métallurgie, vol. 54, no. 49, Dec. 7, 1922, pp. 1829-1831. Flow of gas and steam in tubes; formulas and calculations.

Pulsating Currents. Accelerated Reactions in Pulsating Gaseous Currents, Jules Deschamps and J. F. Shagden. Chem. and Met. Engr., vol. 27, no. 26, Dec. 27, 1922, pp. 1269-1271, 2 figs. Utilization of pulsations and vibrations of appropriate amplitude to accelerate physical interchanges and chemical reactions between gases and vapors in checkerworks, labyrinths, or piled-up solids.

FLOW OF LIQUIDS

Capillary. On the Flow of Liquids under Capillary Pressure, Eric Keightley Rideal. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 44, no. 264, Dec. 1922, pp. 1152-1159, 3 figs. Rate of penetration of liquids into capillary pores; phenomena of absorption by charcoal and other materials.

FLOW OF WATER

Conduits. Non-Uniform Flow and Significance of Drop-Down Curve in Conduits, H. E. Babbitt. Eng. News-Rec., vol. 89, no. 25, Dec. 21, 1922, pp. 1067-1069, 3 figs. Study in conduit design, making possible flatter grades smaller conduits or available grades at cost reduction.

FLUE-GAS ANALYSIS

Graphical Method. Flue-Gas Diagrams (On rookgasdiagram), A. Halvorsen and V. Christiansen. Teknisk Tidskrift, vol. 52, no. [illegible], Dec. 16, 1922, pp. 801-806, 7 figs. Diagrams for various kinds of coal and coke; discusses variation of percentage of CO, CO_2, etc.

Indicators and Recorders. Flue Gas Analyzers and CO_2 Recorders. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 30-33, 7 figs. Principles and methods of use of hand analyzers; getting correct gas samples; types of recorders.

FOREMEN

Training. What Kind of Training for the Foreman? B. M. Nussbaum. Am. Mach., vol. 58, no. 1, Jan. 4, 1923, pp. 29-31. Tests of plans that have worked well in many plants.

FOUNDRIES

Quantity Production, Quality in. How Quality is Produced under Quantity Production Conditions, H. Cole Estep. Foundry Trade Jl., vol. 26, nos. 329, 330, and 331, Dec. 7, 14 and 21, pp. 459-461, 481-484 and 504-506, 6 figs. Notes on scientific control basis of quantity production; subdivision of labour; American basis for management; pyrometric control; mixing metal by analysis; results obtained by Cadillac Motor Car Co.; American malleable iron.

Safety Code. Safety Code to Protect Foundry Workers. Iron Age, vol. 111, no. 3, Jan. 18, 1923, pp. 217-220. American Engineering Standards Committee covers all problems pertaining to foundries, hazards of general character belong in general codes.

Specialty Lines. Are Foundries Developing Along Specialty Lines? F. H. Bell. Can. Machy., vol. 29, no. 1, Jan. 4, 1923, pp. 26-27 and 29, 4 figs. Recent building and equipment are said to indicate this; modern methods for handling material.

Steel. The Steel Foundry of Messrs. Thwaites Brothers. Foundry Trade Jl., vol. 26, no. 327, Nov. 23, 1922, pp. 423-426, 6 figs. Description of Vulcan Works, including foundry proper, physical and chemical laboratories, core shop, heat-treatment plant, and some of the operations.

FREIGHT HANDLING

Cost Analysis. Analysis of Cost of Freight Service, Grand Trunk Railway Company of Canada, J. P. Newell. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 1, Jan. 1923, pp. 1-36, 1 fig. Describes methods used which are said to be applicable to operations of any railroad.

FUELS

Measurement. Fuel Determination. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 16-18, 6 figs. Scales, meters and counters for measurement of coal; meter for oil measurement.

See also Lignite; Oil Fuel; Pulverized Coal.

FURNACES, ANNEALING

Fuel Economy. Fuel Economy in Connection with Annealing Furnaces — II. Chas. E. Wade. Metal Industry (Lond.), vol. 21, no. 21, Nov. 24, 1922, pp. 481-482. Producer-gas firing; blowing-in by steam jet; town-gas, coke, oil, and pulverized-fuel-firing.

FURNACES, HEATING

Recuperative. Recuperative Raises Furnace Efficiency, William B. Chapman. Iron Trade Rev., vol. 72, no. 2, Jan. 11, 1923, pp. 163-164, 3 figs. Discussion of paper entitled Heating Furnaces for Blooms, Slabs and Billets, by W. P. Chandler, Jr., presented before Am. Iron & Steel Inst.

FURNACES, HOT-AIR

Design. Some Comments on Furnace Installation, F. T. Giblin and Frank K. Chew. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 1, Jan. 1923, pp. 19-26, 4 figs. Comparison of good war-time system with rules of prominent authorities and with requirements of proposed furnace code.

Standard Code. Standard Code Regulating the Installation of Warm Air Furnaces in Residences. Am. Soc. Heating and Vent. Engrs.-Jl., vol. 28, no. 9, Dec. 1922, pp. 869-876. Code prepared by special committee.

FURNACES, INDUSTRIAL

Oil-Burning. Factors Affecting the Use of Air in Oil Burning with Comparison of Cost, W. C. Buell, Jr. Engrs.' Soc. West. Pa. — Proc., vol. 38, no. 6, July 1922, pp. 201-221 and (discussion) 222-226, 11 figs. Classification into three general types of oil burners, namely those employing "volume" air, those operating on "positive" air, and those utilizing "high-pressure" air.

FURNACES, METALLURGICAL

Vertical-Retort. The Fiechtl Vertical Retort Furnace for Zinc Ores, William Kapellmann. Eng. and Min. Jl., Press, vol. 114, no. 27, Dec. 30, 1922, pp. 1153-1154, 2 figs. Greater simplicity of design and lower cost of erection and operation than with ordinary retort process are claimed; device tested by construction of four retorts at Kansas plant.

FURNACES, REVERBERATORY

Metal-Melting. Progress in Non-Ferrous Metal Melting. Metal Industry, (Lond.), vol. 21, no. 21, Nov. 24, 1922, pp. 483-485, 4 figs. Describes metal-melting operating on reverberatory principle, placed on market by Brit. Reverberatory Furnaces, Ltd.

G

GAS

Therm Basis for Charging. Status of Therm Basis in Britain, C. H. S. Tupholme. Gas Age-Rec., vol. 50, nos. 24 and 25, Dec. 9 and 16, 1922, pp. 801-802 and 806, and 835-838. Study of operation of gas regulation act of 1920 intending to place charges for gas on more equitable basis, many obstacles encounteredin its operation.

GAS PRODUCERS

TYPES. Modern Gas Producers (Les gazogènes actuels). Ouvrier Moderne, vol. 5, no. 9, Dec. 1922, pp. 355-357, 3 figs. Describes various types and their operation; choice of fuels.

GEARS

BEVEL. Bevel Gear Calculations, C. R. M. Moore, Machy. (Lond.), vol. 21, no. 21, no. 534, Dec. 21, 1922, pp. 370-372, 3 figs. Study of alternative methods.

INVOLUTE, TESTING. Testing Involute Spur Gears, M. Estabrook. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 32-34, and 81, 14 figs. Describes Saurer gear-testing machine, a Swiss development by means of which accuracy of tooth curves, spacing and eccentricities can be determined with high degree of precision; and odontmeter, American instrument for quickly and accurately testing gears for tooth curves and spacing, and with which it is possible to locate troubles in machines or tools. (Abridged.)

OIL TRANSMISSION, VARIABLE-SPEED. Variable Speed Oil Transmission Gear. Engineering, vol. 114, no. 2974, Dec. 29, 1922, pp. 800-801, 15 figs. partly on p. 804. Details and various applications of gear constructed by Oilgear Co., Milwaukee, Wis.

SPIRAL DRIVE. Spiral Driving, C. S. Petitt. Machy. (Lond.), vol. 21, no. 535, Dec. 28, 1922, pp. 393-396, 6 figs. Study of arc of contact, and broad formulation of ideal conditions for continuous spiral drive.

TEETH, STRENGTH OF. Strength of Internal Spur-gear Teeth, A. Fisher. Machy. (Lond.), vol. 21, no. 532, Dec. 7, 1922, pp. 309-310, 3 figs. Discussion of certain geometrical relationships in tooth contact conditions upon which writer arrives at different conclusions from D. T. Hamilton, whose article was published in same journal, Oct. 19, p. 84.

GOLD METALLURGY

ORE CONCENTRATION. Concentration of Rossland, B.C., Ores, Douglas Lay. Eng. and Min. Jl.-Press, vol. 114, no. 26, Dec. 23, 1922, pp. 1118-1124, 6 figs. Low-grade chalcopyrite and pyrrhotite, carrying gold, formerly smelted direct; treatment at Le Roi No. 2 mill of general application; heap roasting, preceding differential flotation, an interesting possibility.

GRINDING MACHINES

CYLINDER. Grinding Large Cylinders. Machy. (N.Y.,), vol. 29, no. 5, Jan. 1923, pp. 347-348, 2 figs. Describes cylinder-grinding machine made by German firm and its use for regrinding steam cylinder for a Worthington duplex hydraulic pump.

H

HANDLING MATERIALS

FACTORIES. Evolution in Shop Material Handling, L. S. Love. Iron Age, vol. 111, no. 3, Jan. 18, 1923, pp. 205-208, 9 figs. Practice at Yale & Towne Mfg. Co.'s plant at Stamford, Conn. Evolution from trolley and hand truckers to electric shop trucks and trailers.

OPEN-HEARTH WORKS. Transport Installations in Open-Hearth Steel Works with Special Regard to Costs of Handling Materials (Transportanlagen in Siemens-Martin-Stahlwerken unter besonderer Berücksichtigung der Kosten der Materialbewegung), Hans Fromm. Stahl u. Eisen, vol. 42, nos. 47 and 49, Nov. 23 and Dec. 7, 1922, pp. 1737-1742 and 1809-1815, 22 figs. Discusses various possibilities of moving material in modern open-hearth works; determination of percentage of total production costs expended for conveyance of material shown on concrete example.

PACKING AND WEIGHING MACHINERY. Modern Packaging Machinery. Indus. Management (Lond.), vol. 8, no. 11, Dec. 14, 1922, pp. 346-348, 4 figs. Pneumatic system of packing and weighing.

HEAT TRANSMISSION

EXPERIMENTS. Heat Flow in a Finite Cylinder Having Variable Temperature, George E. Thompson. Physical Rev., Surface vol. 20, no. 6, Dec. 14, 1922, pp. 601-606, 2 figs. Derives equations of heat flow into finite circular cylinders when surface temperature is changed either suddenly or at uniform rate.

HEAT TREATING

CITY GAS FOR. Gas Useful in Heat Treating Room, J. Weaver Smith. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 396-414, 44 figs. Discusses practical application of city gas or manufactured gas in heat-treating room; convenience of using gas as fuel and its wide application to all types of industrial heating; burner and furnace design and effects of using equipment of improper design.

HEATING AND VENTILATION

BUREAU OF ENGRAVING AND PRINTING. Heating and Ventilating the Bureau of Engraving and Printing, Nelson S. Thompson. Am. Soc. Heating and Vent. Engrs.-Jl., vol. 29, no. 1, Jan. 1923, pp. 1-8, 5 figs. Simplicity of design marks systems in world's largest printing plant.

HUMIDITY IN RESIDENCES. Humidity Requirements for Residences, A. P. Kratz. Am. Soc. Heating and Vent. Engrs.-Jl., vol. 29, no. 1, Jan. 1923, pp. 14-18, 5 figs. Questions answered relative to degree of humidity necessary and methods of supplying it.

HEATING, ELECTRIC

INDUSTRIAL. Big Strides Made in Industrial Electric Heating, J. L. McK. Yardley. Elec. World, vol. 81, no. 1, Jan. 6, 1923, pp. 33-35, 2 figs. Applications of industrial electric ovens and heat-treating equipment extending; electric steam boilers for special service.

HELICOPTERS

CAPTIVE. Will Captive Helicopters Replace the Observation Balloon? Aerial Age, vol. 16, no. 1, Jan. 1923, pp. 9-11, 3 figs. Flight of 1 hr. with Kàrmàn-Zurovec machine; advantages claimed in artilery adjustment; flights.

HOISTING MACHINERY

ELECTRIC CONTROL. Electric Control of Hoisting Apparatus (Commande électrique des appareils de levage), M. Bizot. Electricien, vol. 54, no. 1315, Jan. 1, 1922, pp. 3-8, 6 figs. Its advantages as to distance control, change in speed, automatic control, etc.

HYDRAULIC MACHINERY

AQUAPULSOR MOTOR. The New Hydraulic Engine "Aquapulsor" (Die neue Wasserkraftmaschine "Aquapulsor"), R. Winkle. Glasers Annalen, vol. 91, no. 12, Dec. 15, 1922, pp. 185-191, 9 figs. Its behavior under different loads and varying head, and its use as tidal-power machine in coastal areas.

HYDRAULIC TURBINES

DEVELOPMENT. Hydraulic Turbines (Turbinas Hydraulicas), Herman Greenwood. Revista Brasileira de Engenharia, vol. 4, no. 4, Oct. 1922, pp. 128-142, 27 figs. Discusses increase in capacity, reaction turbines for large heads, efficiency, distance control, high velocity for low heads, inverted and suction turbines.

PELTON WHEELS. 26,000-Hp. Pelton Wheels of Societa Forze Idrauliche del Moncenisio, Constructed by Societa Construzioni Meccaniche Riva of Milan (Le turbine tipo Pelton da 26,000 hp. per l'impianto di Venaus della Societa Forze Idrauliche del Moncenisio, costruite dalla Societa Costruzioni Meccaniche Riva di Milano). Industria, vol. 36, no. 20, Oct. 31, 1922, pp. 382-386, 6 figs. Details of design and construction.

TESTS. High-Speed Turbine Tests (Considerazioni ed esperimenti sulle turbine celeri), Alfredo Calzoni. Electrotecnica, vol. 9, no. 27, Sept. 25, 1922, pp. 593-600, 18 figs. Water turbines for hydroelectric plants; construction of high-speed turbines following Büchi; particulars of tests carried out.

HYDRAULICS

ENERGY-CONVERSION CURVE. The Triangular Chart and the Hydraulic Emergy-Conversion Curve (Die Dreieckrechentafeln und die hydraulische Energieumwandlungskurve), Otto Lacmann. Zeit. für angewandte Mathematik u. Mechanik, vol. 2, no. 5, Oct. 1922, pp. 375-380, 5 figs. Presents charts as schematic examples.

HYDROGRAPHIC INVESTIGATIONS. Hydrographic Principles of the Swiss Water Supply (Hydrographische Grundlagen der Schweizerischcen Wasserwirtschaft). Schweizerische Bauzeitung, vol. 80, nos. 19 and 20, Nov. 4 and 11, 1922, pp. 213-217 and 225-226, 24 figs. Graphic presentations of hydrometric observations. Deals with lake level fluctuations, and water flow in rivers. See also abstract of report of Federal Board of Water Supply, pp. 227-230 and 276-277 of same Jl.

HYDRO-ELECTRIC DEVELOPMENTS

TASMANIA. Hydro-Electric Development in Tasmania, Fred. A. Talbot. Elec. Rev., vol. 91, nos. 2350 and 2351, Dec. 8 and 15, 1922, pp. 856-858 and 892-893, 5 figs. Comprehensive scheme for generation of 350,000 hp. from water power of which initial 58,000 hp. has been brought into service.

UNITED STATES. Hydro Projects Will Total $778,300,000. Elec. World, vol. 81, no. 1, Jan. 6, 1923, pp. 37-38, 1 fig. Active applications filed with Federal Power Commission total 334, involving 17,692,109 primary hp.; projects involving 2,531,489 primary hp. now under construction.

HYDRO-ELECTRIC PLANTS

AUTOMATIC. Automatic Hydroelectric Plant, C. E. von Sothen. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 88-89, 2 figs. Automatic control of small hydro-electric plant at Newton Falls Paper Co. enables water to be used economically.

FRANCE. Electric Power Station and Barrage Dam Near Belle-Isle-en-Terre (Usine électrique installée dans un barrage près de Belle-Isle-en-Terre). Génie Civil, vol. 81, no. 24, Dec. 9, 1922, pp. 529-532, 17 figs. Describes multiple-arch reinforced-concrete dam at Leguer River, forming one structure with works containing turbines, alternators, transformers, etc.

NORTHERN EUROPE, PRACTICE IN. Hydraulic Power Plant Practice in Northern Europe, Clifford N. Anderson. Elec. World, vol. 81, no. 2, Jan. 13, 1923, pp. 91-96, 8 figs. Skeptical regarding outdoor installations; connecting generators and transference directly; higher reactance and regulators; oil circuit breakers with multi-contacts and explosion chambers.

I

IGNITION

HIGH-TENSION APPARATUS. The Duty of High-Tension Ignition Apparatus, J. D. Morgan. Automobile Engr., vol. 12, no. 171, Dec. 1922, pp. 413-415, 6 figs. Describes high-tension spark; high-tension spark as igniting agent; plug insulation leakage; utility test.

INDUSTRIAL MANAGEMENT

ADMINISTRATORS, TRAINING OF. Training of Administration in Industry, H. Riall Sankey. Jl. Indus. Administration, vol. 2, no. 14, Nov.-Dec. 1922, pp. 35-47. Work of Indus. Administration and its aspirations. Training and education of administrators.

COST CONTROL, TEXTILE. Textile Cost Control, Henry C. Haskell. Management Eng., vol. 4, no. 1, Jan. 1923, pp. 57-59. Effort to simplify cost accounting and production planning.

GRAPHICAL EFFICIENCY STUDY. The Graphical Study of Operating Efficiency, A. R. Blakey. Chem. and Met. Engr., vol. 27, no. 26, Dec. 27, 1922, pp. 1259-1261, 2 figs. System of graphs developed to analyze labor costs, and which reveal lack of smoothness in operating and causes for lost time.

MONEY ECONOMY, PRODUCTION AND. Making Goods and Making Money, Wesley C. Mitchell. Mech. Eng., vol. 45, no. 1, Jan. 1923; pp. 4-6. Points out that among improvements needed are methods of stabilizing monetary standard, controlling business cycle, allowing production to be organized in units large enough to attain maximum industrial efficiency while safeguarding community against high prices, etc. Discussion, pp. 10-13.

PLANNING. Factory Planning, H. E. Taylor. Machy. (Lond.), vol. 24, no. 532, Dec. 7, 1922, pp. 289-297, 11 figs. Survey of systems of shop planning for various methods of production. Paper read before Inst. Production Engrs.

PLANT MAINTENANCE. Maintenance Engineering in Large Industrial Plants, Samuel E. Bird. Eng. News-Rec., vol. 89, no. 26, Dec. 28, 1922, pp. 1106-1108. Organization and work of department for inspection and upkeep of buildings, equipment, yards, tracks and roadways.

PRODUCTION COSTS. Calculating the Cost of Production (Etablissement du Prix de revient de Fabrications), Dauty Latrance. Vie Technique et Industrielle, vol. 4, no. 38, Nov. 1922, pp. 83-89, 6 figs. Conditions in manufacture on a large scale, with interchangeable parts; records required regarding labour, material, machines, inspection, etc., and their use in arriving at cost of production.

WASTES. Factory Management Wastes, J. J. Wittefeld. [illegible] Administration, vol. 2, no. 14, Nov., Dec. 1922, pp. [illegible]. Discusses preventable wastes under following heads: (1) imperfect design; (2) inadequate production control; (3) inefficient co-ordination of sales and production sections; (4) inaccurate costs and statistics; (5) improper working conditions; and (6) incompetent personnel.

INDUSTRIAL ORGANIZATION

DEPARTMENTAL. Some Aspects of Departmental Organization, A. H. Railing. [illegible] Administration, vol. 2, nos. 13 and 14, Oct. and Nov.-Dec. 1922, pp. [illegible] and 48-54. Comparison with state government; structure of business organization; resulting changes in conditions; raw material, purchasing, labour and overhead costs; specialization; sales expenses; comparison of types and examples of organizations; the Gen. Elec. Co.'s organization; decentralization.

INDUSTRIAL RELATIONS

HUMAN PROBLEM. The Human Problem in Industry, E. M. Herr. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 6-10. According to author, shop representation, fair wages, security of employment and means for education are among demands for workers and merit consideration of all managers. Discussion, pp. 10-13.

INDUSTRY

FRANCE, RECONSTRUCTION IN. French Industrial Reconstruction and How it Has Been Accomplished, Arthur L. Greene and Henry Obermeyer. Am. Mach., vol. 58, no. 3, Jan. 18, 1923, pp. 107-111, 7 figs. Details of reconstruction plant of a Lille machine company after war and its part in reconstructing other industries, 30 new types of machines developed.

INSULATORS, ELECTRIC

PIN-TYPE. Pin Insulators on 90,000-Volt Line, Paul Ackerman. Elec. World, vol. 80, no. 27, Dec. 30, 1922, pp. 1439-1444, 3 figs. Changed from 60,000 volts delta to 90,000 volts Y; with effective relay protection and heavy-duty oil switches, they are found as reliable as former voltage.

INSULATORS, HEAT

PROPERTIES OF. Heat Insulating Materials, W. Newton, Booth. Gas Jl., vol. 160, no. 3111, Dec. 27, 1922, pp. 798-799, 1 fig. Physical properties of common insulating materials are given in tabular form.

INTERNAL-COMBUSTION ENGINES

RIPERT. The Ripert Engine (Le moteur Ripers), Grison. Bul. Technique du Bureau Veritas, vol. 4, no. 10, Oct. 1922, pp. 245-247, 2 figs. A two- and four-stroke engine endeavouring to rectify some of the weak points of the Diesel; gets charge ready before dead-center and has instantaneous combustion; production of maximum pressure.

See also Airplane Engines, Automobile engines, Diesel engines; Oil engines.

IRON

CORROSION. Parkerizing, A Combined Rust-Proofing and Finishing Process, L. E. Eckelmann. Raw Material, vol. 5, no. 11, Dec. 1922, pp. 438-439, 2 figs. Description of process and its applications.

ELECTROLYTIC. The Production of Electrolytic Iron Using Pyrite as Raw Material, F. A. Eustis. Min. and Met. Soc. of Am.—Bul. no. 157, vol. 15, no. 5, Dec. 1922, 152-160 and (discussion) 160-168, 3 figs. Describes Eustis process directed broadly to treatment of iron ores with or without other metals, to recover pure iron directly by electrolysis; in most of its applications it yields one or more by-products.

IRON ALLOYS

PREPARATION AND PROPERTIES. Preparation and Properties of Pure Iron Alloys: I. Effects of Carbon and Manganese on the Mechanical Properties of Pure Iron, Robert P. Neville and John R. Cain, U.S. Bur. of Standards, Sci. Papers, vol. 18, no. 453, Oct. 16, 1922, pp. 411-443, 16 figs.

IRON AND STEEL

BRITISH COLUMBIA. An Iron and Steel Industry For British Columbia, Robert Dunn. Can. Min. Jl., vol. 43, no. 52, Dec. 29, 1922, pp. 896-987. Resumé of optimistic report by C. P. Williams on economic possibility of establishing an iron and steel industry in British Columbia.

MAGNETIC PROPERTIES. Investigation on the Magnetic Transformation of Iron and Steels (Etude expérimentale sur les transformations magnétiques du fer et des aciers), P. Dejean. Annales de Physique, vol. 18, no. 9, Sept.-Oct. 1922, 1922, pp. 171-272, 52 figs. Loss of magnetic properties at high temperatures; results of experiments carried out on ferromagnetic and paramagnetic phenomena. Bibliography.

IRON CASTINGS

ACID RESISTING. Some Casting Problems of Acid-Resisting Irons, John Longden. Foundry Trade Jl., vol. 26, no. 329, Dec. 7, 1922, pp. 466-470, 12 figs. Notes on composition of alloy; physical characteristics; melting practice; graphite separation; different behaviour from different cupolas; theoretical desiderata; carbon in liquid iron; types and problems of casting.

GATING AND FEEDING. Gating, Feeding and Casting, E. Longden. Foundry Trade Jl., vol. 26, nos. 329, 330 and 331, Dec. 7, 14 and 21, 1922, pp. 471-472, 489-490 and 509-512, 15 figs. Survey od peculiarities of gray cast iron and effect of various elements in reducing or increasing fluidity. Examples of faulty and successful gating and feeding methods.

IRON DEPOSITS

CANADA. The Mattawin Iron Range, F. Hille. Can. Min. Jl., vol. 43, no. 51, Dec. 22, 1922, pp. 872-876, 1 fig. Description of its eastern end, character of ore, and its possibie utilization.

IRON, PIG

MANUFACTURE. Iron Making Economies Developed in 1922, F. H. Willcox. Iron Age, vol. 111, no. 1, Jan. 4, 1923, pp. 84-86. Feasibility of 700-ton-per-day plant; production of 7 tons per man; handling flur dust and utilizing scrap; selling surplus power.

PRODUCTION. Machine Cast Pig Iron Increasing in Popularity. Can. Foundrymen, vol. 13, no. 12 Dec. 1922, pp. 13-15, 2 figs. Can. Furnace Co. installing machine at their Port Colborne furnace; review of old and new process; different people's opinions.

SAMPLING. American Methods of Sampling Pig-Iron. Foundry Trade Jl., vol. 26, no. 331, Dec. 21, 1922, pp. 515-516, 2 figs. Method used and published by Carnegie Steel Co.'s Bur. of Information. Pittsburgh, Pa.

L

LABOUR

LEGISLATION, 1921. Labour Legislation of 1921. U.S. Bur. of Labour Statistics, no. 308, Feb. 1922, 25 pp. Review of legislation, and laws of various states enacted since Jan. 1, 1921.

ORGANIZATION. Labour Unions and [illegible] (Les organisations ouvrières professionnelles et le chômage), G. Olphe Galliard. Vie Technique et Industrielle, vol. 4, nos. 37 and 38, Oct. and Nov. 1922, pp. 5-8 and 77-82. [illegible] trade unionism, organization and employment benefits, and [illegible] in France; guarantees and payments to labour for [illegible].

SHORTAGE. The Labour Shortage: Its Volume and Means of Relief. Eng. News-Rec., vol. 90, nos. 1 and 2, Jan. 4 and 11, 1923, pp. 8-13 and 62-67, 4 figs. Contains following articles: Jan. 4: Labour shortage in building trades. Immigration as affecting labour situation. Jan. 11: How building trades are training apprentices. Seasonal employment in building construction.

LABORATORIES

AERONAUTICAL. Laboratories of the Aeronautical Technical Service (Les laboratoires du Service Technique de l'Aéronautique), Robert. Aéronautique, vol. 4, no. 43, Dec. 1922, pp. 373-378, 4 figs. Describes new laboratories at Chalais-Meudon for aerodynamics, heat treatment, mechanical, chemical, and physical tests, photography, meteorology, and optics.

LATHES

CENTER. A New Center Lathe. Eng. Production, vol. 5, no. 115, Dec. 14, 1922, pp. 567-568, 3 figs. New Dean, Smith & Grace 12-in. high-speed gap lathe.

TAILSTOCKS. Lathe Tailstocks. Eng. Production, vol. 5, no. 117, Dec. 28, 1922, pp. 608-610, 10 figs. Design of various types.

TURRET. The Turret Lathe in the Railway Wagon Shop. British Machine Tool Engineering, vol. 2, no. 18, Nov.-Dec. 1922, pp. 553-556 and 568, 8 figs. Describes operations in production of car buffers for one of the large Indian railways serving as good example to demonstrate capabilities of modern design of turret lathe.

LIGHTING

LUMINAIRE DESIGN. Tentative Code of Luminaire Design. Illuminating Eng. Soc. — Trans., vol. 17, no. 10, Dec. 1922, pp. 703-750, 48 figs. Prepared by Committee to co-operate with fixture manufacturers.

LIGNITE

GERMAN AND AMERICAN. German Brown Coal Compared with American Lignite, O. P. Hood. Chem. and Met. Eng., vol. 28, no. 2, Jan. 10, 1923, pp. 58-59, 1 fig. German is almost two-thirds water, and has 2½ to 13 per cent agglutinating matter; American is one-third water and has less than 1½ per cent agglutinating matter. See also Power, vol. 57, no. 2, Jan. 9, 1923, pp. 63-64, 1 fig.

GASIFICATION. Gasification of Crude Lignite Containing Considerable Water, G. H. Meyer. Am. Gas. Jl., vol. 117, no. 31, Dec. 30, 1922, 711-714, 4 figs. Describes method and apparatus for this work. Translated from Chemiker Zeitung, 1922, pp. 625-628.

LOCOMOTIVE BOILERS

COLE'S RATIOS, GRAPHIC PRESENTATION. Graphic Presentation of Boiler Proportions C. A. Seley. Ry. Age, vol. 74, no. 2, Jan. 13, 1923, pp. 189-192, 19 figs. Diagrammatic method for showing at glance essential facts brought out by Cole's ratio. See also Ry. and Locomotive Eng., vol. 36, no. 1, Jan. 1923, pp. 9-13, 24 figs.

PROPORTIONS, MEASURING. A New Measuring Stick for Locomotive Boiler Proportions, C. A. Seley. Ry. Rev., vol. 71, no. 26, Dec. 23, 1922, pp. 892-897, 24 figs. Graphical analysis of locomotive boiler proportions reveals science of thermic syphon.

LOCOMOTIVES

BRITISH DESIGN. Recent Tendencies in British Locomotive Practice, E. C. Poultney. Ry. Mech. Engr., vol. 96, no. 12, Dec. 1922, pp. 677-682 and vol. 97, no. 1, Jan. 1923, pp. 9-12, 12 figs. Important designs; piston valve with relief and by-pass features; mechanical lubricator. Pacific-type locomotive of 3-cylinder and 4-cylinder types.

DEVELOPMENTS 1922. Locomotives of 1922. Engineer, vol. 135, no. 3497, Jan. 7, 1923, pp. 4-6, 11 figs. partly on supp. plates. Review of new types, including Vincent Raven's electric locomotive Gresley's Pacific express engine, Baltic tank engine, Ramsay condensing locomotive, Ljungström turbo-electric locomotive, and Sulzer Diesel-electric rail coach.

INTERNAL-COMBUSTION. Oil Locomotives for the Gold Coast. Engineer, vol. 134, no. 3494, Dec. 15, 1922, pp. 646-647, 4 figs. Locomotives driven by internal-combustion engines recently supplied to Gold Coast Colony for service on Takoradi Harbour scheme.

STEAM-TURBINE. Ljungström Turbine (La locomotive à turbines Ljungström), R. Villers. Nature, no. 2536, Nov. 11, 1922, pp. 312-316, 5 figs. Steam production, condensing, steering and reversing gears

STEAM VS. ELECTRIC. Comparison of Steam and Electric Locomotives on Standard Gage (Note au sujet de la comparaison entre les locomotives à vapeur et les locomotives électriques sur les Chemins de Fer à voie normale), A. Chardin. Industrie des Tramways, Chemins de Fer et Transports Publics Automobiles. vol. 16, no. 191, Nov. 1922, pp. 234-239, Details of steam and electric equipment; critical review of advantages and disadvantages of each, from technical and traffic points of view.

Electric Locomotives and Motor Cars (Locomotivas electricas e carros motores), Ildeu Ramos Lima. Revista Brasileira de Engenharia, vol. 4, no. 5, Nov. 1922, pp. 271-286, 5 figs. Discusses electric and steam traction as used in various parts of world; systems of electrification, including the Chicago, Milwaukee and St. Paul; power consumption.

SUPERHEATER. Standard 2-10-0 Freight Locomotive for German Railways, Desider Ledacs Kiss Ry. Rev., vol. 72, no. 1, Jan. 6, 1923, pp. 34-38, 8 figs. Three-cylinder superheater locomotive weighing 209,000 lb. develops 2000 hp. and 55,250 max. tractive effort.

VALVE-GEAR LINKS. Methods of Repairing Walschaert Valve Gear Links. Ry. Mech. Engr., vol. 96, no. 12, Dec. 1922, pp. 709-711, 8 figs. Operations systematized to permit quantity production of parts; jigs insure accuracy.

LUBRICATING OILS

PURIFICATION AND RECLAMATION. Getting Better Service From Lubricating Oils. Allen F. Brewer, Indus. Management (N.Y.), vol. 65, no. 1, Jan. 1923, pp. 13-18, 7 figs. Importance and methods of purification and reclamation.

Reclamation of Used Petroleum Lubricating Oils, Winslow H. Herschel and A. H. Anderson. U.S. Bur. of Standards, Technologic Papers, vol. 17, no. 223, Oct. 21, 1922, pp. 93-108. Deterioration of lubricating oils in use; present methods of reclamation; tests with motor-oil purifier; organic acidity; interfacial tension; refining processes; cause of sludge formation.

LUMBER

CUTTING, WASTE CONTROL. Control of Lumber-Cutting Waste and Production, Carle M. Bigelow. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 42-44, 4 figs. Discusses increase in board feet per man-hour and reduction in waste percentage in cutting department of woodworking plants by means of wage incentive. (Abridged.)

M

MACHINE-TOOL INDUSTRY

DEVELOPMENTS 1922. The Trend of the Machine Industry, Frank A. Scott. Iron Age, vol. 111, no. 1, Jan. 4, 1923, pp. 4-6. More specialization, yet general-purpose machines hold strong place; relation to automobile industry; problem of alloy steels.

GERMANY. Changed Machine Tool Shops of Germany, Godfrey L. Garden. Iron Age, vol. 111, no. 1, Jan. 4, 1923, pp. 33-34. Conditions at Ludwig Loewe Works, Berlin, as example; shortage in quantity and quality of expert men; technical training suffers.

PROBLEMS. Conditions Faced by Machine Tool Builder, J. J. Ralph. Iron Age, vol. 111, no. 2, Jan. 11, 1923, pp. 137-141, 7 figs. Why it is difficult to secure continuously satisfactory activity; how some of the problems have been met.

MACHINE TOOLS

DEVELOPMENTS 1922. A Year's Achievement in Machine Tools, L. S. Love. Iron Age, vol. 111, nos. 1 and 2, Jan. 4 and 11, 1923, pp. 49-50 and 151-153. New measuring devices for accuracy; automatic movements replacing many hand operations. Standard types with automatic fixtures favoured; multiple tooling and gearing used more extensively; improvement in threading methods.

SINE-BAR ATTACHMENT. A Universal Sine Bar Attachment, T. V. Greene. Machy. (Lond.), vol. 21, no. 536, Jan. 4, 1923, pp. 426-430, 14 figs. Mathematically exact machine settings obtained by direct measurement with standard outisde micrometer.

MAGNESIUM

CASTINGS. Magnesium Castings, Carl Irresberger. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 48-49. Discussion of magnesium and its alloys, together with practical data on casting articles from these metals and on physical properties of magnesium castings. Translated and abstracted from Giesserei Zeitung, vol. 19, no. 41, Oct. 17, 1922.

MALLEABLE IRON

CUPOLA PRODUCTION. Cupola Malleable Production, C. C. Hermann. Foundry, vol. 50, no. 23, Dec. 1, 1922, pp. 952-955. Effects of constituents of charge and of different elements in metal; method for calculating charge; high annealing temperature.

MERITS AND DEMERITS. Malleable Iron, An "In Between" Product, William Roman off. Raw Material, vol. 5, no. 11, Dec. 1922, p. 421, 2 figs. Views regardin scope of merits and demerits.

SPECIFICATIONS. British Set Malleable Specifications. Iron Trade Rev., vol. 71, no. 25, Dec. 21, 1922, pp. 1701-1702, 1 fig. New specifications for malleable cast iron for admiralty purposes, issued by Brit. Cast Iron Research Assn.

MANGANESE ORE

NOVA SCOTIA. Manganese Deposits of Lunenburg County, Nova Scotia, Frederick C. Fearing. Eng. and Min. Jl.-Press, vol. 115, no. 1, Jan. 6, 1923, pp. 11-15, 6 figs. Shallow mines situated in district of flat glaciated topography and sluggish drainage; origin of manganese found in sedimentaries formerly covering area.

MATERIALS

INSPECTION. The Inspection of Ferrous Materials, E. A. Allcut. Eng. Jl. (Eng. Inst. Can.), vol. 6, no. 1, Jan. 1923, pp. 13-18. System of inspection with methods of testing for various defects.

PROPERTIES. Some Properties of Materials and Their Use, J. M. Lessells. Ry. Mech. Engr., vol. 96, no. 12, Dec. 1922, pp. 683-685, 5 figs. Influence of investigations on design; allowable stresses should be based on true elastic limit.

TESTING. The Testing of Materials Used in the Manufacture of Electrical Equipment, C. Dawson. Instn. Elec. Engrs.-Jl., vol. 61, no. 313, Dec. 1922, pp. 59-64, 1 fig. Describes tests on metals and on insulating materials including sheet and molded insulation, oils and varnishes.

METALS

COLD-ROLLED, HEAT TREATMENT OF. The Heat Treatment of Cold Rolled Metal, Seymour Pile. Metal Industry (Lond.), vol. 21, no. 23, Dec. 8, 1922, pp. 529-531. Notes on method of manufacturing cold rolled metal, hardening and tempering, improving quality of metal, open counter arch muffle furnace, working temperature, heat treatment and cold work, removal of strains, etc

ELASTIC LIMIT. Recent Researches on the Elastic Limit, Herman A. Holz. Am. Soc. for Steel Treating—Trans., vol. no. 4, Jan. 1923, pp. 367-385, 26 figs. Discusses properties of metals which are of vital importance in design of engineering structures; points out fallacies in use of elastic limit, proportional limit, yield point and maximum strength in design; practice of European engineers; latest type of extensometer as contrasted with those previously available. Stress-strain diagrams of various ferrous and not ferrous metals.

FATIGUE. The Fatigue of Metals, Leonard Bairstow. Benna, vol. 11, nos. 4, 5 and 6, Oct., Nov. and Dec. 1922, pp. 652-657, 731-737 and 811-818, 19 figs. Oct.: Notes on static tests; simple types of fatigue tests. Nov.: Cases in which results of static and fatigue tests differ. Overstrain, effect on crystalline material. Dec.: Fatigue test as revealed by extensometer fatigue for unequal tensile and compressive stresses; modern tests and testing appliances.

MICROSCOPES

MICRO-TELESCOPES AND SUPER. The 'Davon' Micro-Telescope and Super-Microscope, F. Davidson. Instn. Min. and Metallurgy—Bul., no. 218, Nov. 1922, pp. 1-5. New apparatus is said to bring telescope almost into microscope uses and microscope somewhat into telescopic uses. Principle involved is application of short-focus telescope objective in a tube with series of diaphragms to microscope, microscope itself acting as compound eye-piece. See also Chem. News, vol. 125, no. 3270, Dec. 15, 1922, pp. 353-355.

MILLING MACHINES

CUTTING POWER. Power Required for Cutting Metal, Fred A. Parsons. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 35-41, 7 figs. Investigation extending over period of more than 10 years, for purpose of determining fundamental laws governing milling, turning, planing and drilling operations on various metals and alloys used in machine construction. Results are presented in shape of formulas and tables by means of which power required to machine metal in any given case may be calculated. (Abridged.)

MINING INDUSTRY

DOMINION DEPARTMENT OF MINES. Notes on the Work and Organization of the Mines Branch of the Dominion Department of Mines, John McLeish. Can. Inst. Min. and Metallurgy — Bul. no. 129, Jan. 1923, pp. 50-59. Mineral resources and technology; laboratory testing and research; ore dressing and metallurgy; fuels and fuel testing; ceramic and road-materials divisions; chemical division.

MINES

DOORS, FIRE AND VENTILATION. Fire and Ventilation Doors in Metal Mines, D. Harrington. U.S. Bur. of Mines Reports of Investigations, no. 2426, Dec. 1922, 5 pp. Suggestions and recommendations for construction and operation.

MINES

GASES, IRRESPIRABLE. Rock Strata Gases in Mines of a Nevada Mining District, E. D. Gardner. U.S. Bur. of Mines Reports of Investigations, no. 2427, Dec. 1922, 4 pp. Includes tables showing analyses of gas samples taken from six different localities in Nevada. Two theories are offered in explanation of presence of nitrogen in mines.

MOLDING MACHINES

TURNOVER. Turnover Moulding Machines, J. W. Smith. Eng. Production, vol. 5, no. 116, Dec. 21, 1922, pp. 595-596, 6 figs. Details of their construction and operation.

MOLDING METHODS

DRY-SAND. Dry Sand Moulding for Small Work, J. D. Nicholson. Foundry Trade Jl., vol. 23, no. 330, Dec. 14, 1922, pp. 485-488, 12 figs. Methods of moulding intricate and troublesome parts; recommendations to moulders.

GEARS. Templet Moulding (Le Moulage au Trousseau en Fosse), E. Pouplin. Fonderie Moderne, no. 11, Nov. 1922, pp. 319-321, 5 figs. Describes operations in connection with moulding a 55-tooth gear.

MOLDS

STEEL VS. CAST-IRON. The Use of Steel Ingots as a Substitute for Gray Cast-iron Molds (Zur Frage der Verwendung von Stahlkokillen statt Graugussformen), Fr. Schivetz. Stahl u. Eisen, vol. 42, no. 52, Dec. 28, 1922, pp. 1897-1900. Experiences with steel ingot molds; dimensions; chemical composition; method of moulding and construction.

N

NICKEL STEEL

PROPERTIES AND TESTS. Invar, Elinvar and Other Nickel Steels, Wallace Dent Williams. Raw Material, vol. 5, nos. 9, 10 and 11, Oct., Nov. and Dec. 1922, pp. 330-336, 372-381 and 428-437, 69 figs. Discusses history of invar and platinite patents and development of nickel steel, mechanical and magnetic properties, Brinell hardness tests and impact tests at various temperatures. Includes list of principal suppliers of high-nickel steels.

NITROGEN

FIXATION. Economic Status of Nitrogen Fixation in Germany, W. T. Daugherty. Chem. and Met. Eng., vol. 28, no. 2, Jan. 10, 1923, pp. 62-64. Present production still inadequate to meet domestic requirements; present developments compared with pre-war situation.

Government Research in Nitrogen Fixation, Chem. Age, (N.Y.), vol. 30, no. 12, Dec. 1922, pp. 535-536. Abstract of report of Fredk. G. Cottrell on work of Fixed Nitrogen Research Laboratory. Notes on direct synthetic-ammonia, cyanamide, arc and cyanide processes.

O

OIL

GEOLOGY. New Ideas in Oil Geology, M. de Hautpick. Min. Jl., vol. 139, nos. 4552 and 4553, Nov. 18 and 25, 1922, pp. 859-860 and 880-881. Shows fallacy of antiklinal theory. Account of experiments in series to study lateral movement of disseminated oil through water sands.

OIL ENGINES

SOLID-INJECTION. Development of the Solid-Injection Oil Engine, H. F. Shepherd. Power, vol. 57, no. 3, Jan. 16, 1923, pp. 92-94, 4 figs. Development of the Crossley engine; the turbulence theory.

OIL FUEL

Burning Systems. Steam Raising by Liquid Fuel. J. H. Dyer. Roy. Engrs. Jl., vol. 52, no. 6, Dec. 1922, pp. 391-399, 5 figs. Oil-burning systems; choice of system; details of installation; advantages of liquid fuel.

Locomotive Hauling. Conditions to Observe to get High Efficiency from Oil Fuel. A. G. Ingles. Inst. Mar. Engrs. — Trans., vol. 34, session 1922-23, Nov. 1922, pp. 199-208 and discussion, 208-222. Deals with methods and conditions together with reasons, of extracting greatest number of heat units for practical work.

OIL WELLS

Back Pressure on. Experiments on Back Pressure on Oil Wells. T. E. Swigart. U. S. Bur. of Mines Reports of Investigations, no. 2420, Dec. 1922, 9 pp. Experiments to determine probable extent to which gas production of oil well can be curtailed while gas in sand still plentiful, and thus saved for doing work during later period of well's life.

Graphical Appraisal. Some Graphical Methods for Appraising Oil Wells. Paul Ruedemann. Am. Assn. Petroleum Geologists — Bul., vol. 6, no. 6, Nov.-Dec. 1922, pp. 533-544, 3 figs. Presents three types of charts; (1) all valuations as of fixed date, (2) valuations of variable dates; (3) all readings direct, and (3) valuations as of variable dates — readings refer to date.

OPEN-HEARTH FURNACES

Slide-Rule Calculations. Slide Rule for Open-Hearth Calculations. B. B. Russell, Jr. Iron Age, vol. 111, no. 3, Jan. 18, 1923, pp. 224-225, 3 figs. Allowances for various kinds of scrap and costs of delays; both sides of rule used; chart for making similar computations.

OXY-ACETYLENE CUTTING

Cast Iron. Principles of Oxyacetylene Fusion Welding. Alfred S. Kinsey. Ry. Mech. Engr., vol. 96, no. 12, Dec. 1922, pp. 716-718, 6 figs. Cutting cast iron.

An unusual Cast Iron Cutting Demonstration. R. C. Rohnbacher. Am. Welding Soc.-Jl., vol. 1, no. 11, Nov. 1922, pp. 43-44, 1 fig. Blast-furnace hearth-cooling plate 10 ft. high by 6 in. in thickness was cut in less than 2½ hours, at plant of large steel company; cut was made with plate in position.

OXY-ACETYLENE WELDING

Locomotive Fireboxes. Locomotive Fire-Box Welding. J. G. Gossman. Am. Welding Soc. Jl., vol. 1, no. 11, Nov. 1922, pp. 44-47, 3 figs. Describes oxy-acetylene welding done on a locomotive firebox at large copper mining plant, after several unsuccessful efforts of repairing by various other means.

Pipe Lines. Oxy-Acetylene Welding as Applied to Oil Carrying Lines and Pumping Stations. N. E. Wagner. Am. Welding Soc.-Jl., vol. 1, no. 12, Dec. 1922, pp. 20-29. Fields for use of cutting and welding torch. Welding a 140-mi. pipe line; factors in pipe-line welding; repairing lines and breaks; storage-tank repairs.

P

PAINTS

Pigments, Microscopy of. Microscopy of Paint and Rubber Pigments. Henry Green. Chem. and Met. Eng., vol. 28, no. 2, Jan. 10, 1923, pp. 53-57, 11 figs. New conception of place of microscopy in examination of pigments involving distinct technique. Apparatus used in pigment study; characteristic of common pigments.

PAPER MANUFACTURE

Processes. Paper Manufacture, Especially Chemical Wood Pulp (Fabricacion del papel, especialment et de pulpa quimica). Sociedad de Fomento Fabriel — Boleton, vol. 39, nos. 8 and 9, Aug. and Sept. 1922, pp. 498-501 and 574-580, 8 figs. Describes sulphite and soda processes; bleaching with chlorine; beating and refining of pulp; use of casein; calenders; cutting sorting and packing of paper.

Pulp Cooking. Mitscherlich Sulphite Pulp. Paper vol. 31, no. 6, Nov. 29, 1922, pp. 7-8. How it differs from Ritter-Kellner quick cook sulphite pulp.

Sulphite Cooking. Seasonal Influences on Sulphite Cooking. Walter S. Haley. Paper, vol. 31, no. 6, Nov. 29, 1922, pp. 9-11. Methods and apparatus that work equally well in summer and winter.

PERMEABILITY

Incremental. Permeability. Thomas Spooner. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 1, Jan. 1923, pp. 42-47, 5 figs. Means of calculating value of what is termed incremental permeability.

PHOTOMETERS

Sphere. A Direct Reading and Computing Attachment for Sphere Photometers. Ben S. Willis. Illuminating Eng. Soc. — Trans., vol. 18, no. 1, Jan. 1923, pp. 62-66, 2 figs. Describes construction of device which converts into logarithmic motion the inverse square motion of comparison lamp of sphere photometer. Preliminary tests show high degree of precision.

PILES

Driving. Forms for Recording Pile Driving Data. Eng. and Contracting (Buildings), vol. 58, no. 3, Dec. 27, 1922, pp. 145-150, 7 figs. Methods of railroads in recording and reporting on pile-driving operations. (Abstract). Report submitted by Am. Ry. Bridge and Bldg. Assn. Committee.

PIPE, CAST-IRON

Gas Distribution. Cast Iron Pipe in Gas Distribution. H. Y. Carson. Gas Age-Rec., vol. 50, no. 26, Dec. 23, 1922, pp. 865-868, 3 figs. Present tendency for underground systems is to increase loads and pressures on main calling for carefully and scientifically made bell and spigot joints; lead-jute joint more universally applicable than cement joint; use of gland type of cast-iron pipe for unusual conditions of high pressure. Paper read before S. Central Gas Assn.

Deflection of. The Theory of Plate Bending and Its Experimental Confirmation. Theorie der Platten-biegung und ihre experimentelle Bestätigung. A. Nadai. Zeit. für angewandte Mathematik u. Mechanik. ... 2 no. 5 Oct. 1922, pp. 381-398, 24 figs. Tests with glass and sheet metal plates; notes on concrete plates.

PNEUMATIC TOOLS

Hammers. Pneumatic Tools. L'outillage pneumatique des Forges et Ateliers du Meudon. Société d'Encouragement pour l'Industrie Nationale. Bul., vol. 134, no. 8, Aug.-Oct. 1922, pp. 842-848, 8 figs. Describes various types of pneumatic hammers made by Forges et Ateliers du Meudon, their construction and operation.

POWER FACTOR

Correcting Devices. Power Factor as It Affects the Consumer. L. J. Murphy. Elec. World, vol. 81, no. 2, Jan. 13, 1923, pp. 97-100, 3 figs. Causes of poor factor, remedial measures, including rearrangement of motors and use of synchronous apparatus, phase advancers and condensers; economic factors which should be considered.

Meaning and Manipulation. Power Factor. W. G. H. Cam. Eng. Jl. Eng. Inst. Can., vol. 6, no. 1, Jan. 1923, pp. 7-13, 6 figs. Its physical meaning and commercial manipulation.

POWER PLANTS

Economic Design. Economic Design of Power Plants. H. Midgley. Beama, vol. 12, no. 6, Dec. 1922, pp. 786-792, 8 figs. Information on costing as affects design and concerns preparation of estimates.

Petroleum Refinery. New Plant at the Bayway Refinery. Power Plant Eng., vol. 27, no. 2, Jan. 15, 1923, pp. 109-117, 12 figs. Centralized control and combination coal and gas-fired boilers are features of particular interest.

Progress 1922. A Year of Progress in the Power. Plant field. Power, vol. 57, no. 1, Jan. 2, 1923, pp. 2-18, 17 figs. Advances in steam pressures; intense interest in powdered coal; construction of large plants; previous records broken in size of steam turbines; hydro-electric units; transformers, and switching equipment.

POWER TRANSMISSION

Factors in. Some Factors in Power Transmission. Can. Machy., Vol. 28, no. 26, Dec. 28, 1922, pp. 110-113 and 132, 7 figs. Installing lineshaft supports; figuring size of shaft; reducing friction by means of ball bearings.

POWER TRANSMISSION

High-Voltage, Long-Distance. Technical Problems Arising from High-Voltage, Long-Distance Transmission (Problemas tecnicos suscitados por el transporte de la energia a largas distancias y altos voltajes), P. J. Perfz del Puigar. Associacion de Ingenieros del Instituto Catolico de Artes e Industrias — Anales, vol. 1, nos. 1, 2, 3, 4 and 5, 1922, pp. 55-61, 112-123, 210-218, 338-344 and 399-412, 34 figs. Requirements to be applied in case of lines not above 400 km.; lines of 20,000 kw. and distances over 150 km.; 50-cycle current most advantageous and convenient for Spain; fundamental equations for simple calculation; methods of voltage regulation in transmission lines; advantages of synchronous condensers in stations; methods of making calculations for synchronous condensers; transmission with synchronous condensers.

PRECIPITATION

Cottrell Process. Electric Precipitation of Dust and Fumes (Précipitation électrique des poussières et des fumées). Industrie Electrique, vol. 31, no. 731, Dec. 10, 1922, pp. 445-446. Theory and methods of Cottrell process and its application in metallurgical, cement, and other works.

PRESSES

Drawing. Electric Stop for. Electric Stop for Drawing Presses. George W. Wilder. Machy. (N.Y.), vol. 29, no. 5, Jan. 1923, pp. 345-346, 4 figs. Automatic electric stop designed for use on Farrel rollfeed double action presses employed in production of screw shells such as are used on incandescent electric lamp bulbs and sockets.

PULVERIZED COAL

Boiler Firing. Pulverized Coal Firing (Le chauffage au charbon pulvérisé des chaudières et des fours en général). Paul Frion. Chimie et Industrielle, vol. 8, nos. 4 and 5, Oct. and Nov. 1922, pp. 736-757 and 974-988, 50 figs. Analogy with combustion of gas; describes pulverizing plants of various types; feeding into burners; using low-grade fuel; pneumatic conveying, applications, drawbacks, and danger of explosion of pulverized coal; balances advantages and disadvantages.

Burner Design. Powdered Coal Used Exclusively in this Industrial Plant. F. K. North. Power, vol. 57, no. 2, Jan. 16, 1923, pp. 84-87, 10 figs. Design of burner adopted for all furnaces and ovens in power plant of Ill. Malleable Iron Co., Chicago.

PUMPS

Rotary. Rotary Pump with Reduced Friction Losses. A. Poitrineau. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 55-56, 1 fig. Describes new type of rotary pump with blades. Translated and abstracted from Arts et Métiers, vol. 75, no. 24, Sept. 1922.

See also Water Elevators.

PUMPS, CENTRIFUGAL

High-Lift. High Lift Centrifugal Pumps. J. Johnstone Taylor. Colliery Guardian, vol. 124, nos. 3232 and 3233, Dec. 8 and 15, 1922, pp. 1397-1400 and 1463-1464, 25 figs. Arguments in favour of centrifugal pump in general and high-lift pump in particular; types. Stuffing boxes and bearings; special application for mining work; testing.

Turbo. Turbo-Centrifugal Pumps. C. R. Waller. Am. Water Works Assn. — Jl., vol. 10, no. 1, Jan. 1923, pp. 41-58, 4 figs. Discusses features which will allow engineer to judge merits of turbo-centrifugal pumping unit with pumping units of other designs.

R

RADIOTELEGRAPHY

EUROPE AND AMERICA. Present Condition of Radio Telegraphy and Telephony in Europe and in America, Isamu Yamamoto. Denki Gakkwai Zasshi (Jl. Inst. Elec. Engrs. of Japan), no. 412, Nov. 1922, pp. 883-904. Notes on British Wireless Telegraphy Committee; Paris radio central and other large power stations in France; Nauen and Koenigswusterhausen; New York radio central and amateur radio in America. (In Japanese.)

RADIOGONIOMETRY. Radiogoniometry (La Radiogoniométrie), Mesny. Annales des Postes, Télégraphes et Téléphones, vol. 11, no. 6, Nov.-Dec. 1922, pp. 1240-1263, 16 figs. Discusses electromagnetic field and waves, wave transmitting and receiving, amplifiers, etc.; application on board ship.

SPARK TRANSMISSION. The Spark Transmitting System of the Eiffel Tower, E. M. Deloraine. Wireless World, vol. 11, no. 173, Dec. 9, 1922, pp. 321-327, 11 figs. Notes on power supply and description of spark system.

RADIOTELEPHONY

AMPLIFIERS. An Electron Tube Amplifier Using 60-Cycle Alternating Current to Supply Power for the Filaments and Plates, P. D. Lowell. U.S. Bur. of Standards, Sci. Papers, vol. 18, no. 450, Oct. 2, 1922, pp. 345-350, 5 figs. Five-stage amplifier having three radio-frequency and two audio-frequency stages and using crystal detector. Circuit diagrams are given and values of condensers, resistors and inductors used. Method for rectifying 110-volt a.c. supply and using it for field of loud speaker.

RAILS

RECLAMATION. Reclamation of Railway Steel Rails, E. J. McVeigh. Can. Ry. and Mar. World, no. 298, Dec. 1922, pp. 595-597, 1 fig. Reclaiming of rails, which are practically unworn but whose ends are battered rendering them unfit for use, by removal of battered end. Rail-sawing plants in use on Grand Trunk Ry.

RAILWAY CONSTRUCTION

GRADINGS. The Problem of Heavy Gradients on Railways (El problema del empleo de fuertes pendientes ennuestros ferrocarriles), J. Alvarez Lleras. Anales de Ingenieria, vol. 29, nos. 349-350, Apr.-May 1922, pp. 543-555. Railway problems in Columbia; construction and management of gradients up to 3.5 per cent; movement of rolling stock; advantages of electric traction.

RAILWAY ELECTRIFICATION

ECONOMICAL JUSTIFICATION. New Haven Operation Has Justified Electrification, Sidney Withington. Ry. Rev., vol. 72, no. 1, Jan. 6, 1923, pp. 71-73, 5 figs. Author qualifies extent to which steam-railway electrification is economically justified. Statement of issues involved.

FRANCE. Electrification of the Saint Gotthard Railway L'elettrificazione della ferrovia del Motardo), Ettore Kerbaker. Elettrotecnica, vol. 9, no. 27, Sept. 25, 1922, pp. 616-620, 14 figs. Power stations, transmission lines, insulators, substations, etc.

HOLLAND. Railway Electrification in Holland (Sur l'éléctrification des chemins de fer aux Pays-Bas), L. G. Stokvis. Revue Générale de l'Electricité, vol. 12, no. 23, Dec. 9, 1922, pp. 906-908, 3 figs. Describes existing monophase line, the Haye-Rotterdam, and work in progress on Rotterdam-Amsterdam line, to be operated by d.c. at 3,000 volts

PROJECTS AND EQUIPMENT, 1922. What Railroads Are doing With Electric Traction, A. G. Oehler. Wy. Age, vol. 74, no. 1, Jan. 6, 1923, pp. 45-48, 1 fig. New projects and equipment; effect of stroke on electrified sections.

RAILWAY MOTOR CARS

CANADA. Self Propelled Cars on Steam Railways. Can. Ry. and Mar. World, no. 298, Dec. 1922, pp. 598-599, 1 fig. Data on cars to be put in service on Can. Nat., Grand Trunk, Greater Winnipeg Water District, Quebec Central, Quebec Montreal and Southern, and Timiskaming and Northern Ontario Railways, including gasoline, gasoline-electric, storage-battery, and steam cars.

DIESEL-ELECTRIC. The Sulzer Diesel-Electric Rail Car. Engineer, vol. 134, no. 3496, Dec. 29, 1922, pp. 696-699, 11 figs. partly on p. 692. Internal arrangement and engine details of car and results of trial runs on Swiss railway line.

RAILWAY OPERATION

TRAIN CONTROL. The Automatic Control Problem, E. J. Blake. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 27-34, 5 figs. Desired characteristics; methods of transmitting an indication to train; controlled functions.

RAILWAY SHOPS

"BIG FOUR" RY. Story of What Has Been Accomplished at the Beech Grove Shops of the Big Four Railway. Ry. Rev., vol. 71, no. 27, Dec. 30, 1922, pp. 927-931, 9 figs. Analysis of methods and organization installed at Beech Grove shops of Cleveland, Cincinnati, Chicago and St. Paul Ry.

RAILWAY SIGNALLING

A. R. A. COMMITTEE REPORTS. Meeting of Signal Section in New York. Ry. Signal Engr., vol. 15, no. 12, Dec. 1922, pp. 473-483, 8 figs. Committee reports of Am. Ry. Assn. on valuation, economics of signaling, standard designs, mechanical interlocking, a.c. signaling, batteries, d.c. relays, oils.

ELECTRIC LAMPS. The Electric Lamp for Railway Signals, L. C. Porter and A. L. Broe. Ry. Signal Engr., vol. 15, no. 12, Dec. 1922, pp. 485-490, 11 figs. Methods of testing, directions for installation and operation to secure long life. Paper read before Am. Ry. Assn.

INTERLOCKING BLOCK. Traffic Direction by Signal Indication on D.L. and W. Ry. Age, vol. 73, no. 26, Dec. 23, 1922, pp. 1185-1188, 4 figs. Current of traffic on Meadows line is authorized only by interlocking block signals.

RAILWAY TIES

PRESERVATIVE TREATMENT. Preservative Treatment of Railway Sleepers in India. Engineering, vol. 114, no. 2974, Dec. 29, 1922, p. 807. Results of long series of tests conducted jointly by Forest Dept. and Ry. Board.

TREATING PLANT. Treating Plant Solves New Haven's Tie Problem. Ry. Age, vol. 73, no. 26, Dec. 23, 1922, pp. 1179-1183, 10 figs. New installation at Cedar Hill renders possible use of hitherto unused New England timbers.

RAILWAYS

BUILDINGS. Specifications for Railway Buildings. Am. Ry. Eng. Bul., vol. 24, no. 247, July 1922, 100 pp. General conditions; excavation, filling and backfilling; sewers and drainage; concrete; brickwork; carpentry and millwork; lathing and plastering; hardware; painting and glazing; plumbing; heating; stone masonry and cut stone work; clay hollow tile; steel and iron work; marble and tile work.

WORLD DEVELOPMENTS 1922. Railway Developments in 1922. Ry. Age, vol. 74, no. 1, Jan. 6, 1923, pp. 54-110, 83 figs. Review of developments in Great Britain, France, Italy, Poland, Russia, Central Europe, Germany, Mexico, Canada, Argentina, Australia, S. Africa, India, Japan and China.

REDUCTION GEARS

INTERNAL. Internal Gear Reduction Mechanism, E. J. Bradley. Machy. (Lond.), vol. 21, no. 535, Dec. 28, 1922, pp. 406-408, 5 figs. Describes new form consisting of two gears only, and internal gear and pinion, with which it is possible to secure reduction up to 20 to 1 in diam. of 12 in.

REFRACTORIES

PRODUCTION. Effect of Some Typical Fireclays on the Behavior of Refractory Masses at High Temperatures (Ueber den Einfluss einiger typischer feuerfester Tone auf das Verhalten von Schamottemassen bei höheren Temperature), W. Steger. Berichte der Deutschen Keramischen Gesellschaft, vol. 3, no. 5, Oct. 1922, pp. 250-256, 2 figs. Discusses shrinking porosity, flexure of test bars, softening at high temperatures, tensile strength when cold, resistance to quick temperature changes, size of grain, and proportion of mixture.

REFRIGERATING MACHINES

ABSORPTION. Principles and Practical Operations of Absorption Machines, Heywood Cockran. Power, vol. 57, no. 2, Jan. 9, 1923, pp. 53-55, 1 fig. Includes diagrammatic outline of present-day absorption machine.

COMPRESSION. Ammonia as a Refrigerant, W. H. Motz. Can. Chem. and Metallurgy, vol. 6, no. 12, Dec. 1922, pp. 260-264 and vol. 7, no. 1, Jan. 1923, pp. 7-11. Fundamental data relative to all factors in operation of compression refrigerating systems, calculating refrigerating effects, heat quantities, etc., for ammonia. Paper read before convention of Practical Refrig. Engrs.

REFRIGERATING PLANTS

MEASURING DEVICES. Measuring Devices for Refrigerating Plants, John E. Starr. Power, vol. 56, no. 26, Dec. 26, 1922, pp. 1010-1011. Thermometers, gages to measure pressures carried, meters to gage brine circulation, and indicator by which compressor and engine operation may be checked. Paper read before Nat. Assn. Practical Refrig. Engrs.

RESEARCH

EXECUTIVE'S VIEWPOINT. The Executive and Research, John A. Matthews. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 393-395. Viewpoint of executive. Executive's and research department's functions; scientific method of examining facts.

FUNDAMENTALS. Some Fundamentals of Research, F. O. Clements. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 415-421 and 429. Discusses three kinds of research and gives typical example of research development.

RIVERS

BANK PROTECTION. Making the Mississippi Rebuild Its Banks. Sci. Am., vol. 128, no. 1, Jan. 1923, pp. 30-31, 3 figs. Method of reclaiming eroded land by mat of trees; performs same duty as pile dike, or jetty, more effectively and at greatly decreased cost.

ROADS

BATES EXPERIMENTAL. Bates Experimental Road Tests. Highway Engr. and Contractor, vol. 7, no. 6, Dec. 1922, pp. 19-27, 4 figs. General comparisons of different types of pavements. Description of behavior of each section under each increment of loading.

Practical Lessons from the Bates Road Tests. Eng. News-Rec., vol. 90, no. 2, Jan. 11, 1923, pp. 57-61, 28 figs. Conclusions and discussion assembled from progress reports, having authority of Clifford Older and Frank Y. T. Sheets. It is claimed that paved roads will fail prematurely unless loads are controlled; balanced strength requires pavement edges to be strengthened; fatigue failures possible.

GRADES, THEORY OF. Economic Theory of Highway Grades, T. R. Agg. Eng. News-Rec., vol. 90, no. 2, Jan. 11, 1923, pp. 76-79. 7 figs. Tests in Iowa give working equations for both automobiles and commercial vehicles; relation of grades to fuel cost; momentum grades economical.

ROADS, BITUMINOUS

WARRENITE-BITULITHIC. The Evolution of Warrenite Bitulithic, R. G. Davidson. Good Roads, vol. 63, no. 15, Oct. 11, 1922, pp. 125-129 and 136, 6 figs. Road Surface invented by F. J. Warren. Review of how has been evolved and wherein it overcomes weaknesses of earlier bituminous pavements.

ROADS, CONCRETE

REINFORCED. Wide Concrete Road Constructed Half at a Time, L. F. Andrews. Eng. News-Rec., vol. 89, no. 25, Dec. 21, 1922, pp. 1059-1060, 4 figs. Light-truck, heavy truck and industrial-railway haulage compared, center joint formed with keyway and groove.

SLAB DESIGN. Bates Road Test Develops New Slab Design in Illinois. Eng. News-Rec., vol. 90, no. 2, Jan. 11, 1923, p. 79, 1 fig. Edges of slab three in. thicker than center; required less concrete; cost per mi. reduced; strength increased.

ROLLING MILLS

CAMBER ON ROLLS. Camber on Rolls, C. E. Davies. Machy. (Lond.), vol. 21, no. 532, Dec. 7, 1922, pp. 299-302, 5 figs. Discusses principles governing roll camber, after calling attention to various kinds of rolling operations. Curves are presented showing relation between deflection curve and roll camber.

ELECTRICALLY DRIVEN. Improved Rolling Mill Practice Obtained by the Use of Direct Current Motors for Main Roll Drive, G. L. Stoltz. Assn. Iron and Steel Elec. Engrs., vol. 4, no. 12, Dec. 1922, pp. 777-793 and discussion, 793-799, 10 figs. Items to be considered in selection of speed at which mill is to be operated.

Rod Mill. Minnesota Steel Adds New Mills, A. J. Hain. Iron Trade Rev., vol. 71, no. 26, Dec. 28, 1922, pp. 1772-1778, 9 figs. New rod mill at Duluth plant of U. S. Steel Corp. for manufacture of wire rod, wire and nail mats.

Roll Grinding. Roll Grinding and Maintenance. Machy. (Lond.), vol. 21, nos. 534 and 535, Dec. 21 and 28, 1922, pp. 353-359 and 385-392, 18 figs. Machines and methods used for producing straight and cambered rolls. Roll grinding practice, wheels, speeds and feeds; copper roll grinders.

S

SAND, MOLDING

Properties and Treatment. Sand Molds (Sablerie). Fonderie Moderne, nos. 10 and 11, Oct. and Nov. 1922, pp. 295-297 and 321-328, 8 figs. Discusses preparation for foundry, chemical analysis, analysis for physical properties, treatment of sand at foundries. Sand for steel, copper, aluminum and alloy foundries. Organization of sand-mold departments; microscopic examination.

Testing. New Method of Testing Foundry Sands, Eugene W. Smith. Iron Age, vol. 110, no. 126, Dec. 28, 1922, pp. 1725-1726. Vibratory precipitation advocated for determining bond, silica and other properties for molds and cores. (Abstract.) Paper before Chicago Foundrymen's Club.

Some Tests for Foundry Sands and Their Practical Applications, W. West. Foundry Trade Jl., vol. 26, no. 330, Dec. 14, 1922, pp. 495-498. Deals with basic principles upon which sand mixture should be built; difference in properties required of sands for iron and those for steel foundry.

SCREW MACHINES

Cast-Iron Bars in Automatic. Using Cast-Iron Bars in Automatics, Fred H. Colvin. Am. Mach., vol. 58, no. 3, Jan. 18, 1923, pp. 97-99, 11 figs. Casting and cleaning bars; pointing and "skinning" to size; how bars are used in automatic machines.

SCREW THREADS

Synchronizing. Synchronizing Screw Threads by Lead Variator. Can. Machy., vol. 28, no. 25, Dec. 21, 1922, pp. 13-15, 10 figs. Article compiled from illustrations and data supplied by Precision and Thread Grinder Mfg. Co., Philadelphia, Pa.

Worm, Thickness of. The Normal Thickness of a Worm Thread, E. A. Limming. Machy. (Lond.), vol. 21, no. 534, Dec. 21, 1922, pp. 360-362, 4 figs. Formulas for measurement.

SEWAGE DISPOSAL

Pumping-Station Equipment. Unique Sewage-Works and Pump-Equipment Bid Plan, Glen D. Holmes. Eng. News-Rec., vol. 89, no. 26, Dec. 28, 1922, pp. 1121-1124, 2 figs. Sludge from plain settling tanks at Syracuse mixed with Solvay lime liquors; pump-equipment contract awarded on baisis of annual capital and electric current charges.

Purification. Sewage Purification Processes: Sewage Works Analysis and Standard of Purification, J. H. Garner. Surveyor, vol. 62, nos. 1613 and 1614, Dec. 15 and 22, 1922, pp. 373-376 and 393-395, 3 figs. Paper read before Assn. Mgrs. of Sewage Disposal Works.

SEWERS

Design. Modern Tendencies in Sewer Design, A. G. Dalzell. Contract Rec., vol. 36, no. 52, Dec. 27, 1922, pp. 1250-1251. Must be considered in conjunction with method of sewage disposal; separate system of sewers has limitations which may lead to some modification.

Overflow System. Extensive Sewer Overflow System for the City of Hamilton, Ont., W. M. Johnston. Contract Rec., vol. 36, no. 52, Dec. 27, 1922, pp. 1241-1250, 9 figs. Review of design, construction methods and costs of large project involving 10,000 ft. of brick and concrete sewers in open-cut and tunnel.

SHAFT SINKING

Quicksand. Sinking a Shaft in Illinois Through Quicksand, D. P. Buchanan, Coal Age, vol. 22, no. 26, Dec. 28, 1922, pp. 1032-1034, 4 figs. Expecting only four ft. of running sand finding nearly 30 ft., shaft had to be enlarged and sheet piling driven to bedrock when jacking method failed.

STEAM

Priming and Condensation. Undigested Water Makes Steam Vicious. Power Plant Eng., vol. 27, no. 1, Jan. 1, 1923, pp. 64-71, 14 figs. Causes, effects and remedies for priming and condensation.

Tables, Reading of. Method of Reading Steam Tables Correctly, T. H. Fenner. Power House, vol., 15, no. 23, Dec. 5, 1922, pp. 21-23. Explanation of what each column in steam table means, and some examples of method of application to every-day problems.

STEAM ENGINES

Condensation in. Condensation in Steam Engines (La Condensation dans les Machines à vapeur). Métallurgie, vol. 54, no. 50, Dec. 14, 1922, pp. 1865-1867. Condensation by injection and surface condensation in marine engines

Unaflow. A Unaflow Engine Without Auxiliary Exhaust Valves. Power, vol. 56, no. 26, Dec. 26, 1922, pp. 1024-1025, 4 figs. Design of Harrisburg dual clearance unaflow.

STEAM METERS

Float-Type. New Steam Meter with Float and Steam Recorder. Eng. Progress, vol. 3, no. 12, Dec. 1922, pp. 274-275, 7 figs. Meters placed on market by Ernest Claasen & Co., Berlin-Lichterfelde, for installation in heating systems where steam is taken from exhaust of steam engine.

STEAM PIPING

Covering, Heat-Insulating. An Improved Method of Analysis for "85 Per Cent Magnesia" Covering, H. W. Greider. Jl. Indus. and Eng. Chem., vol. 15, no. 1, Jan. 1923, pp. 50-53. Study of proximate method of analysis for commercial heat-insulating coverings, with particular attention to method of sampling, separation and determination of asbestos fiber and determination of new and more correct gravimetric factor for calculation of basic magnesium carbonate from magnesium pyrophosphate.

STEAM TRAPS

Selection and Use. Selection and Use of Traps, Charles L. Hubbard. Nat. Engr., vol. 26, no. 12, Dec. 1922, pp. 576-579, 10 figs. Various types and where applicable.

STEAM TURBINES

Bleeder. The Bleeder Turbine, J. J. Moore. Combustion, vol. 7, no. 6, Dec. 1922, pp. 343-344, 2 figs. Details of design.

Use of the Bleeder Turbine in Industrial Plants, J. J. Moore. Power Plant Eng., vol. 27, no. 2, Jan. 15, 1923, pp. 126-128, 4 figs. Where steam is required for heating or for process work, bleeder turbine may be used to advantage.

Leveling Bases. Using [illegible] Instead of Wedges for Leveling Bases of Steam Turbines, Edgar C. Barker, Sr. Power, vol. 57, no. 2, Jan. 9, 1923, pp. 58-60, 2 figs. Outlines ingenious and practical method of providing plate surface composed of iron blocks for supporting bedplate and preventing undue strain while installing.

STEEL

Brittleness. Brittleness of Steel and Notch-Bar Tests (La fragilité des aciers et l'essai de flexion par choc unique sur barreaux entaillés), Henri [illegible]. Revue de l'Industrie Minérale, no. 48, Dec. 15, 1922, pp. 741-747. Results of experiments extending over 17 years as to absolute brittleness, intermediary brittleness, and resistance to impact.

Drill. A Metallographic Study of Hollow Rock Drill Steel, As Influenced by the Method of Manufacture, N. B. Hoffman. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 436-446, 24 figs. Method of manufacture; types of steel tested and test procedure. Photomicrographs.

High-Speed. *See Steel, High-Speed.*

Iron and. *See Iron and Steel.*

Nickel. *See Nickel Steel.*

Nitrogen in. Gases in Metals: I. The Determination of Combined Nitrogen in Iron and Steel and the Change in Form of Nitrogen by Heat Treatment, Louis Jordan and F. F. Swindells. U.S. Bur. of Standards, Sci. Papers, vol. 18, no. 457, Nov. 8, 1922, pp. 499-511, 1 fig. The Allen method for combined nitrogen and nitrides determined by this method, two forms of nitrogen in steel.

Numbering. European Attempts to Number Steel. Chem. and Met. Eng., vol. 28, no. 1, Jan. 3, 1923, pp. 19-20. Progress made by Switzerland, Germany and France toward standardization.

Properties at High Temperature. Effect of Temperature on the Mechanical and Microscopic Properties of Steel, George C. Priester and Oscar E. Harder. Chem. and Met. Eng., vol. 28, no. 3, Jan. 17, 1923, pp. 111-115, 13 figs. Points out that properties of low-carbon steel in blue-heat range are inherent to that temperature and are not duplicated when same metal is tested at room temperature after corresponding tempering.

Structural. *See Structural Steel.*

Tensile Properties. Effect of Temperature, Deformation, and Rate of Loading on the Tensile Properties of Low-Carbon Steel Below the Thermal Critical Range, H. J. French. U.S. Bur. of Standards Technologic Papers, no. 219, Aug. 22, 1922, pp. 679-725, 31 figs. Describes apparatus for determining tensile properties of metals at high temperatures (including limit of proportionality), and results of tests of several grades of boiler plate from 20 to 465 deg. cent.; effects of cold and blue work on properties of these steels throughout range given. Bibliography.

Tests. Permanent Deformation of Steels by Elongation, Bending and Torsion (Déformations permanentes des aciers par traction, flexion et torsion), J. Seigle. Revue de l'Industrie Minérale, no. 48, Dec. 15, 1922, pp. 655-673, 29 figs. Experiments with test bars of soft and hard steels; diagrams showing variations for elongation, bending and torsion.

STEEL, HEAT TREATMENT OF

Cast Steel. The Heat Treatment of Cast Steel for Hydroelectric Power Machinery, B. Egeberg. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 422-429, 13 figs. Outlines specifications usually used in Norway in ordering steel castings for hydroelectric plants; these include chemical composition, physical properties and thermal treatment.

Methods. Heat Treatment of Steel and Metallic Alloys (La Trempe de l'acier et des alliages métalliques), Albert Portevin. Revue Universelle des Mines, vol. 15, no. 6, Dec. 15, 1922, pp. 225-332, 31 figs. Also Revue de Métallurgie, vol. 19, no. 12, Dec. 1922, pp. 717-740, 8 figs. Character and kinds of changes, i.e., physical chemical magnetic, and structural, produced by heat treatment generally; effect of velocity of cooling; gives equilibrium diagrams.

STEEL, HIGH-SPEED

Segregation. Carbide Segregation in High Speed Steel, A. E. White. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 386-392, 18 figs. Points out that degree of segregation depends upon casting temperature, rate of cooling ingot and degree of mechanical reduction in mills.

STEEL INDUSTRY

Practical Information. The Need for More Practical Information in Industry, J. S. Unger. Am. Soc. for Steel Treating—Trans., vol. 3, no. 4, Jan. 1923, pp. 430-435. Plea for more reliable data and information; suggestions on practical problems of investigation.

Problems. Germans Discuss Steel Problems, Hubert Hermanns. Iron Trade Rev., vol. 71, no. 25, Dec. 21, 1922, pp. 1711-1712. Outline work of technical committees at fall meeting of German Iron & Steel Inst. (Verein Deutscher Eisenhüttenleute).

STEEL MANUFACTURE

Dephosphorization and Basicity. The Dephosphorization of Iron in the Basic Furnace, J. H. Whiteley. Iron and Coal Trades Rev., vol. 105, no. 2858, Dec. 8, 1922, pp. 839-840, 2 figs. Points out that in general basicity must be increased with P_2O_5 content of slag, and if this rule is followed iron content not exceeding 7 per cent is sufficient for most purposes. (Abstract.) Paper read before Cleveland Instn. Engrs.

Electric Process. New Steel-Making Process. Times Trade Supp., vol. 11, no. 230, Dec. 2, 1922, p. 282. Describes steel-melting furnaces and patent duplex electric process of Stobie Steel Co.

METALS AND ALLOYS FOR. Metals and Alloys for the Manufacture of Special Steels (Les métaux et alliages pour la fabrication des aciers spéciaux), Revue d'Electrochimie et d'Electrométallurgie, vol. 16, nos. 2 and 3, Feb. and May, Apr.-May, 1922, pp. 25-28 and 49-55. Feb. Mar.; Discusses nickel and nickel alloys, tungsten and tungsten alloys; analyses of composition of alloy steels-Apr.-May: Chromium and chromium alloys; chromium steels; vanadium; titanium and its alloys.

STEEL WORKS

SCOTLAND. The Mossend Steel Works and Rolling Mills. Engineering, vol. 114, nos. 2963, 2964, 2966, 2969, 2971 and 2974, Oct. 13, 20, Nov. 3, 17, 24, Dec. 8 and 29, 1922, pp. 447-448, 484 and 494, 543-545, 603-606, 641-643, 704 and 795-797, 51 figs. partly on supp. plates. Describes installation of plant comprising sixteen 50-ton Siemens-Martin furnaces, with necessary gas producers and other accessories; and rolling-mill plant, completed December 1919.

TORONTO, OHIO. Plant Embodies Modern Practice, John D. Knox. Iron Trade Rev., vol. 72, no. 2, Jan. 11, 1923, pp. 153-158 and 160, 9 figs. Installation of steel works and semi-finishing mills in conjunction with sheet mills by Follansbee Bros. Co., at Toronto, Ohio, permits control of operations from production of open-hearth steel to finished product. Description of plant.

STOKERS

DEVELOPMENTS IN PRACTICE. Developments in Stoker Practice. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 14-21, 4 figs. Contains extracts from following papers; The Development and Use of the Modern Chain Grate, T. A. Marsh; Overl feed Stokers of the Inclined Type, Geo. I. Bouton; The Design and Operation of Underfeed Stokers, H. F. Lawrence. Discussion, pp. 21-24.

STORAGE BATTERIES

CENTRAL STATIONS, IN. The Operation and Control of Storage Batteries in Central Stations, Abel Fastman. Elec. Rev., vol. 91, no. 2352, Dec. 22, 1922, pp. 933-934. Points out that out-of-balance should be minimized as far as possible, charging should be at about normal rate, extent of charging should be limited and that floating charge should be carefully avoided.

STRAIGHTENING MACHINES

ABRAMSEN. The Abramsen Straightening Machine for Round Bars and Tubes. Engineering, vol. 114, no. 2972, Dec. 15, 1922, pp. 736-737, 7 figs. Details and operation of machine put on market by J. Bigwood & Son, Ltd., Wolverhampton.

STREET RAILWAYS

TRACK. Maintaining Continually Sinking Track. Elec. Ry. Jl., vol. 5, no. 26, Dec. 23, 1922, pp. 967-969, 7 figs. 9 mi. of track in San Francisco settles at rate of 0.1 ft. per yr.; permanent types of construction are held inadvisable; methods used for restoring grade.

STRIKES

VALUE OF. The Value of Lock-Outs and Strikes, L. Askwith. Roy. Soc. of Arts—Jl., vol. 71, no. 3653, Nov. 24, 1922, pp. 2-15 and (discussion) 15-16. Discusses value and results of strikes and gives details of exceptionally large disputes occurring since end of war.

STRUCTURAL STEEL

TORSIONAL STRENGTH. The Torsional Strength of Bars, Constantin Weber. Mech. Eng., vol. 45, no. 1, Jan. 1923, pp. 45-47, 16 figs. Mathematical treatment of torsional strength of bars, giving a general solution of problem together with precise solutions for certain cases and approximate solution for others. Translated from Zeit. des Vereines deutscher Ingenieure, vol. 66, nos. 31-32, Aug. 31, 1922.

SUBSTATIONS

AUTOMATIC. Automatic Substations Success in St. Paul, Robert Reinbold. Elec. World, vol. 81, no. 2, Jan. 13, 1923, pp. 87-90, 5 figs. Two years' experience of St. Paul Gas Light Co. brings entirely satisfactory results; both a.c. and d.c. stations in use.

SURVEYING

STEREOAUTOGRAPHIC. Practical Surveying (Aus der Praxis der Raumbildmessung), Otto Lacmann. Zentralblatt der Bauverwaltung, vol. 42, no. 96, Nov. 29, 1922, pp. 589-592. Discusses stereoautographic method, its advantages and field of application; comparison with theodolite methods.

T

TELEGRAPH LINES

WIND SHIELDING. Wind Shielding Between Conductors of Telegraph and Telephone Lines, P. J. Howe. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 20-26, 10 figs. Investigation of action of wind on telegraph and telephone lines. Results show that relation between wind velocity and wind pressure on ice-covered conductors conforms closely to generally accepted formula $P\text{-}KV_2$; and that wires, when coated with ice, shield each other from wind.

TELEPHONY

LONG CABLE CIRCUITS. Telephone Transmission Over Long Cable Circuits, Alva B. Clark. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 1, Jan. 1923, pp. 1-11, 15 figs. Author seeks to present idea of what is involved in transmission of voice currents over long-toll cable circuits. Different types of circuits; loading characteristics; effects encountered in long-cable circuits.

LONG-DISTANCE. Telephone Repeaters and Long-Distance Telephony, J. A. Cooper. Instn. Elec. Engrs.—Jl., vol. 61, no. 313, Dec. 1922, pp. 75-80, 4 figs. Repeater is defined and its advantages enumerated; Post Office tests for magnification, speech, stability, life and characteristics; the Edison single relay and double-relay systems and difficulties encountered in their designs. Forecast of 50-lb. trunk lines and transcontinental an transoceanic telephony is made.

TESTING MACHINES

OSCILLOSCOPE. Practical Application of Mechanical Oscilloscope. Can. Machy., vol. 28, no. 24, Dec. 14, 1922, pp. 18-19 and 28, 3 figs. Describes Elverson oscilloscope and its operation; tuning down high-speed mechanisms so that same are visible to naked eye; high-tension current employed for lamps; use of "creeper" gear.

TIDAL POWER

PRACTICAL APPLICATION. Harnessing the Tides, Can. Engr. vol. 43, no. 23, Dec. 5, 1922, p. 604. Scientific study of practical application; different aspects of utilization; system of basins employed. Translated from Nature.

TOLERANCES

SCREW-THREAD. English Screw Thread Tolerances (Englische Gewindetoleranzen), G. Berndt. Werkstatts Technik, vol. 16, no. 24, Dec. 15, 1922, pp. 747-748. Comparison of English, American and German standards with those proposed by A. Herbert Co.

TRACTORS

FARM. Factors Influencing Tractor Development, L. J. Fletcher. Agricultural Eng., vol. 3, no. 11, Nov. 1922, pp. 179-182, 2 figs. With special reference to its adaptation as agricultural machine.

TRANSPORTATION

INDUSTRIAL PLANTS. Internal Transportation in a Large Plant, W. Rockwood Conover. Management Eng., vol. 4, no. 1, Jan. 1923, pp. 15-18, 8 figs. Standard and narrow-gage railways, trucks and tractors enable Gen. Elec. Co. to reduce hand labour.

TRESTLES

WOODEN. Heavy Trestlework Required on New Logging Railroad. Eng. News-Rec., vol. 89, no. 26, Dec. 28, 1922, pp. 1110-1111, 2 figs. Line 38½ mi. long in Oregon used 4,500,000 ft. b.m. in five trestles.

TUBES

BRASS. Defects in Bass Tubes. Foundry Trade Jl., vol. 26, no. 327, Nov. 23, 1922, pp. 427-428. Mold dressings; internal defects and pouring temperatures; speed of teeming and slag inclusions; annealing defects; drawing defects. Abstract of paper by W. E. Ballard before Birmingham Univ. Met. Soc.

TUNNELS

MACHINE MUCKLING. Methods and Costs of Myers-Whaley Shovel Operation in Waterworks Tunnels. Eng. and Contracting, (Water Works), vol. 18, no. 3, Dec. 13, 1922, pp. 132-136, 5 figs. Data from Hetch Hetchy and Shandaken tunnels and comparisons with hand mucking.

TURBO-GENERATORS

PEDESTALS. The Design of Structural Supports for Turbo-Generators, Edward H. Cameron. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 1, Jan. 1923, pp. 37-52, 6 figs. Relative merits of three types of pedestals, reinforced-concrete, structural-steel, an composite; nature of vibrations is described and suggestion is made that definite horizontal impact allowance should be adopted, in addition to vertical impact allowance now generally used.

V

VALVES

AIR- AND WATER-RELIEF. Air and Water Relief Valves, M. M. Borden. Am. Water Works Assn.—Jl., vol. 10, no. 1, Jan. 1923, pp. 59-67. Facts concerning use of such valves on water-supply mains.

VENTILATION

AUDITORIUM. Ventilating the Cleveland Auditorium, C. L. Riley. Am. Soc. Heating and Vent. Engrs.—Jl., vol. 28, no. 9, Dec. 1922, pp. 843-852, 8 figs. Five separate and complete ventilating systems are used, three being located in attic space, one in basement and one on basement mezzanine.

BANK BUILDING. Improving Air Conditions in a Chicago Bank Building, E. Vernon Hill. Heating and Vent. Mag., vol. 19, nos. 11 and 12, Nov. and Dec. 1922, pp. 37-40 and 38-42, 13 figs. How tests disclosed faults in ventilating systems and suggessed remedy.

MODERN TENDENCIES. Modern Tendencies of Ventilation Practice, George T. Palmer. Am. Soc. Heating and Vent. Engrs.—Jl., vol. 29, no. 1, Jan. 1923, pp. 27-44. Developments of half century and forecast of what future holds as indicated by present status of development.

PRINCIPLES AND PRACTICE. Ventilation Principles and Practice. Contract Rec., vol. 26, nos. 50 and 51, Dec. 13 and 20, 1922, pp. 1187-1191 and 1206-1208 and 1212. Importance of ventilation and systems that are applicable to various types of buildings; standard requirements; relationship of heating and ventilation

ROOF VENTILATORS. Comparative Tests of Roof Ventilators, F. B. Rowley. Am. Soc. Heating and Vent. Engrs.—Jl., vol. 29, no. 1, Jan. 1923, pp. 9-13, 13 figs. Report of tests of five distinct types and description of method and apparatus used.

VIADUCTS

TRACK ELEVATION. Track Elevation on Long Concrete Viaduct at Aurora, Ill. Eng. News-Rec., vol. 89, no. 25, Dec. 21, 1922, pp. 1056-1059, 7 figs. Burlington R.R. builds three-track structure through city; concreting by dump cars; heavy fills on line and grade revision.

VIBRATIONS

PHOTOGRAPHY OF. High-Speed Photography of Vibrations (Sound, Mechanical, Electrical, Etc.), Augustus Trowbridge. Franklin Inst—Jl., vol. 194, no. 6, Dec. 1922, pp. 713-729, 11 figs. Applications of photographic recording to study of vibrations in running machinery. Design of camera and galvanometer; damping.

VISCOSITY

Liquid Films. A Problem in Viscosity. The Thickness of Liquid Films Formed on Solid Surfaces under Dynamic Conditions. Lond., Edinburgh and Dublin Ph. Mag. and Jl. of Sci., vol. 44, no. 263, Nov. 1922, pp. 1002-1014, 4 figs., part of which appears plate. Develops equations for flat slab of infinite width and for wire; experimental results and apparatus used.

W

WAGES

Group vs Collective Bargaining. Group Versus Collective Bargaining in the Railway Shop. Ry. Rev., vol. 72, no. 1, Jan. 6, 1923, pp. 76-83, 6 figs. Labour corporation formed at Beech Grove Shops of Big four Ry. Advantages of group over collective bargaining.

Incentive Basis. The Human Elements of Wage Incentive, Dale S. Cole. Indus. Management, N.Y., vol. 65, no. 1, Jan. 1923, pp. 39-41, 1 fig. Points out importance of contentment on worker's part.

International Comparison. Wages Compared Internationally, M. S. Birkett. Iron Trade Rev., vol. 72, no. 2, Jan. 11, 1923, pp. 159-160. Standards in European iron and steel producing centers, in relation to American, purchasing capacity is indicated.

WASTE HEAT

Utilization. The Utilization of Waste Heat, John B. C. Kershaw. Combustion, vol. 7, no. 6, Dec. 1922, pp. 328-334 and 360, 5 figs. Heat losses from steam boilers, and recovery of waste heat from boiler exitgases. Describes most efficient forms of heat-saving appliances that have been used in England, America, France and Germany.

Using Waste Heat of Gas Works (Energiegewinnung aus der Abwärme der Gaswerke), Trautmann. Gesundheits-Ingenieur, vol. 45, no. 52, Dec. 30, 1922, pp. 642-644. Use of flue gases for steam production.

WATER

Heating. Water Heating by Gaseous Fuel, Archibald Kay. Gas Jl., vol. 160, no. 3109, Dec. 13, 1922, pp. 682-683. General principles of hot-water supply with special reference to particular arrangements required in successfully fitting up gas-heated hot-water appliances.

WATER ELEVATORS

Caruelle. Tests of Caruelle Water Elevators. Engineering, vol. 114, no. 2973, Dec. 22, 1922, pp. 770-771, 5 figs. Results of tests of water lifter made by Boulton & Paul, Ltd., Norwich.

WATER POWER

Problem. The Water Power Problem. A Symposium. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 1, Jan. 1923, pp. 113-122, 1 fig. Discussion continued from Dec. 1922 Proc.

Washington, Cascade Range. Water Powers of the Cascade Range Wenatchee and Entiat Basins, Glen L. Parker and Lasley Lee. U.S. Geol. Survey, Water Supply Paper, no. 486, 1922, 76 pp. 12 figs. Report based on data of daily stream-flow records. Miscellaneous measurements, river plans and profiles, reservoir surveys, topographic maps, and results of reconnaissances made by U.S. Geol. Survey, supplemented by information from State officials, private individuals and officials of private enterprises.

WATER SUPPLY

City Residence. Water Supplies for City Residences, Aden E. Smith. Domestic Eng., vol. 101, nos. 11 and 13, Dec. 16 and 30, 1922, pp. 467-469 and 578-580, 7 figs. Tapping city water mains; running service lines; connecting heaters and auxiliary pumps; insuring good circulation, etc.

Distribution Systems, Standards for. Report of Committee on Physical Standards for Distribution Systems. Am. Water Works Assn.—Jl., vol. 10, no. 1, Jan. 1923, pp. 68-74. Recommendations for terminology, hydraulic design and performance; practical details.

Taste and Odors Removal. Modern Practices Involved in the Removal of Taste and Odors by Aeration, Filtration and Other Processes, Norman J. Howard. Can. Engr., vol. 43, no. 25, Dec. 19, 1922, pp. 635-640. Tastes from microscopic organisms, chlorine, phenols and iodoform potasium permanganate and copper sulphate treatments; colour standards adopted in Toronto.

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See also Electric Welding, Arc; Electric Welding, Resistance; Oxy-Acetylene Welding.

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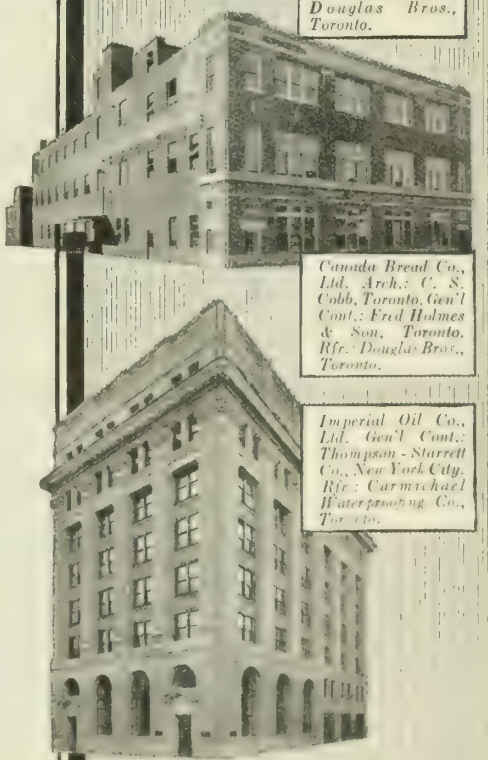

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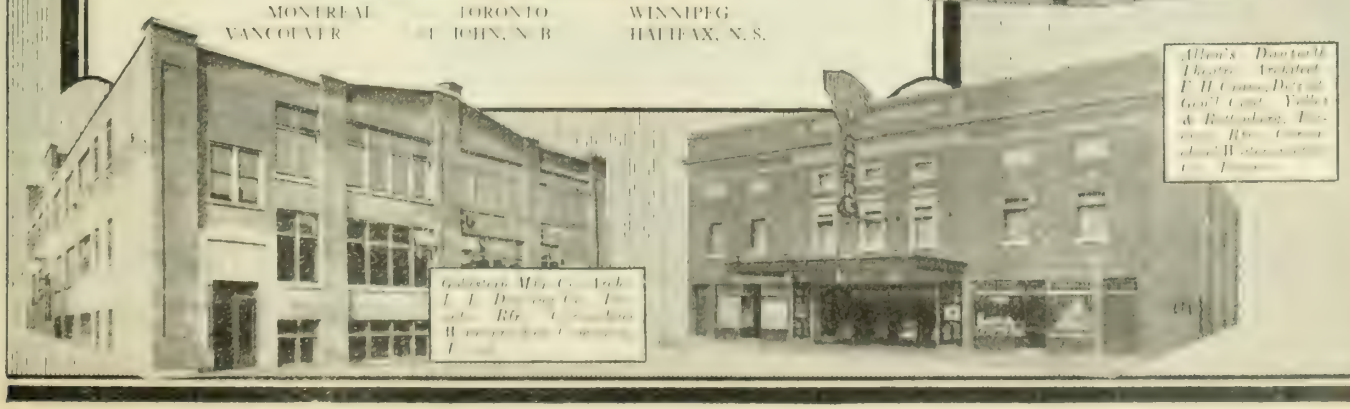

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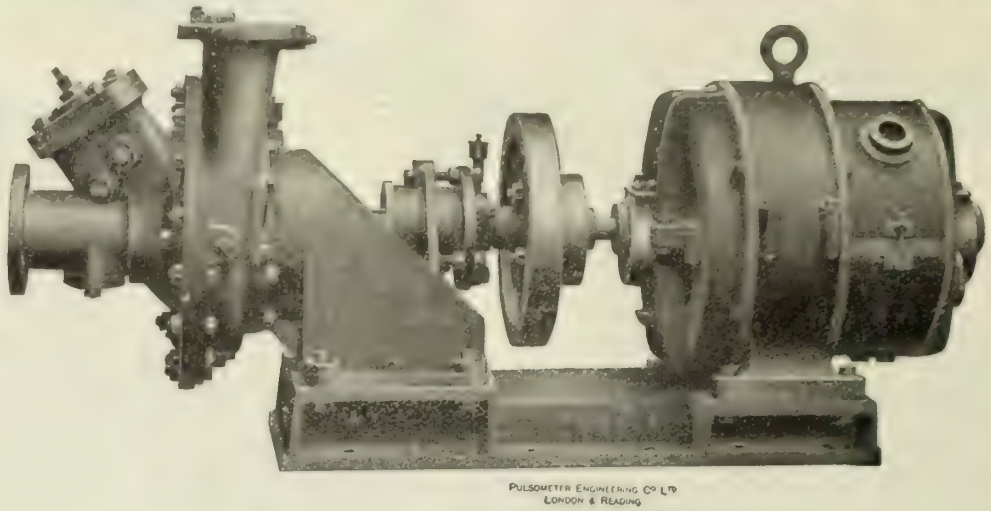

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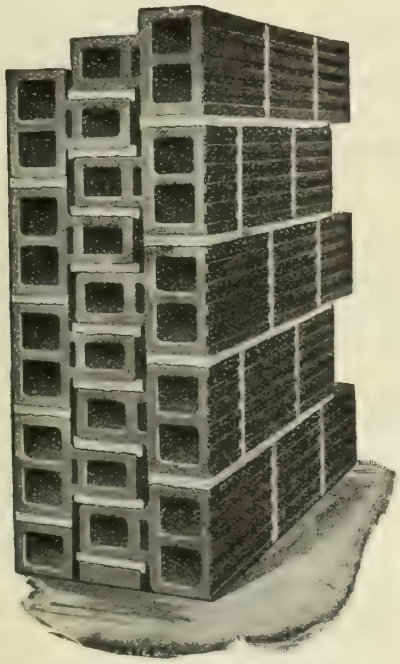

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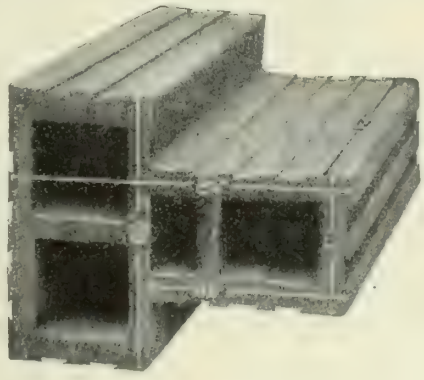

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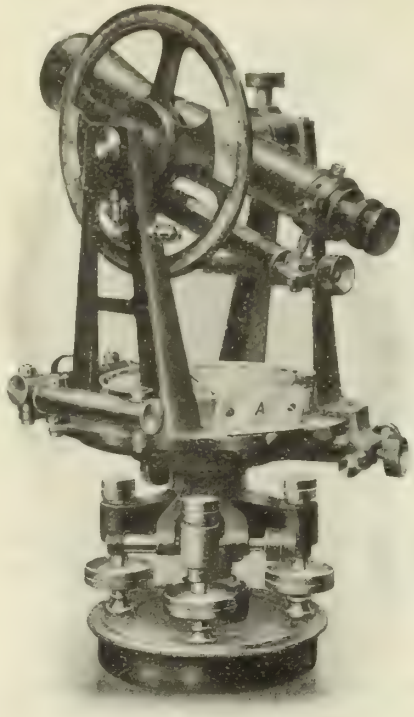

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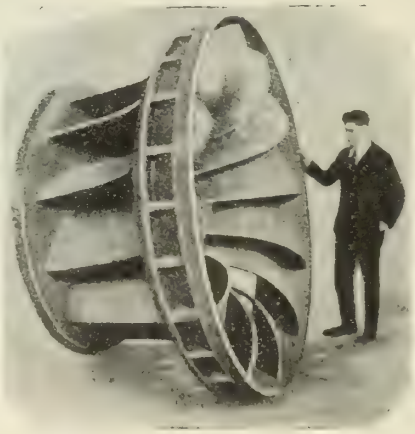

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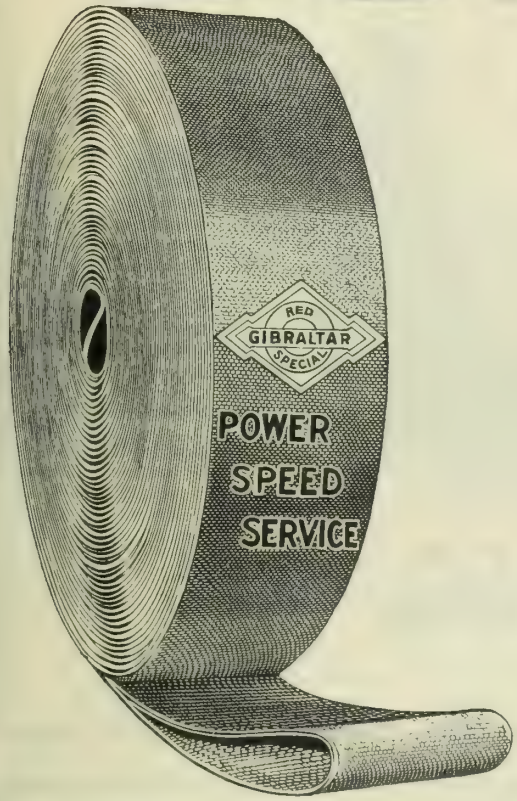

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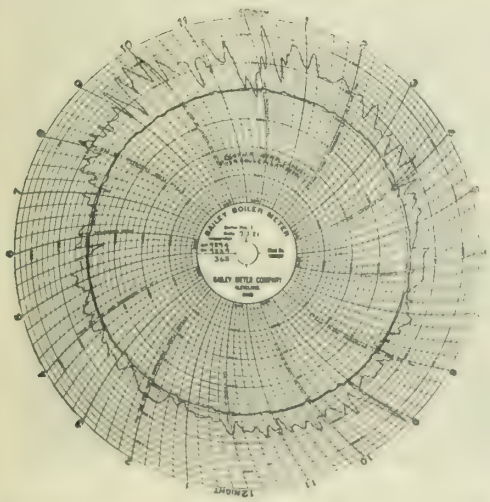

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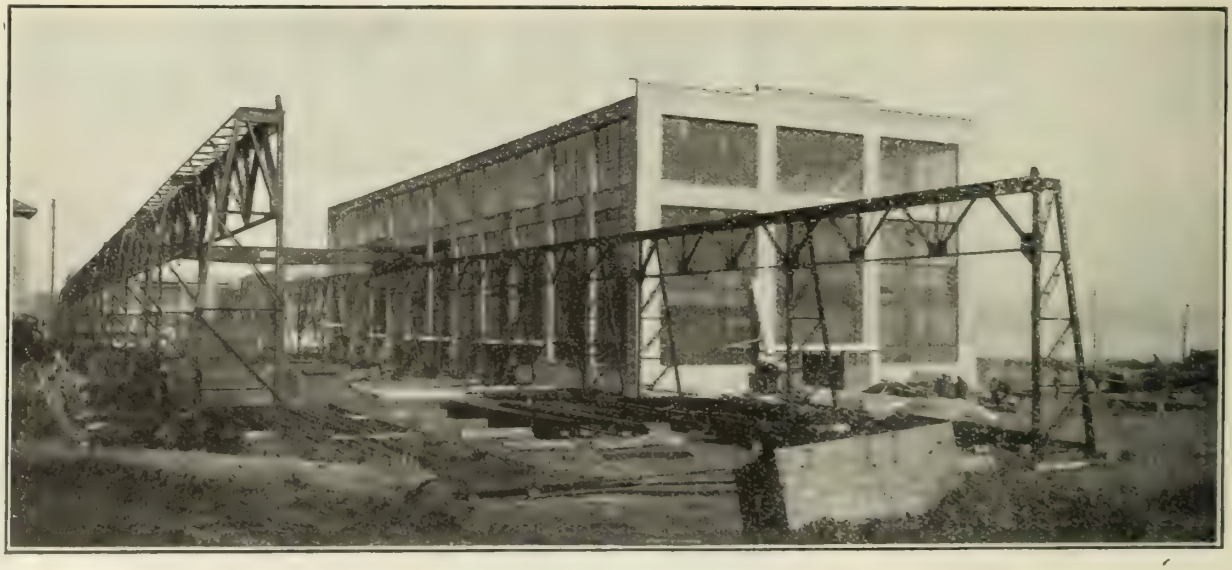

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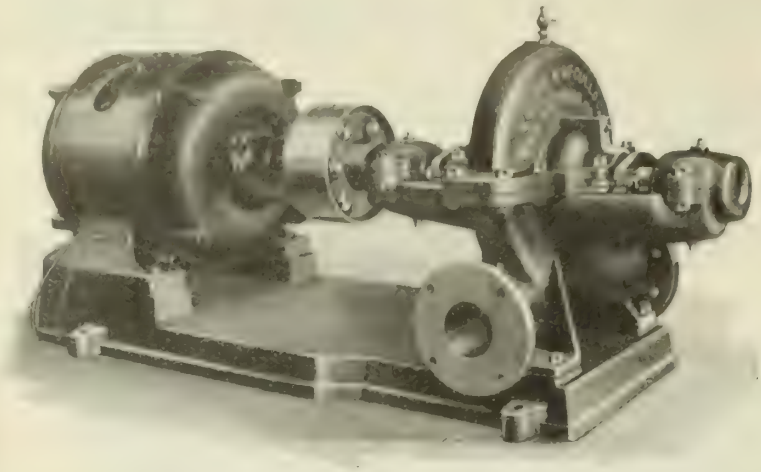

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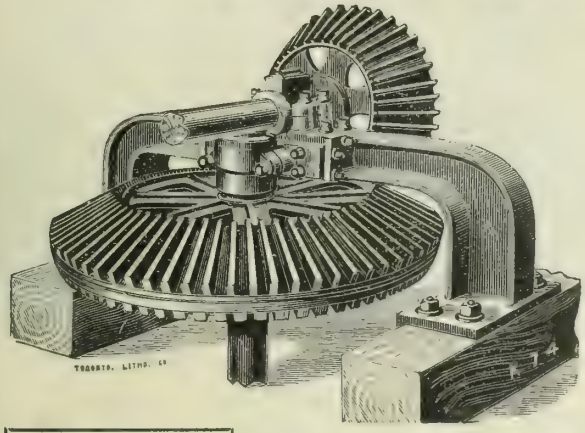

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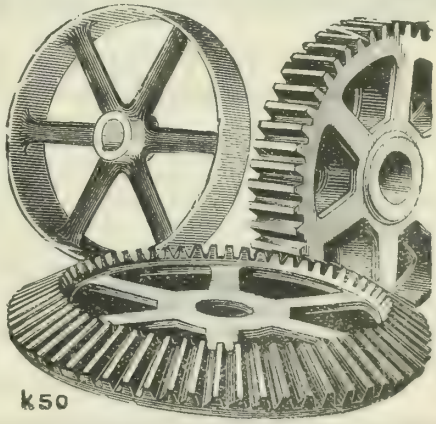

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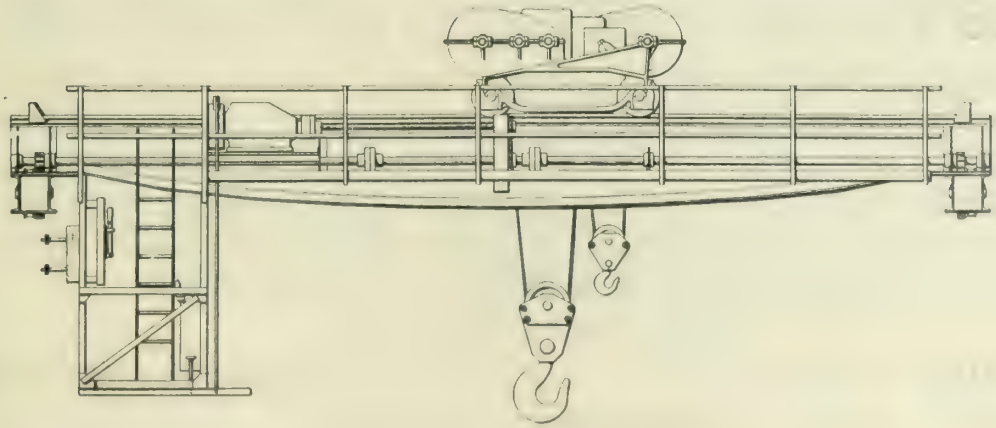

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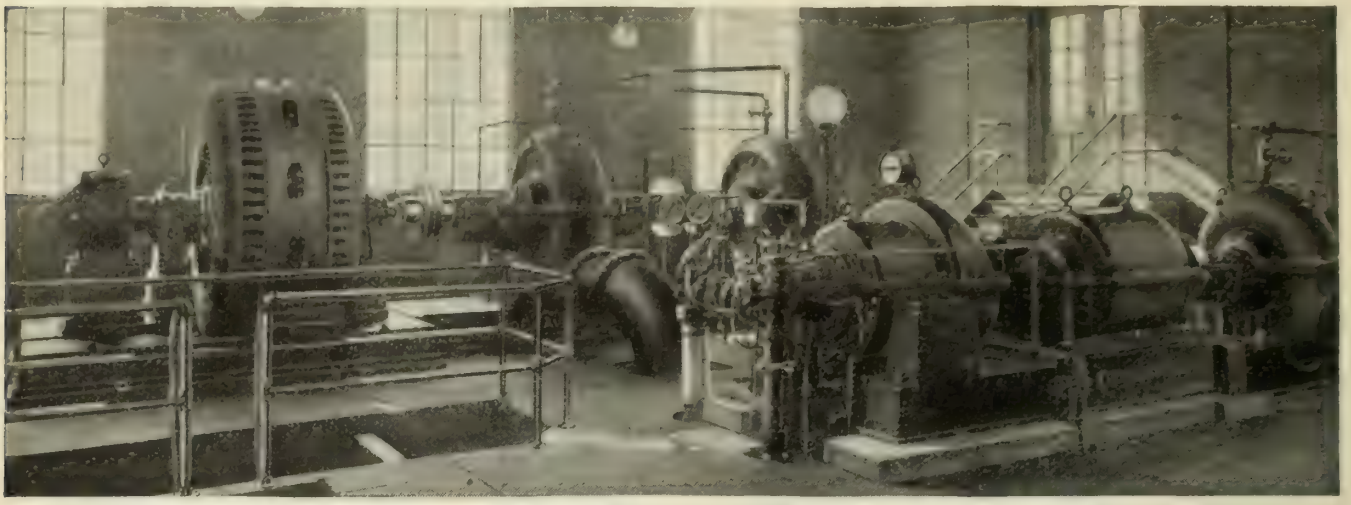

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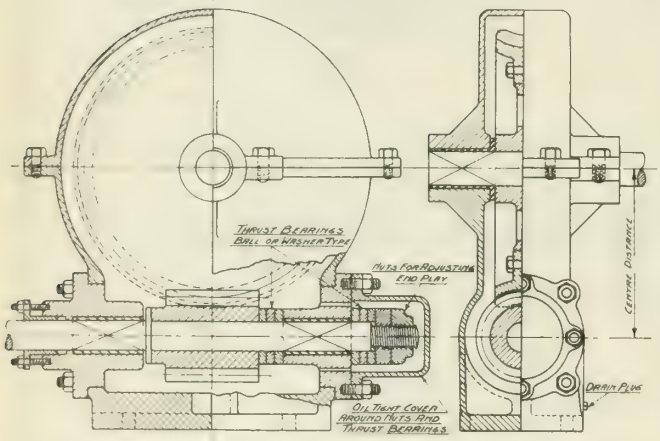

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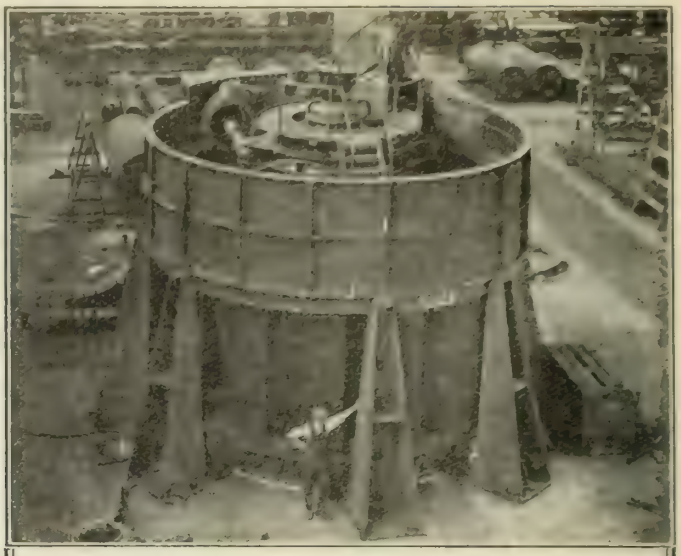

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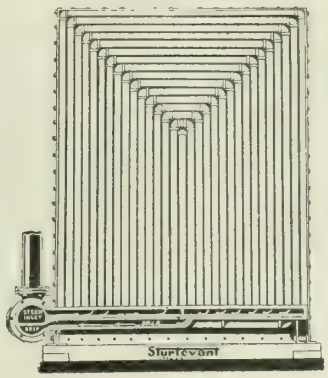

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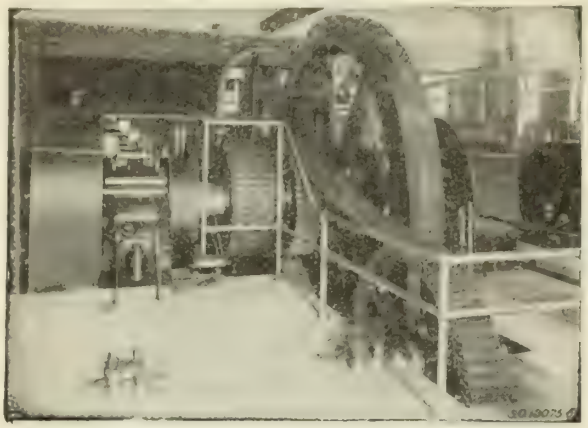

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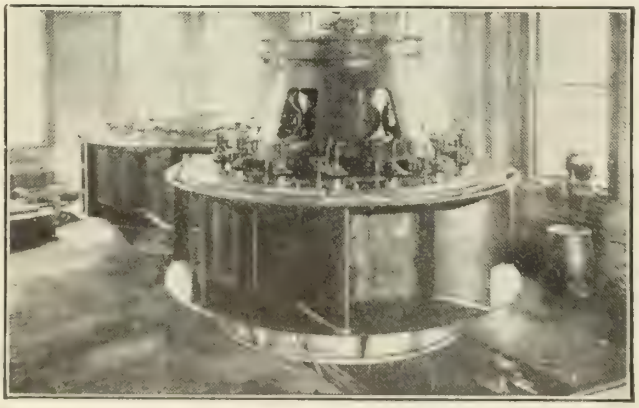

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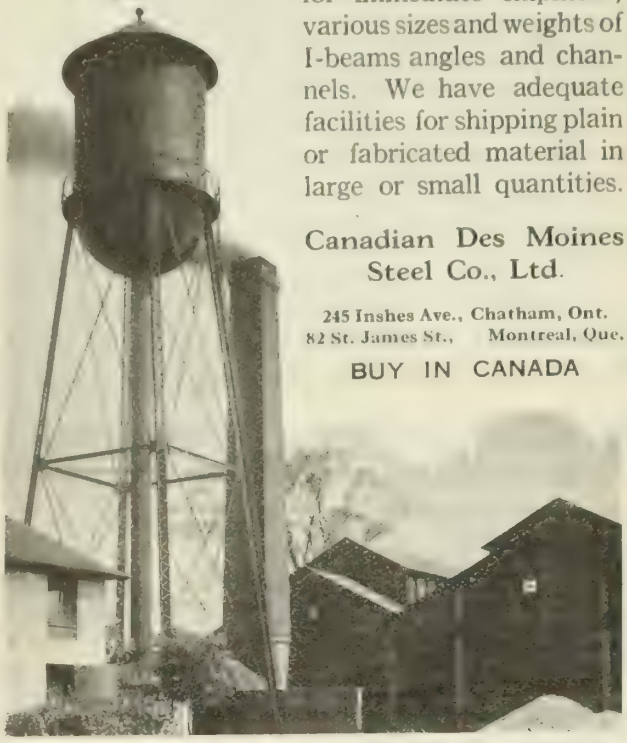

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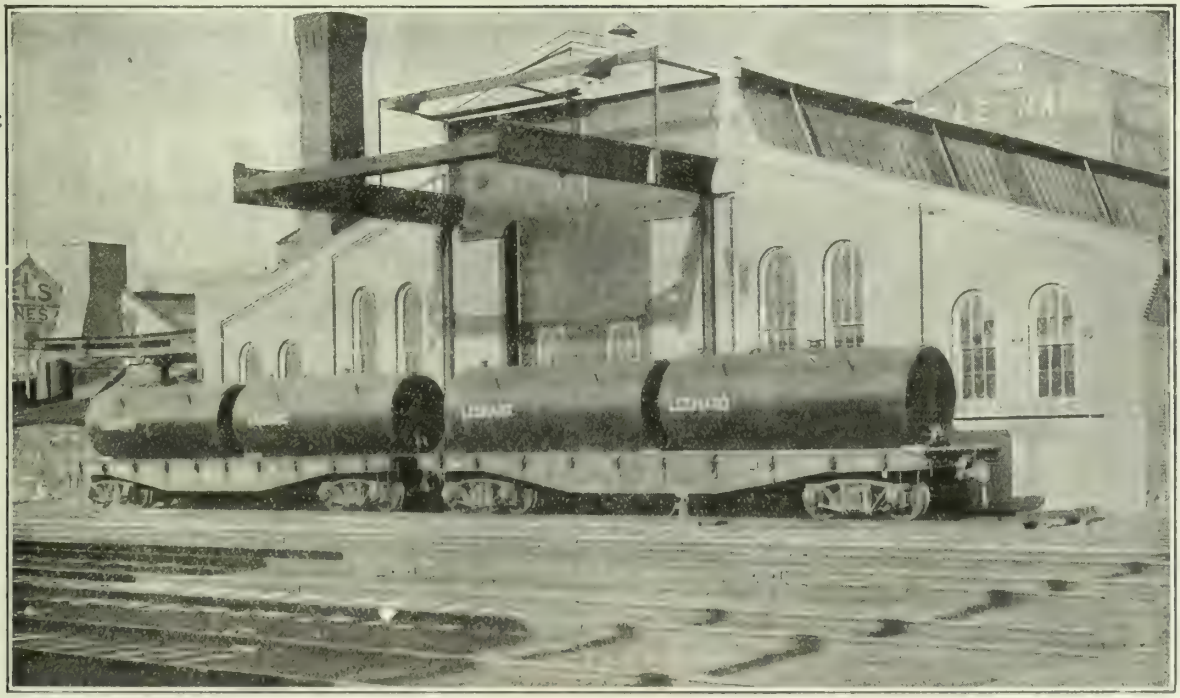
By order,

R. C. DESROCHERS, Secretary.

Department of Public Works, Ottawa, February 7, 1923.



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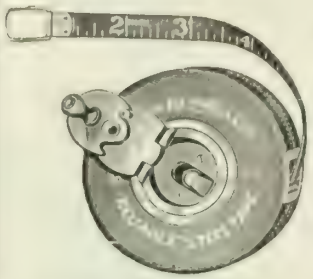

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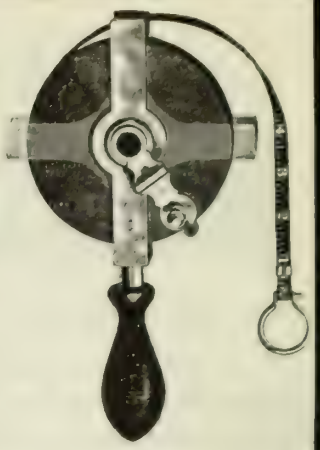

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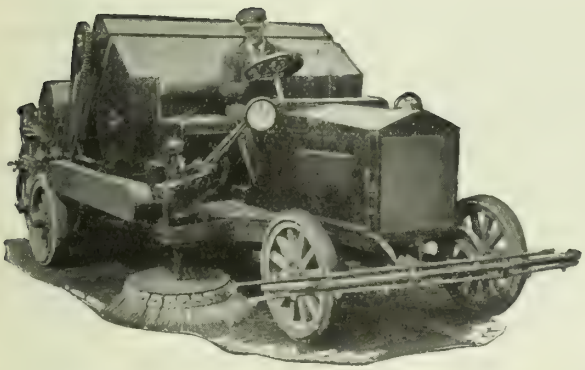

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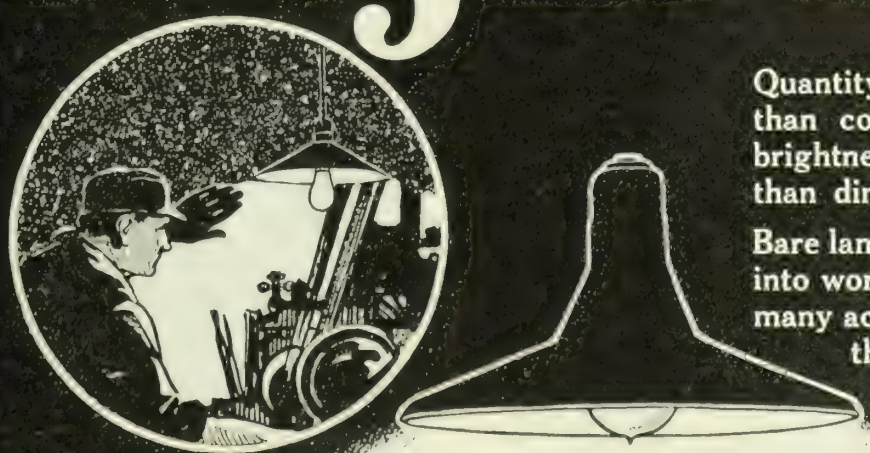

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Bank clearings, 1921	302,237,674
Port Statistics, Imports 1921	26,663,862
" " Exports, 1921	28,799,768
" " Duty collected, 1921	4,772,693
Number of Industries and Workshops	835
Number of Industrial Employees	18,000
Value of Production in 1919	33,126,504

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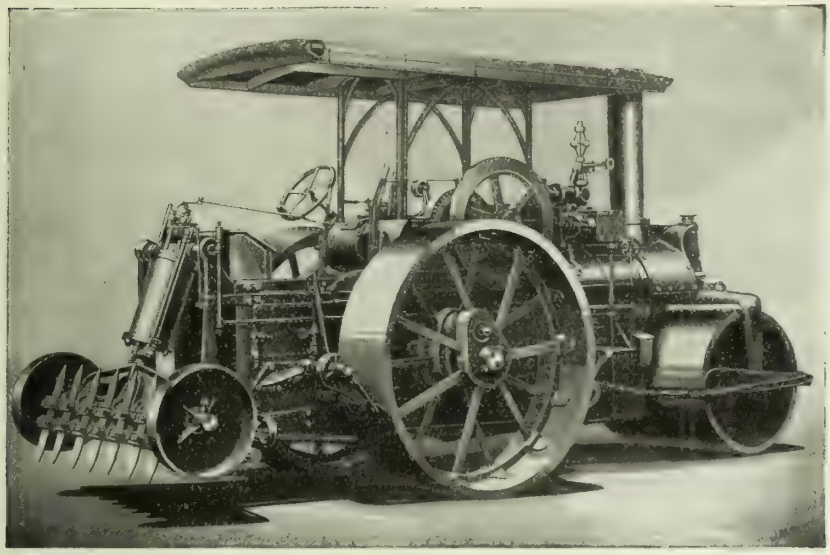

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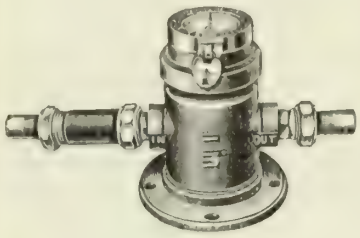

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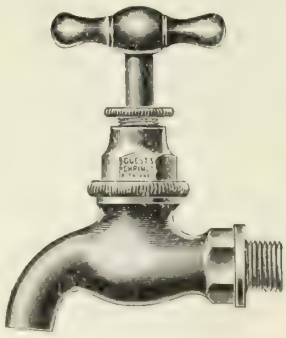

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Wellington St., 4" Black Base, 1½" Sheet Asphalt Top
Laid Aug. 1922

"Black Base" in Brantford

Continuing a successful program of asphalt construction, Brantford in 1922 laid 17,585 square yards of asphalt pavement, of which 12,570 square yards were of 4" of "Black Base" with 1½" sheet asphalt wearing surface, laid over old gravel and macadam subgrades. The Black Base mixture utilized local materials to the fullest extent and consisted of 80% local gravel, 15% crushed stone and 5% asphalt cement. The work was done by day labor under the direction of F. P. Adams, A.M.E.I.C., City Engineer.

By salvaging these old roadways with this type of improvement, Brantford City officials saved their rate-payers thousands of dollars, yet gave them a first class pavement capable of carrying heavy traffic for many years.

Where old subgrades possess considerable supporting power, thin slabs of flexible black base successfully absorb the impact of heavy fast traffic and the combination provides a foundation which has all the characteristics of the ideal.

Over 15,000,000 square yards of Black Base are in existence on the American Continent today and some sections have been giving excellent service for many years. Many Canadian municipalities will find it to their decided advantage to fully investigate the possibilities and service records of Black Base pavements.

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APRIL 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VI No. 4

BULLETIN № 8

BURLINGTON STEEL CO. LTD.

RAIL CARBON REAL STRENGTH

HAMILTON ONT

4½ BILLION VIBRATIONS

AND STILL THE BUILDING STANDS UP

IN SALT LAKE CITY, THE UTAH COPPER CO HAVE A BUILDING WHICH, ACCORDING TO THEIR ENGINEER, HAS BEEN VIBRATING A MILLION TIMES A DAY SINCE 1907.

IT CONTAINS OVER 600 SEPARATING MACHINES WHICH VIBRATE SO INTENSELY THAT AN ORDINARY INDIVIDUAL CANNOT STAY IN THE BUILDING

THERE ARE 1500 TONS OF RAIL-CARBON BARS USED IN THE STRUCTURE AND STILL EVERYONE IS SATISFIED.

YET SOME ENGINEERS WILL TELL US THAT A HIGH-CARBON STEEL BAR IS NO GOOD WHEN SUBJECT TO VIBRATION

THE UTAH COPPER CO., SALT LAKE CITY

A CERTAIN RAILWAY EQUIPMENT COMPANY HAS IN THE LAST 15 YEARS, MANUFACTURED AND PUT INTO SERVICE ON RAILROAD ROLLING STOCK, 3,210,000 PIECES OF RAIL-CARBON STEEL, ROLLED IN THE FORM OF U'S OR CHANNELS TO FORM BRAKE-BEAMS.

IN 15 YEARS THEY HAVE NEVER HAD A FAILURE

SURELY SUCH A RECORD IS WORTHY OF CONSIDERATION

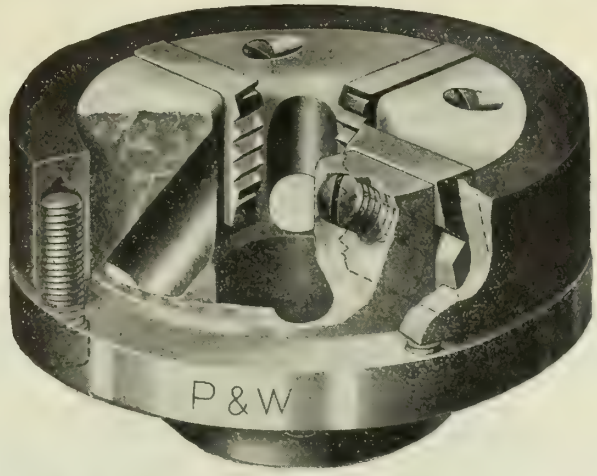
IF A NAKED BRAKE-BEAM WILL STAND UP YEAR IN YEAR OUT UNDER HEAVY-DUTY SERVICE, CERTAINLY A BAR OF THE SAME MATERIAL WHEN EMBEDDED IN CONCRETE IS FOOLISHLY SAFE

IF THE MOTHER RAIL STANDS UP UNDER THE POUNDING AND VIBRATION OF THE LOCOMOTIVE, WHY SHOULD THE LITTLE BABY RAIL STEEL RODS IN THE CONCRETE GIRDER BELOW FALL DOWN?

THINK IT OVER

THEN SPECIFY RAIL-CARBON STEEL BARS ACCORDING TO A.S.T.M. SPECIFICATION A-16-14, AND YOU WILL GET THE STRONGEST, PUREST AND BEST STEEL

BULLETIN № 9 — THE MOTHER RAIL.



P. & W. Die Stock Dies

For Clean, Accurate Threads

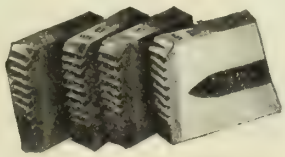
THE die consists of a single piece collar and guide containing four chasers held in radial slots by set screws placed at an angle of 45°.

A ring surrounds the collet and in this ring are four tapered slots which match the bevel backs of the chasers. Pushing and pulling screws in the flange of the collet move the ring to permit adjusting the chasers 1/32 in. over or under standard size.

The chasers are hobbed one at a time in a separate holder in such a manner as to provide proper relief or clearance when set up in the collet. Chasers are readily removed for regrinding. Their proper location is always determined as the collet slots and chasers are correspondingly numbered. Collet is bored to correct diameter to act as a guide and thus insures true alignment.

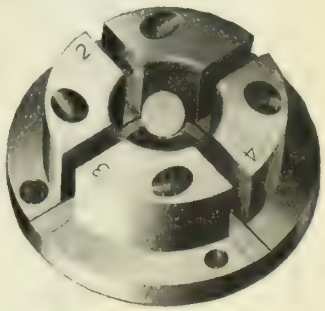
The Holding Ring

Note the taper adjusting slots for the chasers. Threaded for pulling screws.



The Chasers

Set in the holding ring to provide the correct relief or clearance. Easily sharpened on the cutting face.



The Collet

Market slots for chasers. Clearance holes for chips. Center hole bored to correct diameter for true alignment. Slot for locking in the diestock. Counterbored for pulling screws, threaded for pushing screws and tapped on an angle for chaser locking screws.

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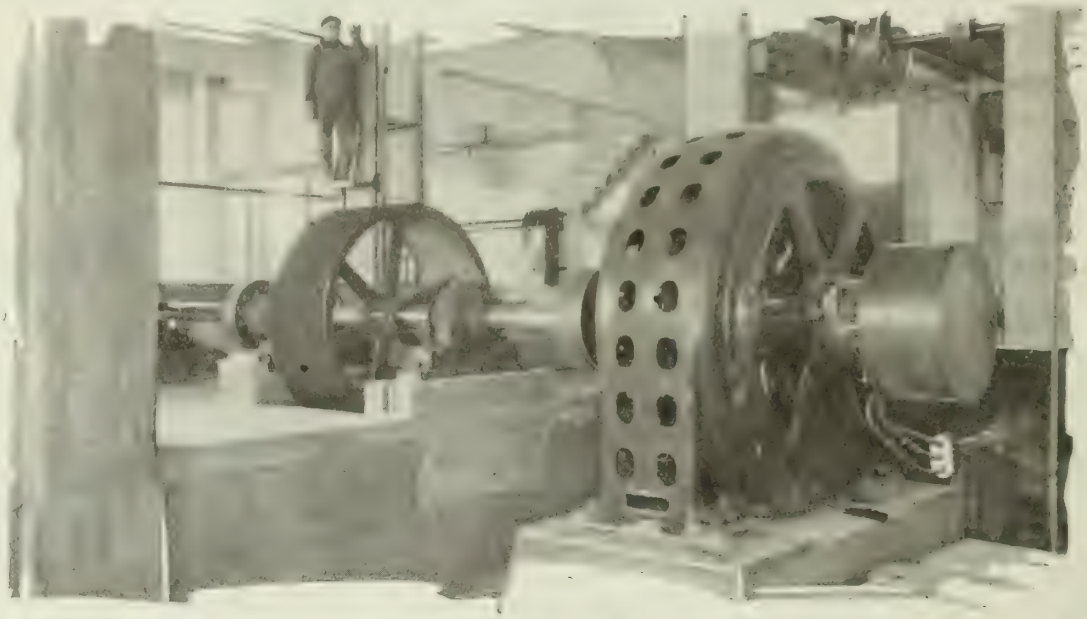

15 Per Cent Upwards—Power Saved
by Ball Bearing Pillow Blocks and Hangers

MOST vital of all losses in grain mills is the waste in power caused by the frictional resistance in plain bearings in power distribution systems. More than fifteen per cent of the power generated is wasted in overcoming this useless load.

Of this power absorbed by plain bearing equipped shafting, approximately 60 per cent can be saved by using SKF improved self-aligning ball bearing pillow blocks and hangers.

Shafts thus supported are carried by two rows of hardened steel balls that roll between polished steel races and without appreciable friction or wear. Even shaft deflections cannot cause heating and binding for the inner race tilts with the shaft like a ball and socket joint.

Furthermore, there is no worn shafting, no need for bearing adjustments and replacements, no vibrations and no oil leakage. Engineering details on request.

CANADIAN SKF COMPANY, LIMITED
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is adaptable to any machining Process

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It can be sawed, bored, drilled, turned, tapped, threaded, milled, punched, bent or worked into any shape and on any machine fashioned for handling metal.

It takes extreme machining with but little wear on edge tools.

No other material can compare with *Diamond Fibre* in the relation of its weight to its tensile strength.

Diamond Fibre is supplied in sheets, rods, tubes and fish paper or in parts machined to your specifications.

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Makes Good Roads

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"The City of Kokomo is now constructing a large relief sewerage system; some concrete pipe that was placed in 1873, according to the records in the offices here, will be replaced with larger concrete pipe. This sewer has been in use as a combined sanitary and storm sewer, and seems to be in first class condition, showing no defects from acids which have flowed through it, As this pipe has been in service forty-eight years, it is, as far as I know, the oldest concrete pipe carrying sanitary matter".

FRED DAVENPORT, City Engineer,
Kokomo, Indiana.

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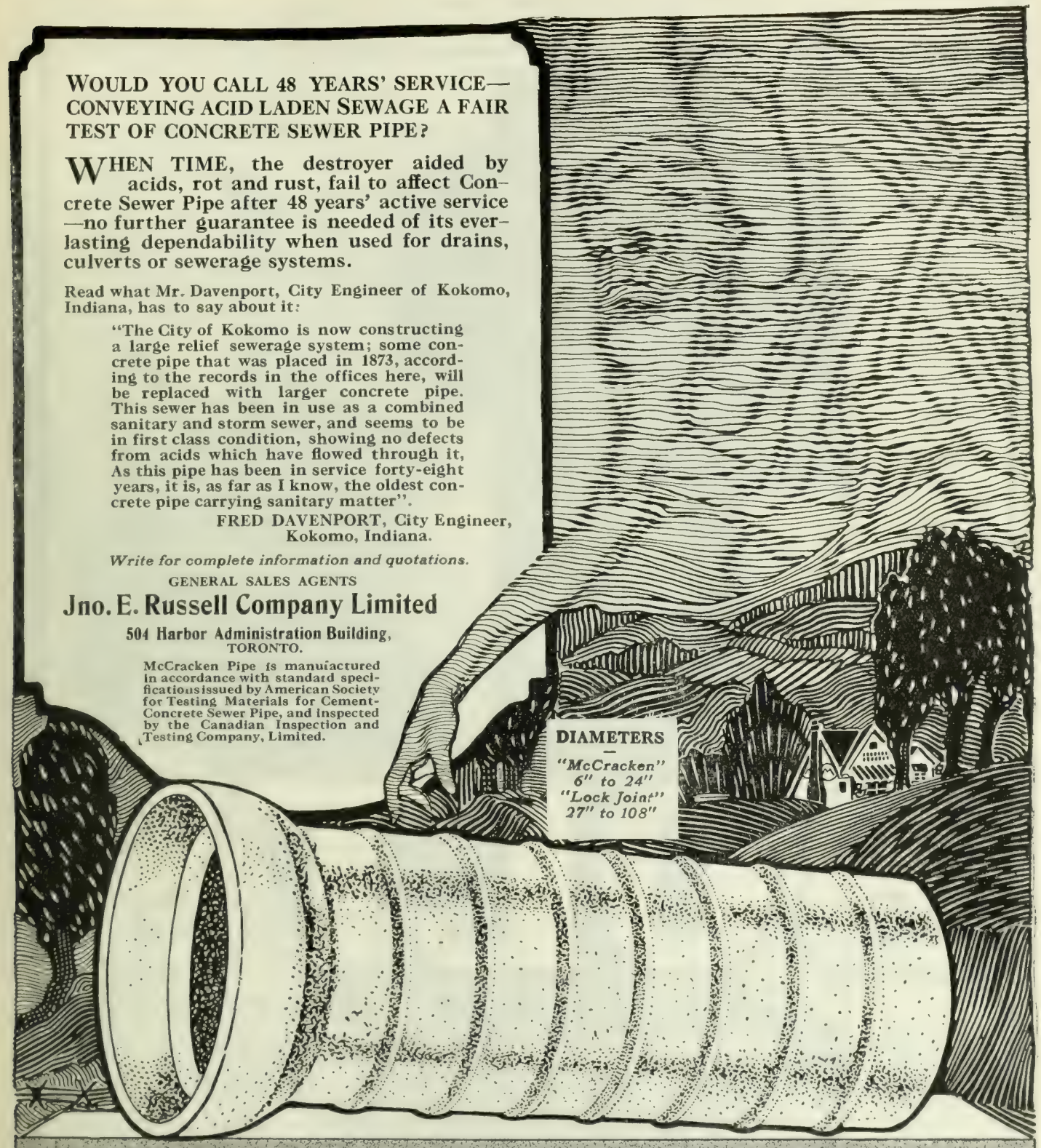

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"Lock Joint" 27" to 108"

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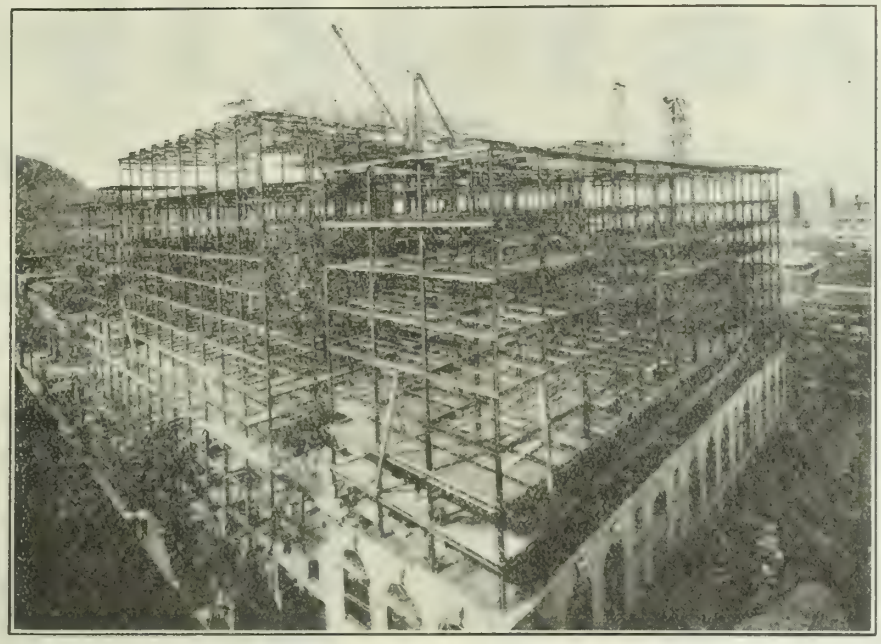

YOU GET SERVICE ONLY WHEN YOU PAY FOR IT.

IF all protective paints carried the same price per gallon, which would you select? Naturally the one with the best service records back of it. The initial price, then would not be the deciding factor, and in no case should it be.

When you pay a fair price for a product, whose services records make its quality unquestioned, then you are assured of service.

What then does the "initial saving" of a half dollar per gallon, more or less, mean when you permit price to be the deciding factor? Simply this—it generally means you get low price in lieu of quality—and lack of quality and proven worth means that you will not get service.

SUPERIOR GRAPHITE PAINT—the leader in the metal protective field—is not made to fit a price, but it does render service. Back of this statement stands its demonstrated value.

SUPERIOR GRAPHITE PAINT is specified and used in larger quantities every year for protection of bridges, structural steel and all metal surfaces, because discriminating buyers insist on service and are willing to pay for it.

When you specify SUPERIOR GRAPHITE PAINT you are assuring utmost paint satisfaction with a low per year cost.
Summed up in one thought—the use of SUPERIOR GRAPHITE PAINT eliminates the hazard of experiment.

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SUPERIOR GRAPHITE PAINT is one of the DEGRACO line of dependable paints.
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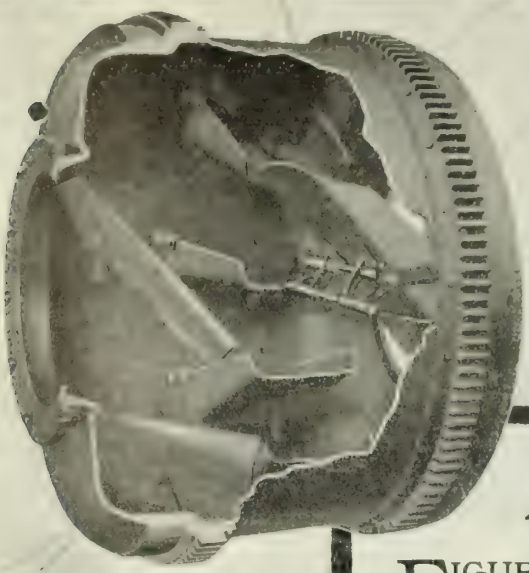

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FIGURE the actual cubic capacity of a Koehring drum—you will discover that every rated capacity is generously justified, giving plenty of room for proper mixing action.

Drum heads are cast of special composition metal to resist abrasion—an important feature when big capacity mixers and longer mixing time are considered. No pockets or corners to clog. Easily renewable splash ring. Study the Koehring drum, a good example of Koehring "Heavy Duty" construction.

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Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete. Write for Catalog C-35.

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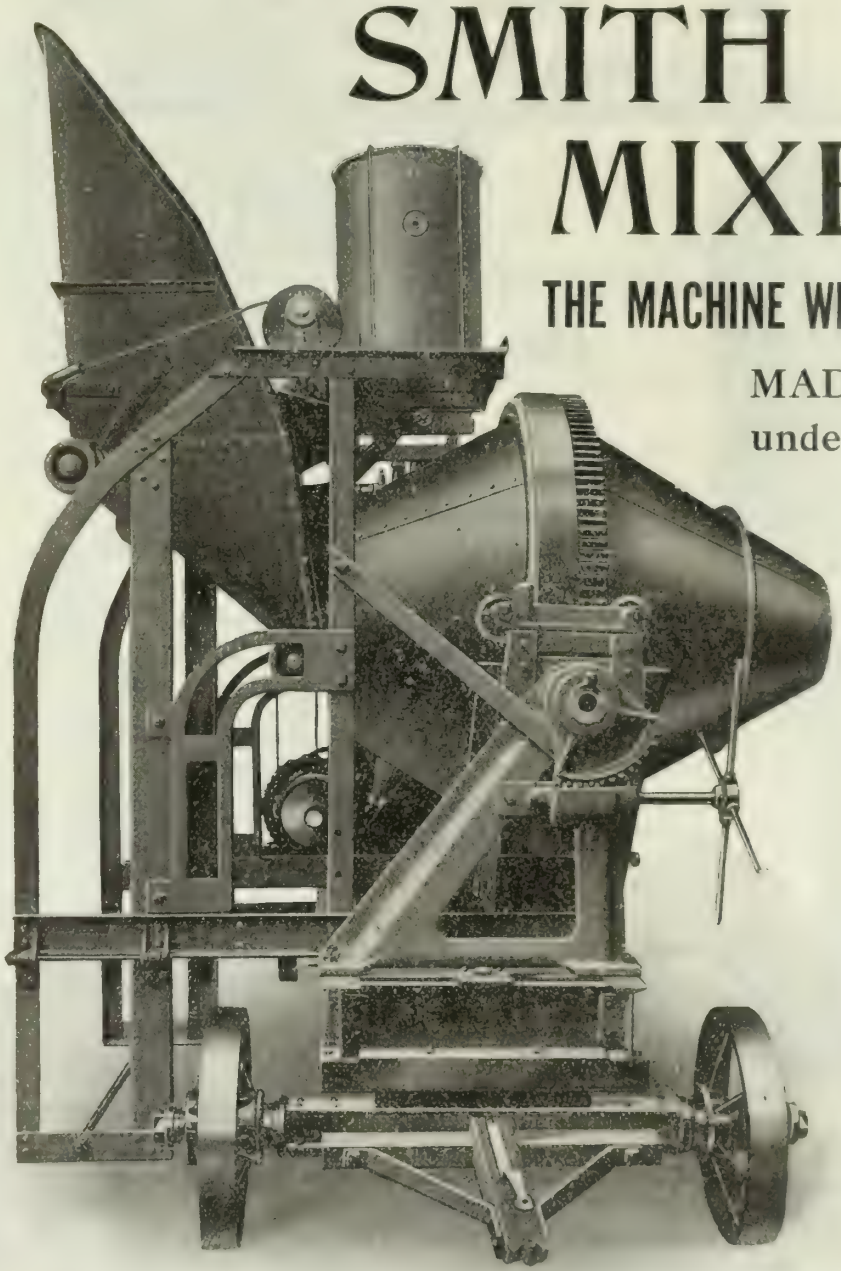

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MADE IN MONTREAL
under our own supervision.

We know they are made right and of the best materials.

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OF ALL KINDS.

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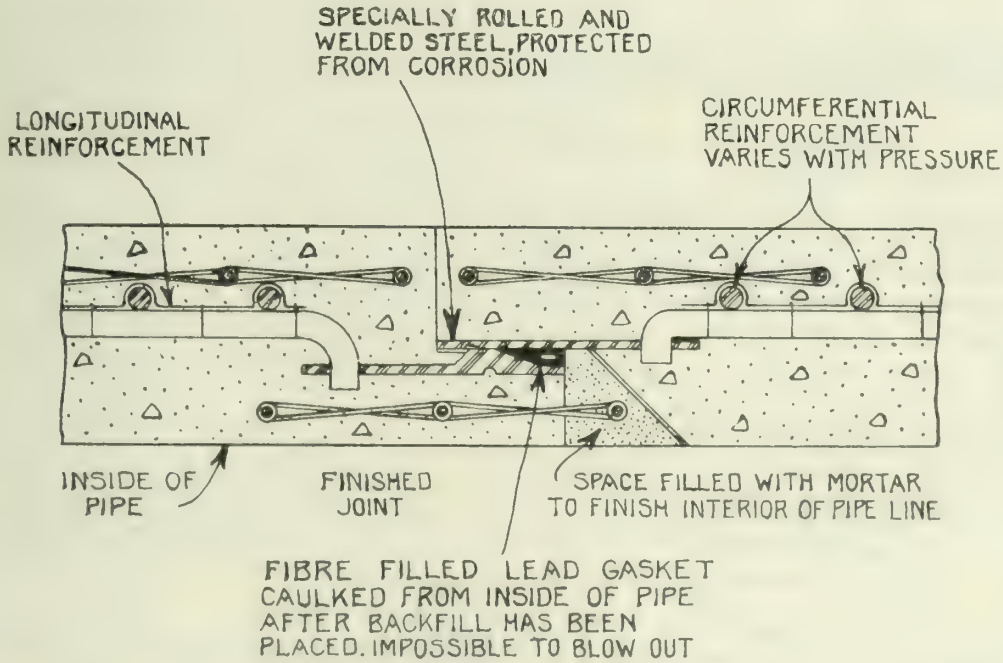
REINFORCED CONCRETE PIPE

was chosen in October by the Water Commission of Tulsa for their new Pressure line --- 25 miles of 54 inch pipe and 28 miles of 60 inch pipe --- which will bring soft water from SPAVINAW CREEK to the storage reservoir near TULSA, OKLAHOMA.

Our "LEAD AND STEEL" EXPANSION JOINT is used in each twelve foot length of Pipe.

Manufacture was begun in January of this year.



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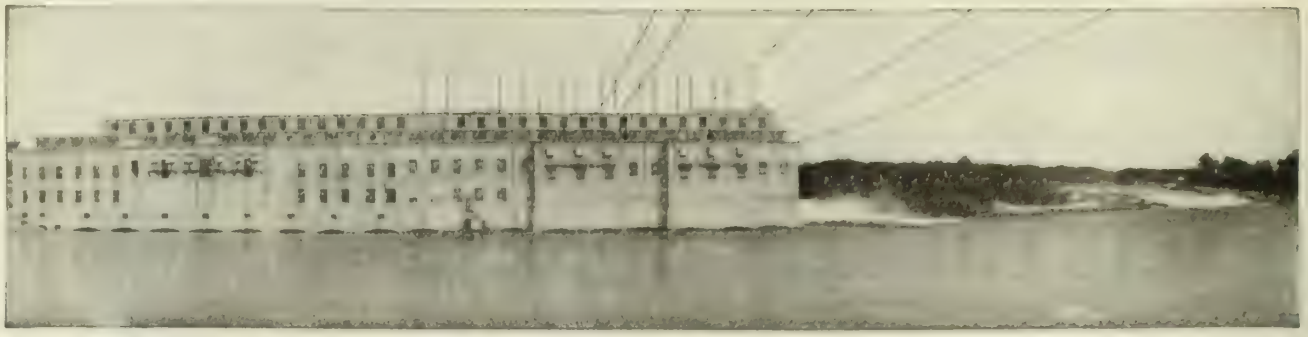

Power house, Point du Bois—View from Tail Race.

CANADA CEMENT CONCRETE FOR PERMANENCE

HARNESSING THE WATERS OF THE WINNIPEG RIVER

The development of water power within economic transportation distance of Winnipeg, has reached a point where 70,000 horse power is available, and there is sufficient additional reserve power to develop 500,000 H.P. when required.

At the power house site, the Winnipeg River falls over a series of rapids with a natural fall of 33 to 28 feet within a ¼ mile. This fall is increased to a total head of 43 to 48 feet, by a concrete Dam; giving a pondage area of 7 sq. miles.

The Power House, completed in 1920-21, is of concrete and steel. The Power House foundations, consisting, besides the series of draft tubes, of a series of flat tail race arches upon supporting walls tapered in plan, were built in pairs of arches; the two adjacent spans, built as a unit with a mid-wall, are resting upon asphalt painted skewbacks formed upon alternate tail race walls. The contraction joints are thus 56 ft. apart. By this means the use of reinforcing steel in these arches was avoided.

In the other elevation of the building the foundations were separated into three portions—the arrester bays, the transformer and generator room and the turbine and rack rooms. This was done by the use of two vertical expansion joints, running the entire length of the building. Above the tail race arches, parting planes, asphalted and keyed with wooden strips, were provided in the main walls, with considerable success in the effort to avoid unsightly cracks.

This great plan of hydro-electric development at Point du Bois has given Winnipeg power at the lowest rate on the continent; less than a half cent per K W H.

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UNIFORMLY RELIABLE

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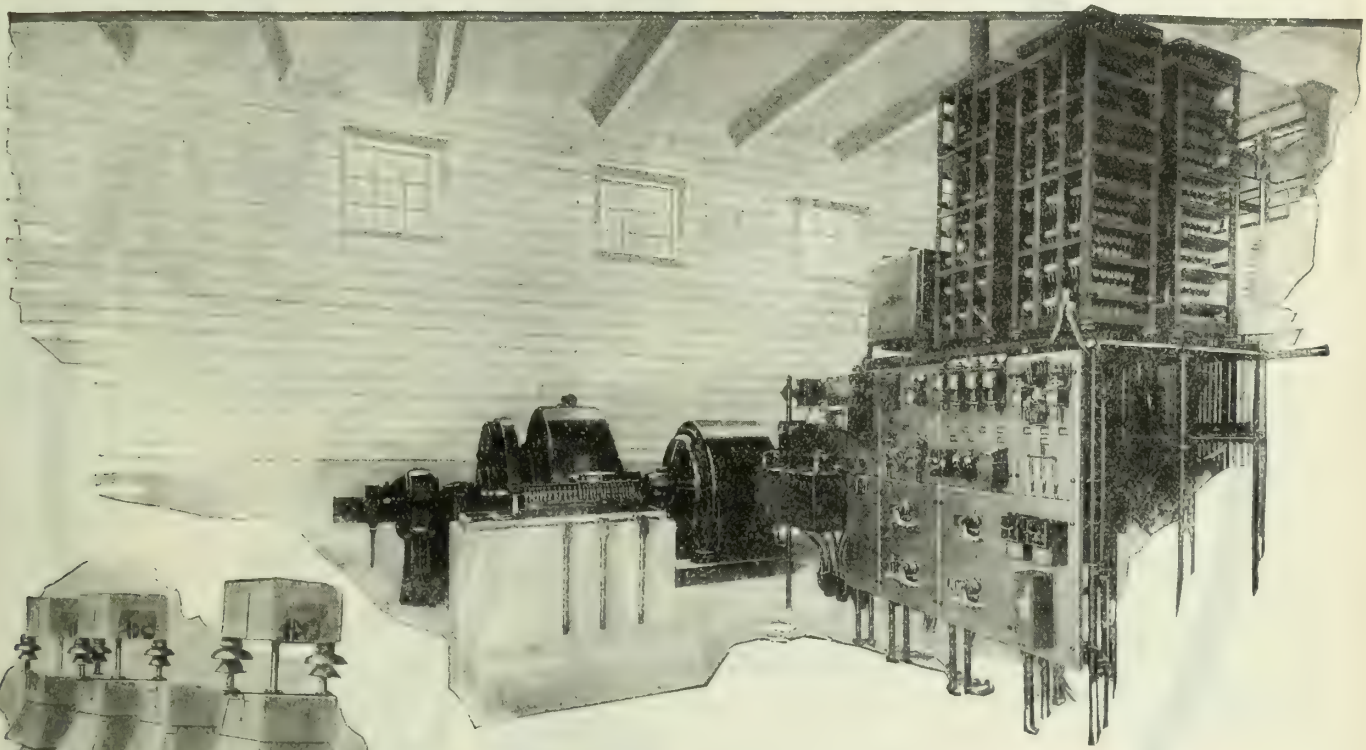
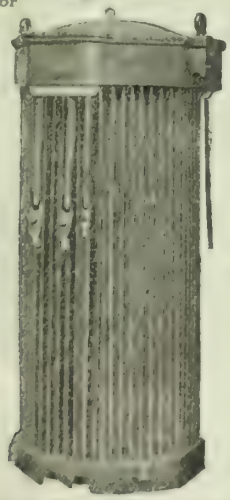
Mentioning The Journal gives you additional consideration.

Save Money and Improve Service



C-G-E Oxide Film Lightning Arrestor



C-G-E Type H Transformer "The Standard of Quality"

C-G-E Automatic Substations Produce Results.

Automatic Railway Substations start up and shut down as the demand for power appears or disappears. The expense for operators is eliminated so that cost for attendance is minimized.

Automatic Substations can be more closely spaced because of the lower cost of operation. This saves feeder copper and improves the trolley voltage. By shutting down under no load "running light losses" are saved for a large part of the day.

Let the automatic station engineer in the nearest C-G-E office tell you how much your savings would be with C-G-E automatic control.

Canadian General Electric Co., Limited

HEAD OFFICE TORONTO

Branch Offices: Halifax, Sydney, St. John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

Buy your equipment from Journal advertisers.

Westinghouse

ELECTRICAL APPARATUS FOR EVERY PURPOSE

LOADING THE WORLD'S FREIGHT

Slowly the pontoon crane moves its arm of steel. Deliberately it lifts—swings—lowers—as it carries its weighty load from the dock to the freighter's hold.

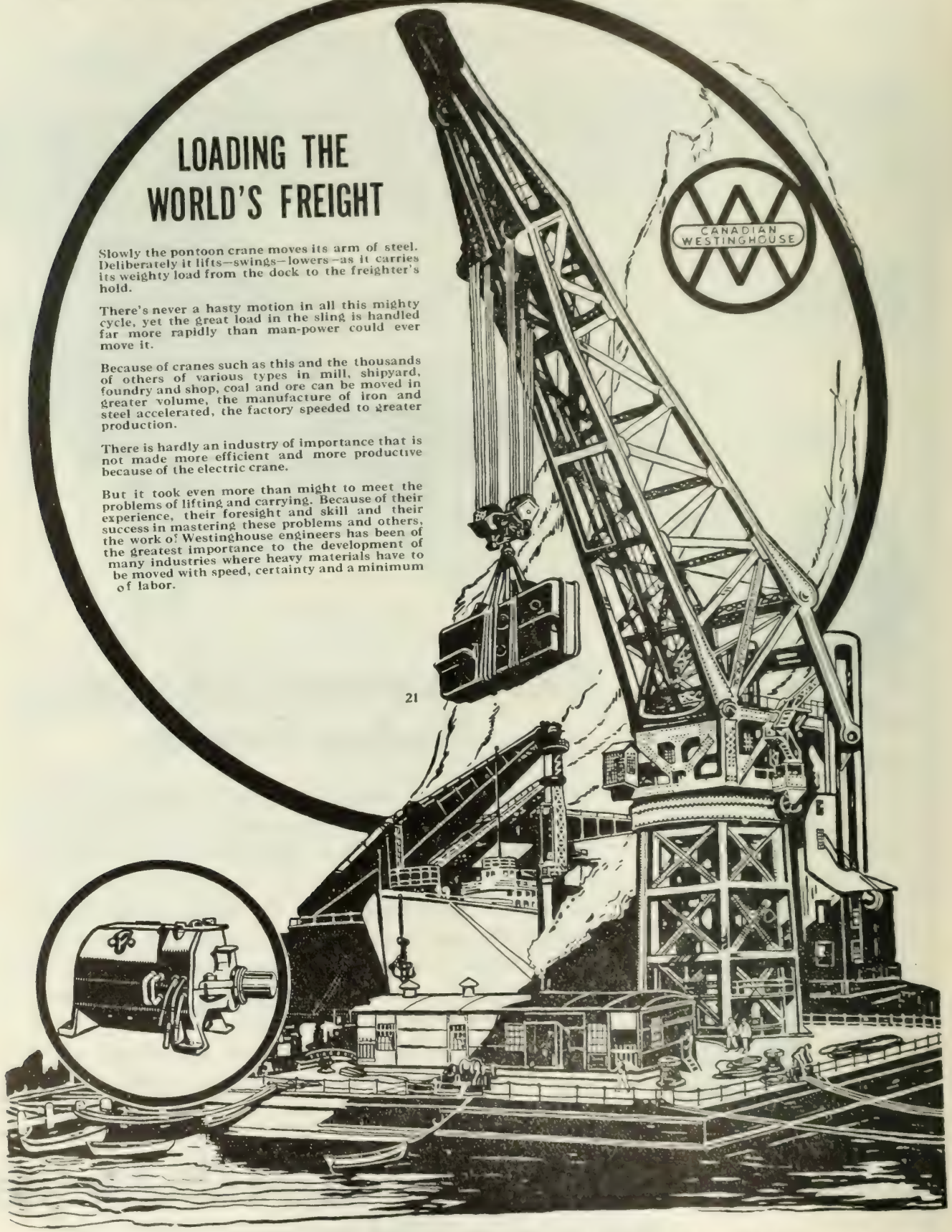
There's never a hasty motion in all this mighty cycle, yet the great load in the sling is handled far more rapidly than man-power could ever move it.

Because of cranes such as this and the thousands of others of various types in mill, shipyard, foundry and shop, coal and ore can be moved in greater volume, the manufacture of iron and steel accelerated, the factory speeded to greater production.

There is hardly an industry of importance that is not made more efficient and more productive because of the electric crane.

But it took even more than might to meet the problems of lifting and carrying. Because of their experience, their foresight and skill and their success in mastering these problems and others, the work of Westinghouse engineers has been of the greatest importance to the development of many industries where heavy materials have to be moved with speed, certainty and a minimum of labor.

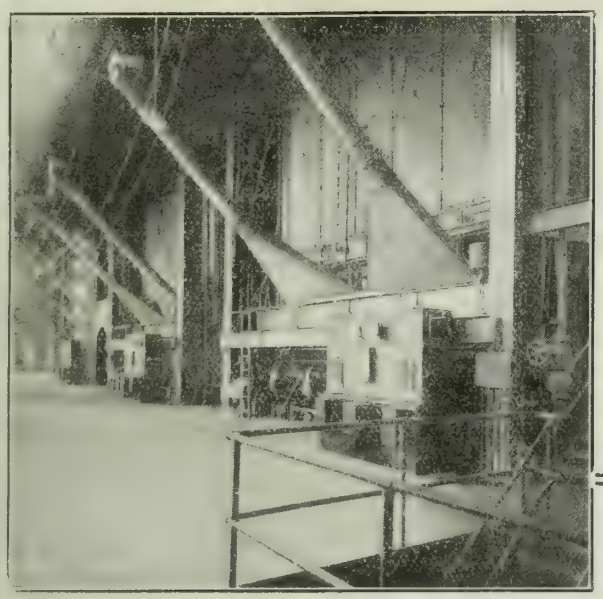
21



Canadian Westinghouse Co., Limited, Hamilton, Ont.

TORONTO, Bank of Hamilton Bldg.
HALIFAX, 105 Hollis St.
CALGARY, Canada Life Bldg.
MONTREAL, 285 Beaver Hall Hill
Ft. WILLIAM, Cuthertson Block
VANCOUVER, Bank of Nova Scotia Bldg.
OTTAWA, Ahearn & Soper, Ltd.
WINNIPEG, 158 Portage Ave., E.
EDMONTON, 211 McLeod Bldg.

Remember The Journal when buying apparatus.



Boiler Room of the Seward Station of the Penn Public Service Corporation Equipped with Taylor Stokers. Dwight P. Robinson, Inc., designers of this station.

Why Central Pennsylvania is assured of reliable light and power service

The Penn Public Service Corporation supplies light and power to an extensive district in Central Pennsylvania.

When the demand reached the point where a new station became necessary, Dwight P. Robinson, Inc., nationally known engineers, were called in to design it.

The 100,000 K.W. station at Seward resulted.

Naturally, in a Public Service plant **RELIABILITY** is the important consideration; and when you come right down to it reliability in a power plant starts in the fuel burning equipment. No plant can be any more reliable than the stokers that are under the boilers.

The Penn Public Service Corporation realized this fact and so did Dwight P. Robinson, Inc., the designing engineers.

They knew, two, that the Taylor Stoker had given years of reliable service in the Phillipsburg Station of the Corporation. That's why the boilers in the new Seward Station are equipped with

Putting the Reliability Into the Taylor Stoker.

The greatest care and the finest workmanship goes into the making by the American Engineering Company of the Taylor Stoker. It is built on a precision basis.

The design of every part is the result of a thorough understanding of every requirement and function of that part.

For instance, the depth of retort of the Taylor Stoker causes correct porosity in the fuel bed which produces maximum scrubbing action. This has a bunsen burner effect that causes air and volatile to unite in the intimate mixture necessary to complete combustion. The resultant flame is short and intensely hot.

The absolute reliability of the Taylor Stoker is the natural result of the many years of experience back of its design and the most modern machines and methods that are used in its manufacture.

The Taylor Stoker

"The Pioneer Underfeed Stoker—and still leading"

And that is why Central Pennsylvania is assured of reliable light and power service.

If 100 per cent reliability is a consideration in your steam plant get the Taylor Stoker story. You will find it profitable. Do it now.

THE TAYLOR STOKER COMPANY, LTD.

TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

The advertiser is ready to give full information.

Concrete Road Building Again Breaks All Records

80,700,000 square yards of Concrete pavement were placed under contract last year in the United States and Canada—a gain of more than 40 per cent over 1921, the largest previous year.

The construction thus provided for, and to a large extent completed, is equivalent to almost 8,000 miles of 18-foot pavement.

That is a larger amount of Concrete highway than there was in the United States and Canada altogether up to 1917.

These facts witness the determination of the people to have roads equal to the traffic they bear.

Yet even with this great record, the output of motor vehicles continues to outstrip by far the construction of motor roads.

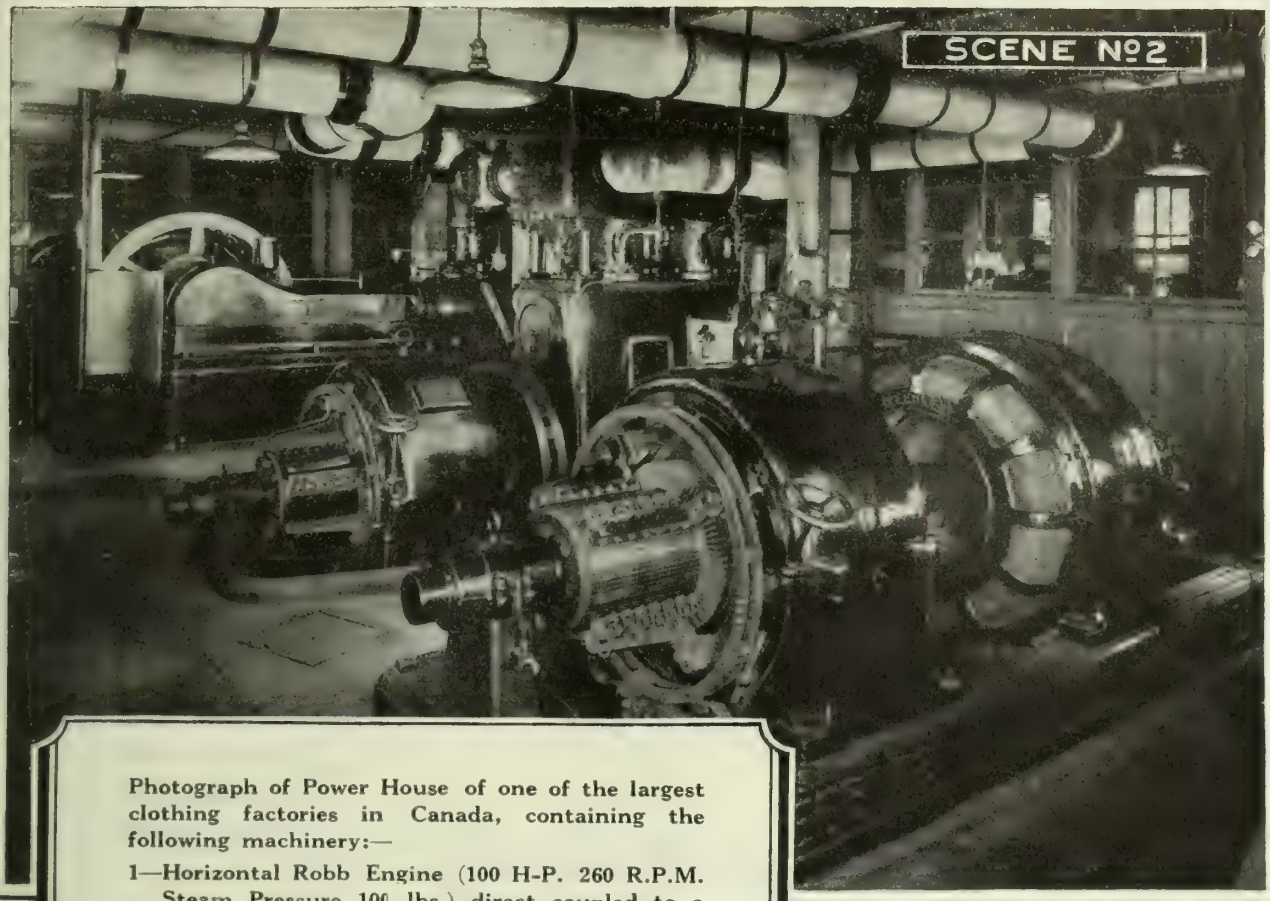
The revolution in road traffic due to the automobile has called for hole-proof, skid-proof, really enduring pavement; and Concrete fills the need.

That is the explanation of the steady, rapid gain in Concrete road construction during the last decade—the largest development in basic transportation facilities in this country in many years.

PORTLAND CEMENT ASSOCIATION
111 West Washington Street
CHICAGO, ILL.

A National Organization
to Improve and Extend the Uses of Concrete

Atlanta	Des Moines	Los Angeles	Parkersburg	San Francisco
Boston	Detroit	Milwaukee	Philadelphia	Seattle
Chicago	Helena	Minneapolis	Pittsburgh	St. Louis
Dallas	Indianapolis	New Orleans	Portland, Oreg.	Vancouver, B. C.
Denver	Kansas City	New York	Salt Lake City	Washington, D. C.



Photograph of Power House of one of the largest clothing factories in Canada, containing the following machinery:—

1—Horizontal Robb Engine (100 H-P. 260 R.P.M. Steam Pressure 100 lbs.) direct coupled to a D.C. Generator.

1—Robb-Armstrong Vertical Crank Case Engine (200 H.P. 425 R.P.M. Steam Pressure 100 lbs.) direct coupled to a D.C. Generator.

1—Bruce Peebles Motor Generator Set (100 K.W., 700 R.P.M.)

Imperial Lubricants in use:—

Imperial Cylinder Oil.
Imperial Solar Red Oil.
Imperial No. 1 Crank Case Oil.
Imperial Renown Oil.

You *know* your machinery—the Imperial Oil man *knows* our lubricants. When the two of you get together you will easily be able to work out a satisfactory solution of the most difficult lubrication problem. Service supplements our years of experience in producing first-class lubricants for every industrial purpose. A letter to our nearest branch will secure for you detailed information regarding any phase of plant lubrication or the services of an Imperial lubrication engineer if you desire.

IMPERIAL OIL LIMITED

IMPERIAL LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS

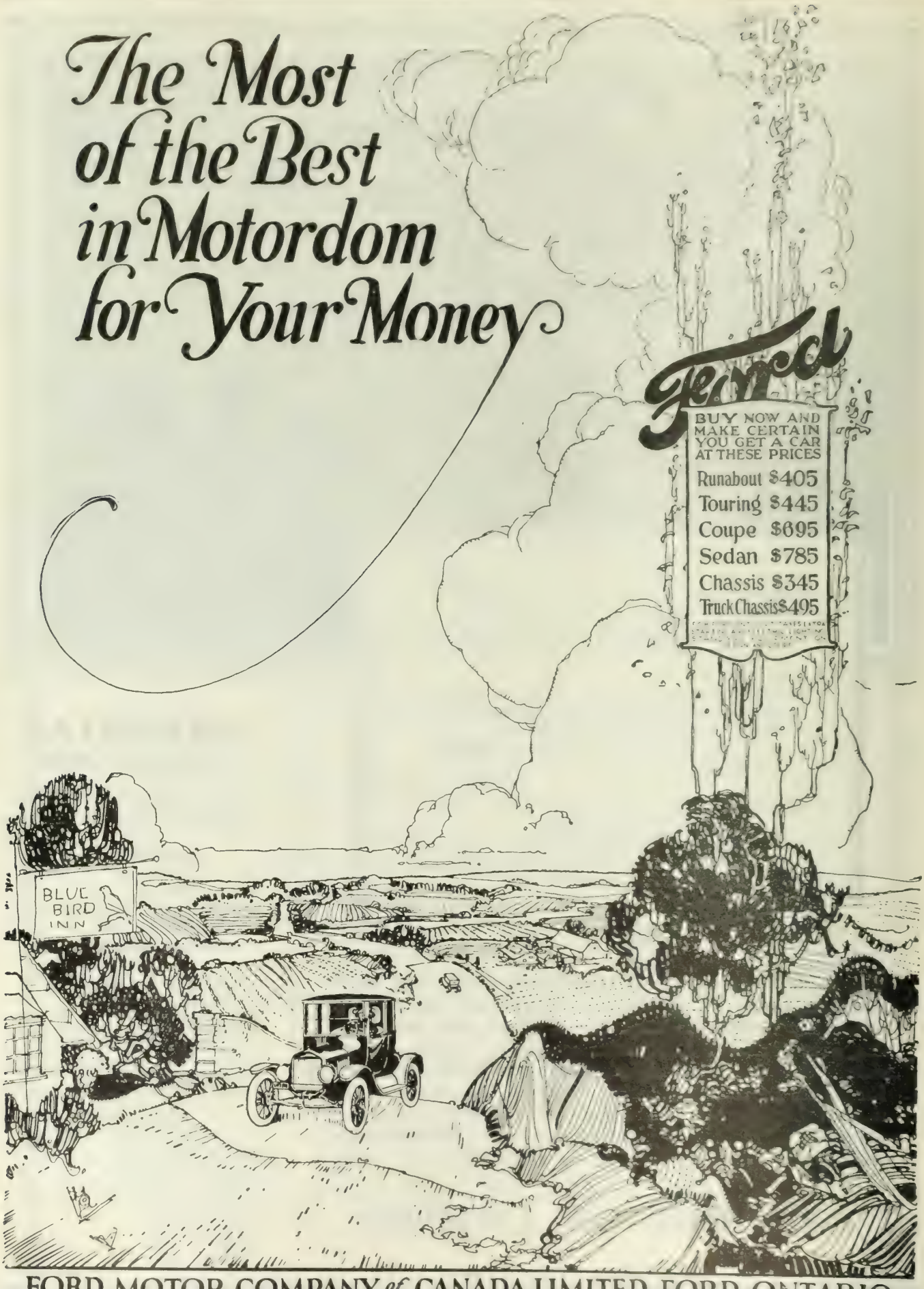
Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
Imperial Beaver Cylinder Oil

ENGINE AND MACHINE OILS

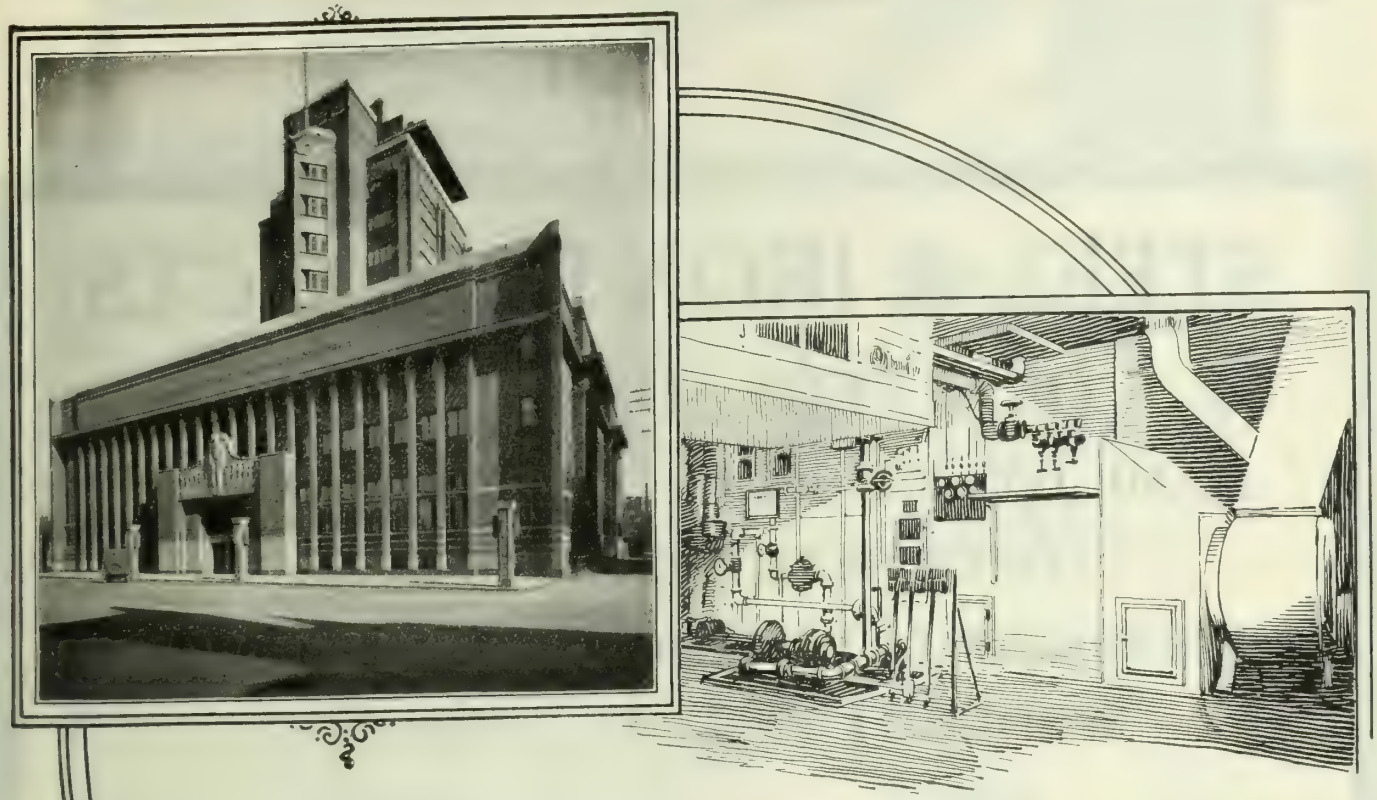
Imperial Solar Red Oil
Imperial Atlantic Red Oil
Imperial Renown Oil
Imperial Bayonne Engine Oil
Imperial Polar Machine Oil
Imperial Ario Compressor Oil
Imperial Turbine Oils
Imperial Eldorado Castor Machine Oil

FOR VARIOUS INDUSTRIAL USES

Imperial Black Oils
Imperial Cutting Oils
Imperial Tempering Oils
Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.



Firms advertising in The Journal are considered as absolutely reputable.



Use Air Washing Equipment That Will Safeguard Your Reputation

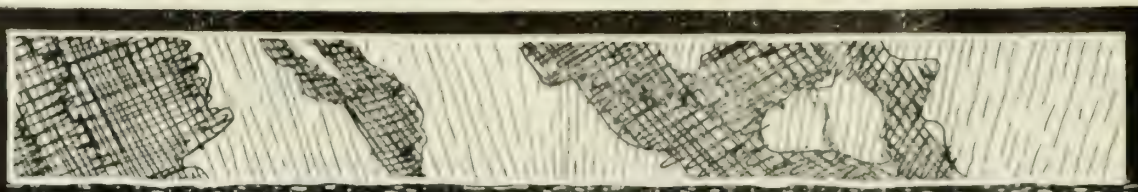
Have you ever considered the part that efficient ventilating and air washing apparatus plays in the maintenance of your reputation as an architect, engineer or contractor?

Such equipment insures clean, showy interiors, free from dust and dirt, that impress observers with the thoroughness and foresight of the designer and builder.

Canadian Sirocco Fans and Air Washing equipment are more than a recognized standard. Certain exclusive features of construction have caused leading architects and engineers to regard it as highly superior. These features are fully covered in descriptive bulletins that will be gladly sent upon request.

CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

"Sirocco" Products
TRADE MARK
BLOWERS · EXHAUSTERS · VENTILATING FANS · AIR WASHERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT



STEEL & IRON PRODUCTS

OF EVERY DESCRIPTION

HAMILTON PIG IRON STEEL & IRON BARS

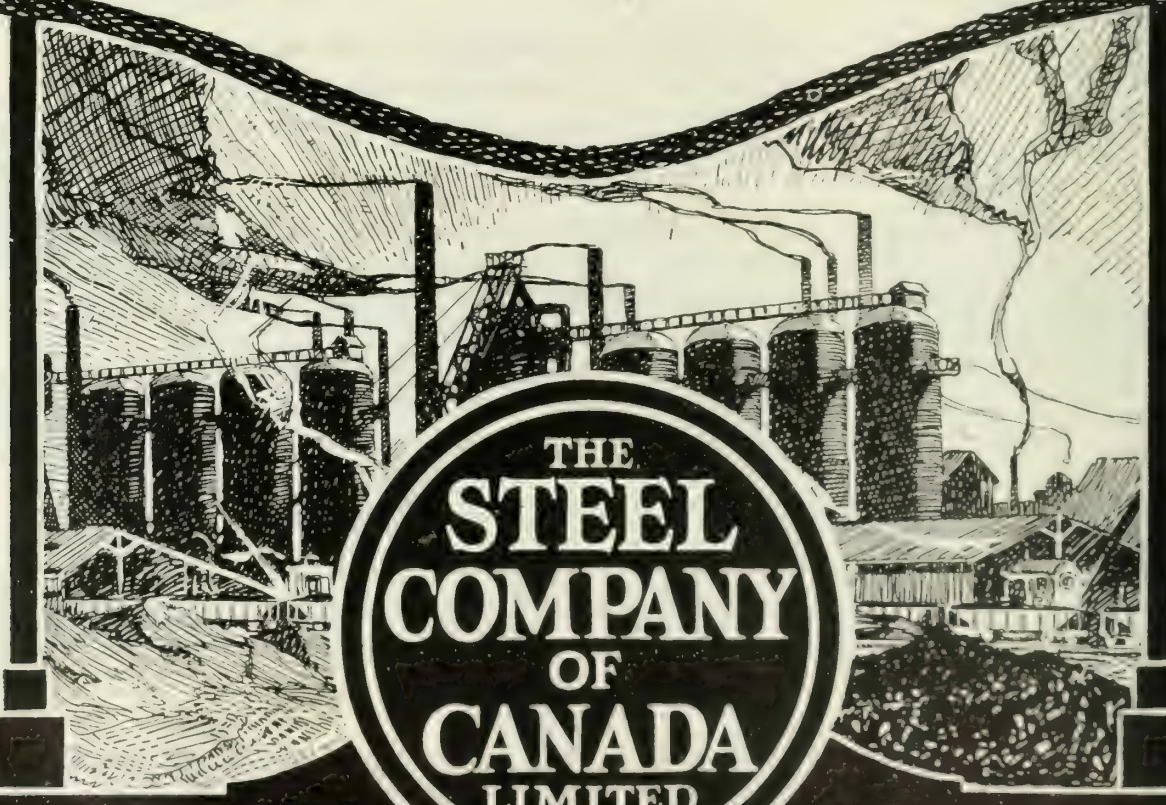
OPEN HEARTH STEEL SHEETS

RAILROAD TRACK MATERIAL POLE LINE HARDWARE

WROUGHT PIPE FORGINGS

NAILS WIRE

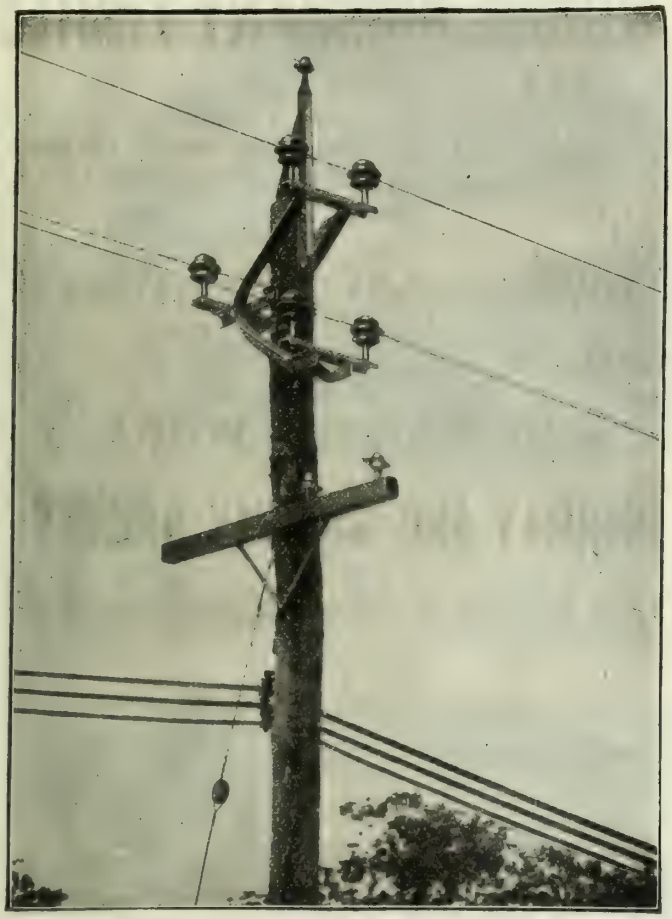
TACKS SCREWS



THE STEEL COMPANY OF CANADA LIMITED

HAMILTON MONTREAL

Consider the advertiser, his course is that of wisdom.



The Peirce

BO-ARROW ARMS

From first to last— The Peirce

SPECIFY the Peirce Bo-Arrow Arms for your next transmission job—

They give you dependability and permanence at a surprisingly low cost.

—Ask your jobber

N. Slater Company, Limited

Hamilton, Ontario.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.

We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

Consult the advertiser, his information is valuable.

Dominion OXYGEN
FOR WELDING AND CUTTING.
Prest-O-Lite
DISSOLVED ACETYLENE

As You Would Like It

WE have endeavoured to make our service ideal from the customers' viewpoint.

In every detail of the transaction, from the minute your order is received by us until payment is made for oxygen and acetylene supplied, your requirements are of first importance.

We supply oxygen and dissolved acetylene of the highest quality, in modern cylinders, light in weight yet rugged in construction, fitted with leak-proof valves; at the lowest prices obtainable.

This service is available for you immediately. Why not take advantage of it?

DOMINION OXYGEN COMPANY, LIMITED

Operating the Welding and Cutting Gas Division of Prest-O-Lite Company of Canada, Limited

General Offices; 80 Adelaide St., East, Toronto

Distribution Points: Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, Winnipeg

2

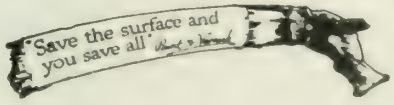
A Durable Elastic Paint for Structural Steel and Metal Surface

A practical metal protective paint that dries well with a firm elastic film.

A metal paint that resists abrasion, providing maximum surface protection at a reasonable price.

Metalastic No. 7 (Liquid) is made in four attractive shades---Gray, Olive, Green, Dark Green and Red---and meets the demand for a variety of colors in painting iron and steel.

Illustrated literature and films of the various shades will be sent to Architects and Structural Engineers upon request.



THE SHERWIN-WILLIAMS CO.

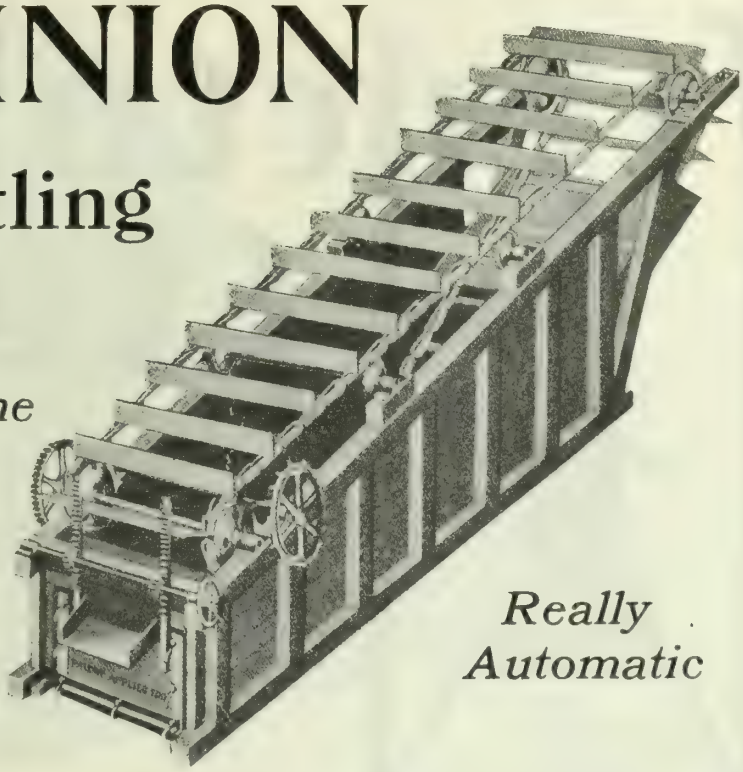
OF CANADA, LIMITED

Head Office - - - - MONTREAL

DOMINION

Sand Settling Tank

Stands Supreme



Really Automatic

THE excellent mechanical conveyor type of Settling Tank requires very little power, works definitely and mechanically without attention, and drains the sand as free from water as desired. It produces cleaner sand, because the conveyor constantly agitates the dirty water in the tank. This keep the dirt in suspension until it is carried over the spillway.

It is really automatic. It doesn't overflow, and there is no trouble with water leakage at the bin, and no necessity for excessive patching of cars to stop leakage when loading. The sand is loaded free from dirt.

Installing a second tank for finer sizes provides for almost any grade when various sizes of sand are required. Our adjustable spillway gate goes on the primary tank. It can be adjusted, while the plant is in motion, to give any degree of fine or coarse sand at the second tank.

For complete information and quotations, write—

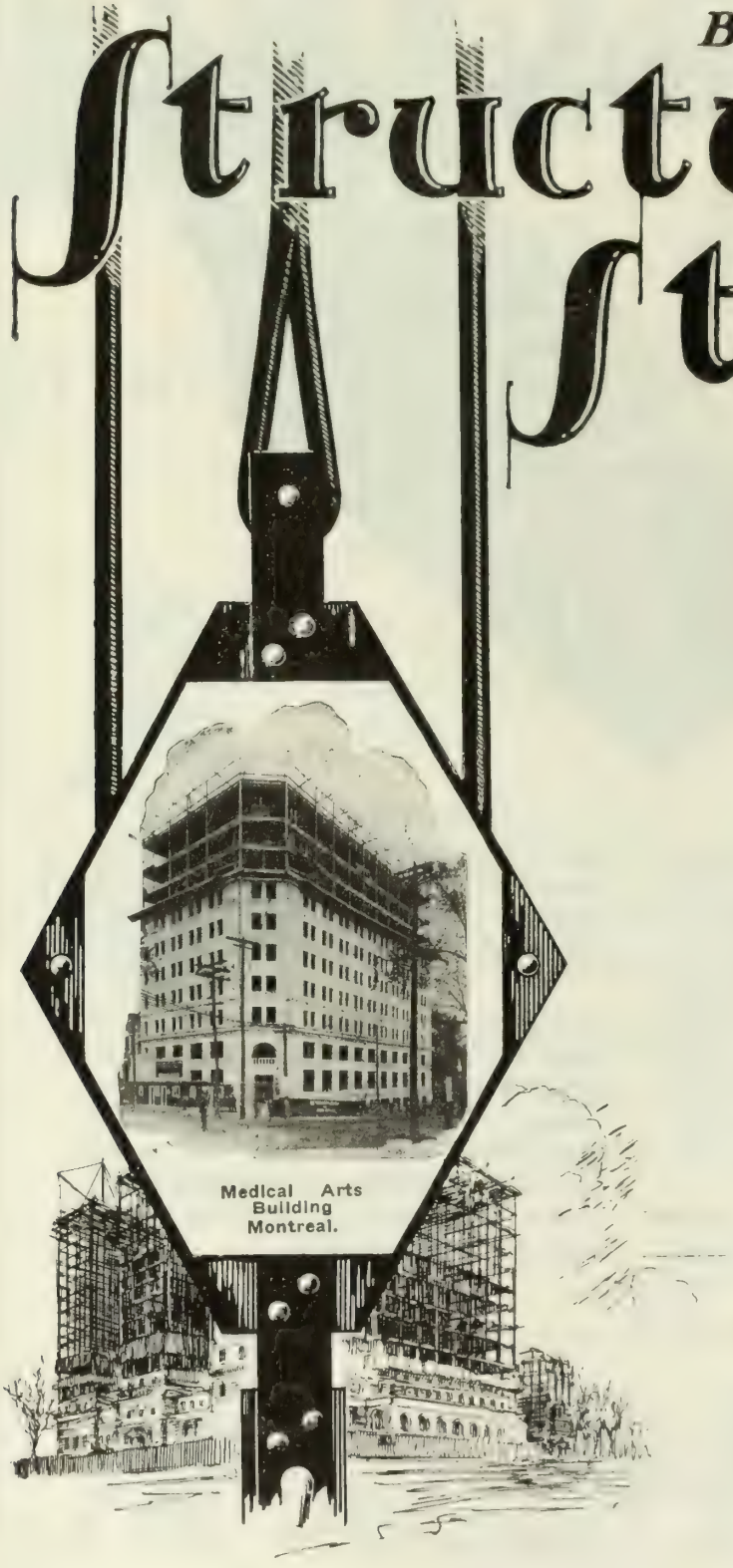
The Dominion Road Machinery Company

LIMITED

Goderich, Ontario

BUILD WITH

Structural Steel



Steel Work Erected in ONE MONTH

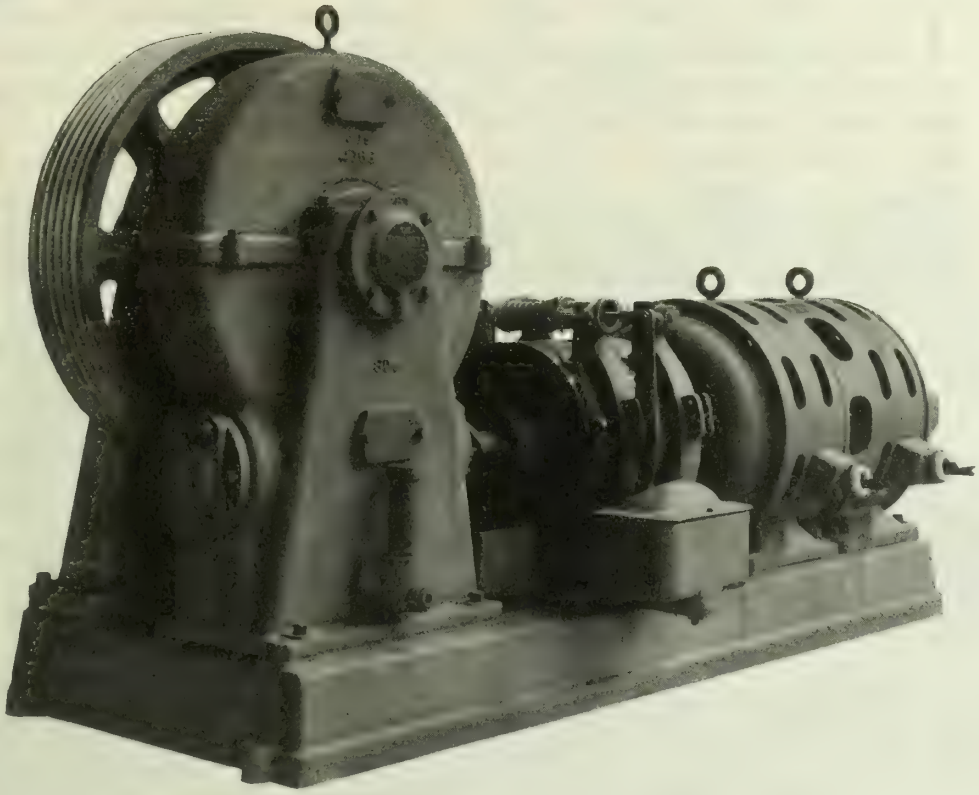
Record for Ten-Storey Building

THE Medical Arts Building is one of the most recent buildings constructed in Montreal. Its framework is *structural steel*, which was erected in the remarkably short time of one month, constituting a record for ten-storey buildings.

The building, which is 80x150 feet, is located at the corner of Guy and Sherbrooke Streets. It will be used as an office building for the medical profession.

Issued by the
Structural Steel Association

The
TURNBULL ELEVATOR COMPANY
LIMITED
HEAD OFFICE & WORKS
John st TORONTO
MONTREAL BRANCH:
202 Mappin Building



TURNBULL A. C. ELEVATORS

Until very recently alternating current elevators could not be safely operated at a speed over 250 feet per minute.

This was due to the difficulty of stopping the elevator at higher speeds under all conditions of load.

With Turnbull Two speed A. C. Motors and Controls the operator can reduce the car speed to one third of running speed and thus make accurate and smooth stops even with speeds of 350 or 400 feet per minute.

Above is shown our A. C. single wrap Traction Elevator Gearing with Two speed Motor and magnet Brakes.

The
TURNBULL ELEVATOR COMPANY
LIMITED

HEAD OFFICE & WORKS:
John st, TORONTO.

MONTREAL BRANCH:
202 Mappin Building.

A new Canadian factory to supply your electrical needs

THIS modern Canadian factory is equipped with every modern facility for the manufacture of the latest improved designs of High Tension Porcelain Insulators. Manned by skilled, experienced labor and using the most advanced processes, this plant is now producing insulators in quantity.

If is also planned, so far as possible, to manufacture in this plant other O-B products such as Trolley Material and Rail Bonds for Electric Railways and Mines, Electric Railway Car Equipment and Steam Road Electrification Materials.

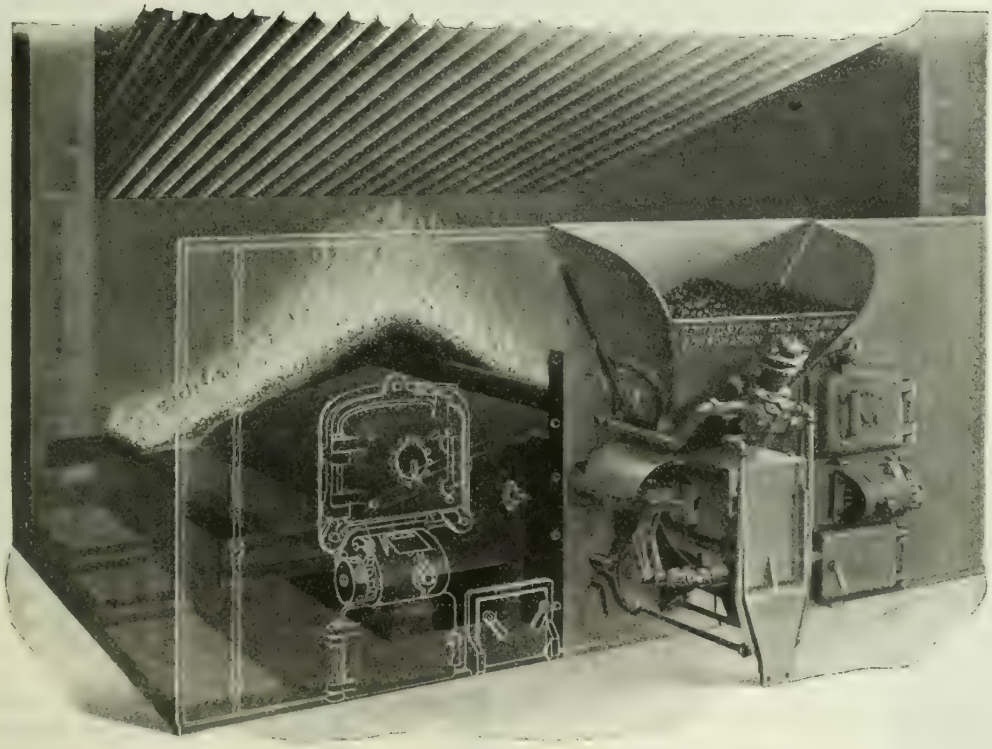
Dominion Insulator & Mfg. Co. Limited

[Manufacturing Ohio Brass Company Products in Canada]

Niagara Falls, Ont.

Type E Stokers

ARE ESTABLISHING RECORDS FOR SUCCESSFUL OPERATION



Burn Low Grade Coals
Easy to install
Economical in Operation
Capable of High Capacity
Simple to Operate

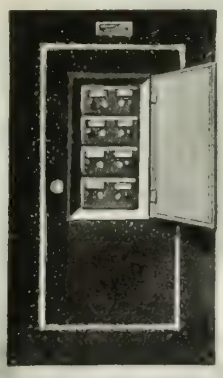
Let us give you detailed information

COMBUSTION ENGINEERING CORPORATION
LIMITED

A. J. T. Taylor, President **John T. Farmer, Chief Engineer**

MAIN OFFICE: TORONTO

VANCOUVER **MONTREAL** **WINNIPEG**



BENJAMIN ELECTRICAL PRODUCTS

REFLECTOR OR LIGHTING FIXTURES ARE DESIGNED FOR EVERY INDUSTRIAL LIGHTING REQUIREMENT.

—ELLIPTICAL ANGLE
—BOWL
—FLAT CONE
—R.L.M DOME STANDARD
—FLUTED BOWL, ETC.

INDUSTRIAL REFLECTORS

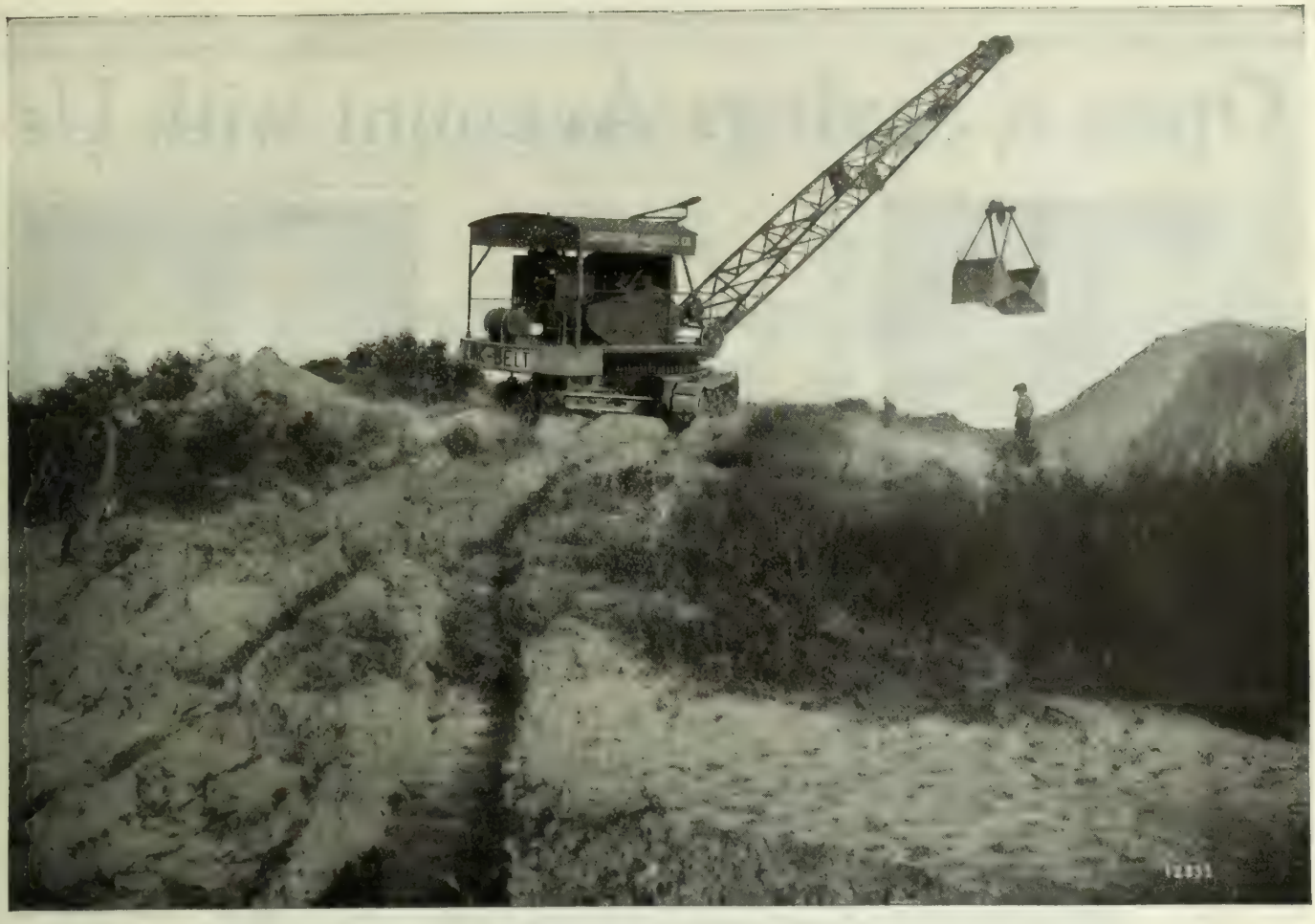
BENJAMIN Industrial Lighting is successfully serving the foremost industrial institutions—men work better, faster and more profitably when they work in the safety insuring rays of Benjamin Industrial Lighting.

Consult your own engineer, contractor or architect. The experience and guidance of our own illuminating engineers are at their disposal—their counsel implies no obligation. There is a Benjamin Reflector or lighting fixture for every industrial lighting requirement.

We have prepared instructive and interesting literature on the subject of perfect illumination which we will gladly forward on request.

Benjamin Electric Mfg Co., Limited

MONTREAL TORONTO WINNIPEG



DO IT *BETTER* WITH LINK-BELT LABOR-AIDING MACHINERY

LINK-BELT PRODUCTS INCLUDE:

Elevating and Conveying Machinery,
Locomotive Cranes,
Crawler Cranes,
Portable Loaders,
Belt Conveyors,
Car Unloaders,
Screens,
Sand and Gravel Washing Plants,
Transmission Machinery,
Chains,
Wheels,
Buckets,
World's largest makers of Conveying and Power Transmission Chains.

CATALOGS on REQUEST

MAKE your labor more productive—increase the efficiency of your men by using Link-Belt material handling machinery.

The Link-Belt Crawler Crane, illustrated, "the machine that gives locomotive crane service where there are no tracks" has no superior for road work, excavating and material handling. It is an all-purpose crane, operated by one man. Lays its own bed in soft ground and readily climbs over rough places like a war-time tank. Write for specifications, catalog, etc. Also send for book No. 370, showing the standard line of Link-Belt Locomotive Cranes, and books on any other Link-Belt products in which you are interested.

CANADIAN LINK-BELT COMPANY, LIMITED

TORONTO—Wellington and Peter Streets MONTREAL—10 Gauvin Lane

LINK-BELT

Journal advertisers are discriminating advertisers.

Open a Savings Account with Us

COMPARATIVE STATEMENT

Showing labor and material laying

Interlocking Tile and Brick

INTERLOCKING TILE—
Bricklayers.....2
Laborers.....2
Total time laying.....2 Hours 45 Minutes.
Total barrows mortar.....6

BRICK (Toronto Stock)—
Bricklayers.....2
Laborers.....2
Total time laying.....4 Hours 30 Minutes
Total barrows of mortar.....12

Size of both panels shown; length 15′; height 9′ 4″; 1′ each end at corners; 1 door 3′ wide open all way up; 1 window 3′ wide 7′ high.

Estimated Saving Using Interlocking Tile

Number square feet wall	104
Laying Brick—Labor per square foot wall	13c
Laying Tile—Labor per square foot wall	.079c
Mortar Brick—Cost per square foot wall	.011c
Mortar Tile—Cost per square foot wall	.005c
Saving Labor Interlocking Tile over brick	.054 Sq. Ft. or 41%
Saving Motar Interlocking Tile over brick	.005 Sq. Ft. or 50%
Bricklayers estimated @	1.00 per hour.
Helpers " @	.50 " "
Cost Mortar " @	15.00 Cu. Yd.

Even half this saving would be plenty.

We the undersigned hereby certify that the above is a true and correct statement.

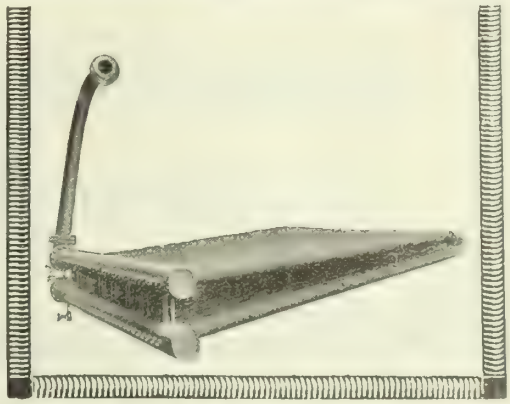
D. D. Wilson — Witness, 208 Bloor St. W., Toronto.
William McConkey — Bricklayer, 203 Euclid Ave, Toronto
E. Wood — Witness, 94 Oakcrest Ave., Toronto.
Bert Fisher — Bricklayer, 1 Talbot St., Brantford, Ont.

INTERLOCKING TILE COMPANY, LIMITED

Excelsior Life Building : : 32 Toronto Street : : TORONTO, ONTARIO

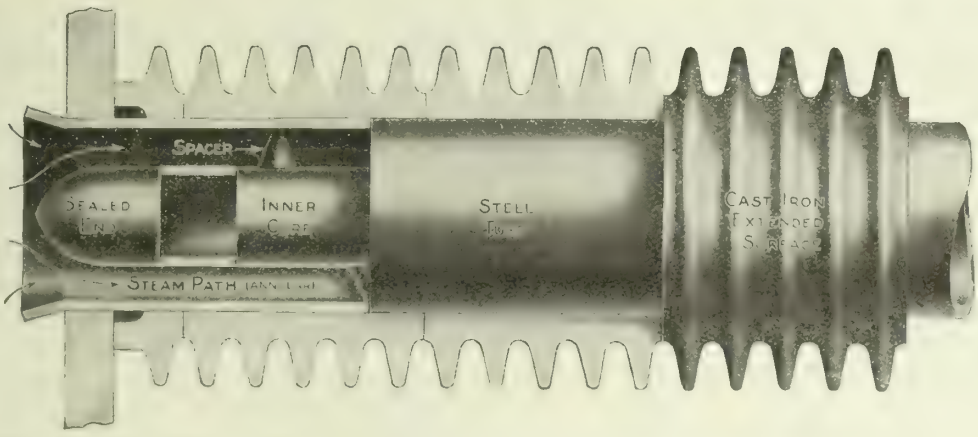
Twenty years without an equal and now in use in over 4,000,000 HP of Stationary Boilers

Typical Foster Superheater for use in vertically baffled Horizontal Water tube Boilers.



FOSTER SUPERHEATERS

Typical Foster Extended Superheating Surface. (Patented.)



A short uncovered portion at each end of the tube permits the ends to be inserted and expanded into the connecting headers

Note the Inner Core Tube with Spacer Pieces

This holds the Inner Tube Central and provides an Annular Space through which the steam Flows. By this means the heat reaches every part of the flowing steam by travelling a shorter distance than if it had to reach the centre of the Tube. This cut also shows the Cast Iron Spools or Extended Surface which protects the Outer Surface of the Steel Tube from the corroding effect of the Gasses of Combustion and from burning tubes during starting or stand by periods.

These Superheaters do not require Flooding at any Time.

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The Design and Economics of City Refuse Destructors

Principal Features of Design and Possible Economics of Modern Refuse Disposal Plants.

F. A. Combe, M.E.I.C.

Paper read before the Montreal Branch, The Engineering Institute of Canada, December 7, 1922.

The subject of garbage and refuse disposal is a very live one in many cities to-day. During the war and the succeeding years of high construction costs there was only a comparatively small amount of new work done, and many plans contemplated were left over or only partly carried out. Now that building conditions have improved and the need for development has become more acute with increasing population and inadequacy of existing systems, municipalities are investigating the different methods in use to find out what would be the best to adopt for their particular requirements.

The primary object is one of sanitation,— the quick disposal without nuisance of all refuse as collected. At the same time consideration must be given to the location of the disposal site in relation to the cost of collection and haul, and also, in the case of the larger cities, to possible revenue to be derived from the disposal.

General Classes of Refuse and Waste

Refuse or wastes collected by municipal service are commonly classified under three headings: — *Garbage*, — comprising organic or putrescible matter from kitchens, hotels, restaurants, markets and stores. *Rubbish*, — comprising general non-putrescible matter, partly combustible and partly incombustible; such as paper, wood, glass, crockery, metals, rags, leather, and other household wastes in addition to certain trade wastes. *Ashes*, — from household furnaces and from heating boilers in buildings and stores; power plants usually disposing of their ashes separately. In addition there are street sweepings which may be, but usually are not, disposed of through the same channels.

The quantity and composition of the different classes of refuse will, of course, vary to a considerable extent in different localities and at different seasons, but the following table gives an approximate average production per day per thousand of population, for the extreme summer and winter conditions, which might be expected in a large Canadian city.

	August	February
Garbage	1,000 pounds	400 pounds
Rubbish	600 pounds	400 pounds
Ash	200 pounds	4,000 pounds

Self-supporting Methods of Disposal

Of the various methods of disposal which give opportunity for a revenue to offset the cost of disposal, the two usually considered for a large city are: — (a) Treating the garbage alone by a reduction process, whereby the fats and grease are extracted and the residue — termed tankage — utilized as a base for fertilizers. (b) Destruction by burning in furnaces, and utilization of the heat generated by the combustion to produce steam in boilers.

The reduction process is in use almost solely in the United States where it is economically possible by reason of the greater wastes of food material there than in European countries. It is not within the scope of this paper to deal with this process, but it may be mentioned that approximately 40 pounds to 60 pounds of grease and 160 pounds to 200 pounds of tankage are recovered per ton of garbage; the grease being sold to packers or soap manufacturers, and the tankage, which contains about 2½ per cent nitrogen as ammonia, 4 per cent bone, and 1 per cent potash, to fertilizer mixing companies.

The market for these materials is very uncertain; high prices were obtained during the years 1918, 1919, and 1920, when grease reached 11 cents per pound, but to-day the price has dropped to around 2 to 4 cents per pound.

As regards the second method of disposal, the furnaces in which garbage and refuse are burned can be classed as of two general types: — (a) Those in which the temperature is generally below 1,200 deg., and which are technically known as incinerators or crematories; and (b), those in which a temperature of over 1,200 deg. is maintained, technically termed destructors.

The low temperature incinerators were developed chiefly in America and for that reason are often referred to as the American type. They were designed presumably to destroy the refuse in the cheapest way and do not employ any forced draft or special means for maintaining a high temperature.

There have been hundreds of different types of incinerators built, from the crude stew pots, giving off odorous fumes freely, such as are still used in many of the small towns in the United States and Canada, to the more elaborate designs in which the volatile gases, distilled off from the slowly drying and burning mass in the furnace, are passed over coal fires with the idea of oxidizing them; or again in others where the garbage is spread, dried and burned on the perforated top of a flue from a separate fuel grate. While such furnaces may serve the purpose for a small community where the short collections hauls allow them to be set sufficiently far distant to avoid nuisance, they cannot be considered for larger cities.

The English Destructor

In England and the older countries, where the population is more congested, the attention of engineers has for a long time been directed to the design of furnaces in which combined household wastes could be destroyed in a sanitary way without creating a nuisance to the immediate neighbourhood, and further, to utilize the heat generated by the burning refuse to produce steam for power purposes. In this way furnaces were developed through various forms until, about twenty years ago, the design of a continuous series of grates in one furnace communicating with a common combustion chamber was adopted, as shown roughly in figure No. 1, and this has become universally known as the English destructor.

In this design the refuse is fed alternately on to the different grates, which may have drying and burning sections, (the garbage being raked over from one to the other as needed), or burning sections alone, depending upon the class of refuse to be destroyed. There are always then two or more actively burning beds from which the hot products of combustion will mix with the distilled gases from the freshly fired charges, and render oxidization complete in the combustion chamber before passing to the chimney or boiler. Improvements in details have been made from time to time, with special features by different makers, but the general principle of combustion has been retained, and that it has proved successful for the purpose intended is evidenced by the fact that it is a common sight to see destructor plants in the middle of residential districts next to city halls, schools, or other public buildings.

Figure No. 1.
English Continuous Grate Destructor.

Apart from a few special designs in Germany, this form of destructor has been used generally throughout France and other European countries, and in nearly all cases electric power is developed from the operation. It was thought for some time in the United States that such a design of furnace would not be suitable for the special conditions existing in that country, and many different designs have been tried out, yet it is worthy of note that the large majority of modern installations, both in the United States and Canada, have been based on this same English design.

Properties of Refuse Ingredients

The peculiar nature of the material to be disposed of calls for a furnace design and treatment different to those employed for burning other wet refuse such as bark, bagasse, etc. Disregard or ignorance of these special requirements has been the cause of many of the incinerator failures and has led to the impression held by many that it is doubtful whether city refuse can be burned without producing offensive odors.

Garbage

Garbage is the most troublesome component to burn, due not only to the high moisture content, but also to the fact that this moisture is largely contained within the cellular structure of the material and is not as easily dealt with as in the case of superficial moisture. Sixty-six per cent moisture content means that for every pound of dry garbage burned, two pounds of water must be evaporated and raised to the temperature of the furnace gases. This makes it impossible to maintain a sufficiently high furnace temperature when garbage is burned alone on an ordinary grate, (if it will burn), to ignite the combustible matter, with the result that the process becomes one of destructive distillation with the emission of the objectionably smelling volatiles. The theoretical ignition temperature of these volatile gases is about 1,200 deg., and, in actual practice, a higher temperature than this, preferably 1,400 deg. to 2,000 deg., should be maintained to ensure complete combustion.

Complicated reactions take place when garbage is in the process of decay or putrefaction, and a quantity of different gases are given off at comparatively low temperatures. Where garbage is mixed with a sufficient proportion of combustible rubbish or coal ash to furnish the heat required to evaporate the moisture from the garbage and maintain a high temperature, the particular characteristics of these reactions and volatiles may not be of practical importance, but it has been recognized

that they can be made use of in southern and semi-tropical countries where large amounts of fruit wastes and similar matter are destroyed without the same admixture of combustible waste. In South America a method has been developed of utilizing the combustible volatiles given off from refuse while in a heated storage chamber to provide the additional heat necessary to cause combustion of refuse on the furnace grate, so that no auxiliary fuel is needed. This is an extremely interesting process.

Rubbish

Rubbish will vary widely in composition at different seasons and places. In the winter there will be a larger proportion of incombustible matter, both because of the greater amount of canned goods consumed, and also because the wood and easily burned material will be burned in the house heating furnaces. There is no difficulty in burning the usual rubbish agregate collected, and, in this country, the amount is generally sufficient to supply the extra heat required for burning the garbage when rubbish and garbage are mixed together.

The higher proportion of combustible rubbish in the summer compensates in some degree for the greater amount of green garbage at such times, but August and September are still the most troublesome months for incinerators and destructors of the usual type.

Approximately 30 per cent of the rubbish as collected has a marketable value and in some places, notably Buffalo, complete sorting has been carried out for many years and a considerable revenue derived therefrom. When rubbish is to be burned, the sorting out of many of the incombustible materials is of considerable benefit also, because of the trouble caused by them in clinkering the fuel bed.

Ashes

Household ashes in this section of the country where American anthracite is used as fuel for heating, differ considerably both in quantity and general characteristics from the ashes from bituminous or semi-bituminous coals as used in England and Europe. The ashes here are made up of unburned particles of coal which have sifted through the grate, often in the original state, mixed with bone, slate, stone and a large proportion of very fine ash, whereas those from European household fuels comprise coke, clinker, and a smaller proportion of dust.

The fine particles of the anthracite ashes form a dense blanket on the destructor furnace grate obstructing the passage of air for combustion. For this reason, and because the actual weight of such ashes is not greatly reduced after passing through the furnace, many municipalities consider the fuel value is more than offset by the cost of double handling and the trouble caused, and prefer to cart the ashes direct for fill.

The percentage of residue from American anthracite coal used for household purposes is often 25 per cent and over, especially at the present time, while that from English coals would be 10 per cent or less. Those who have been burning Welsh anthracite recently will appreciate this difference. Taking 25 per cent combustible in each ash residue, which is a conservative figure, means that 25 per cent of 25 per cent, or 6¼ per cent, of the combustible in American anthracite is wasted against 25 per cent of 10 per cent, or 2½ per cent, of the combustible in English coals. The increased waste, then, is considerable. Screening the ashes to recover the larger and more combustible material has been done to a limited extent, but for a large city a more complete process of separation of the greater part of the combustible matter from the ash is feasible and should be considered.

The requirements for the combustion of the coal ash residue are entirely different from those for burning garbage and rubbish, and in our climate, where the ash production is high during the heating season, it would, in the writer's opinion, be the proper course to collect and burn the ashes in separate furnaces designed for the purpose where the heat could be utilized profitably.

Destructor Design

It has been proved that the English form of destructor will successfully consume the mixture of garbage and rubbish usually collected in Canada, without auxiliary fuel and with an entire absence of nuisance in the neighbourhood, as evidenced by the plants in operation in Westmount, Toronto, and other towns. At the same time there seems to be room for decided improvement both in methods of feeding and burning the material in order to reduce the amount of hand labour now required, and also the general dusty conditions of operation.

During the past ten years there has been a great advance both in the design of furnaces for burning primary fuels and factory wastes, and also in automatic stokers and labour-saving methods of boiler plant operation, but there does not appear to have been such notable advance in this respect in the design of incinerator and destructor plants. The general method employed is to feed periodically heavy charges of refuse on to each grate section, spreading and raking it over by hand labour to assist the combustion. The residue from successive charges builds up on the stationary grates under the burning mass, often as a hard vitreous clinker, gradually blocking the air for combustion, and the consequent frequent cleaning of the fires and removal of the clinker and ash, is an arduous hand task. In fact, generally speaking, the fires are cleaned in the same manner as a coal fired stationary grate, but with infinitely worse clinker conditions.

When ashes are mixed with the garbage and the resulting clinker is hard, one English destructor employs a special trough grate which, besides allowing the air for combustion to be introduced at the sides as well as the bottom of each fuel bed section, also moulds the clinker into a form in which it can be drawn out by mechanical means without breaking. Another incinerator has been built with a disc grate, of which the four quadrants are used in rotation for charging, burning, clinker cooling and clinker removal.

As regards feeding in the refuse, the method commonly used to-day for the larger furnaces is to rake the material by hand from a storage or receiving bin into charging chutes, which are set directly over the closing door of the furnace mouth. The door is mechanically operated from the firing floor, being opened to allow a fresh charge to be dropped on the grate when the fire is in a condition to receive it. The amount of each

Figure No. 2.
City of Rotterdam Destructor Plant.

charge is usually about one cubic yard, this being generally considered to be the most economical quantity from a labour standpoint. This means that a dense wet soggy mass weighing about one-half ton is dropped periodically into the furnace. The doors are then opened and the material spread by hand rakes, allowing an inrush of cold air to still further cool the furnace. In the light of modern developments, this method appears crude to say the least, and it is not to be wondered at that the brickwork needs frequent renewal. It is the writer's opinion that an entirely different method of feeding the green refuse and removing the residue might be adopted, and that future developments will probably be towards improvements in this respect.

Some destructor plants, notably in Europe, deliver the refuse to the furnace in closed containers which are carried by a crane from the receiving point and either discharged automatically by mechanism which opens the bottom of the containers and the furnace door as soon as placed in position; or the containers are set over the feed doors to be mechanically discharged as required by the furnace tender. An example of this is illustrated in figure No. 2, which shows a cross-section of the Rotterdam plant of 400 tons per day capacity, and it will be seen that with such a system the exposure of the refuse with its attendant mess and smell is entirely absent. The illustration also shows the method of drawing out the clinker from the trough grates on to cradles which are carried away by a crane to the clinker house. Boilers are installed in connection with this plant and steam generated at 160 pounds pressure for a turbo-generator station. The St. Ouen destructor plant in Paris is of similar type.

Some cities go so far as to furnish the householders with refuse receptacles of a uniform size which are collected in special trucks and the contents discharged direct into the destructor furnaces without exposure at any time to the atmosphere. The cans are then cleaned by steam and returned. Such a service would be generally very costly and could seldom be adopted, but it shows what high standards of sanitation have been reached. On this continent no such elaborate methods have been used, and in only a few cases has any attempt been made to utilize or to derive revenue from destruction of the refuse.

Canadian Plants

Through the courtesy of Geo. B. Wilson, street commissioner, of Toronto, the following information regarding the 200-ton destructor installed in that city in 1917, is given. This is an English destructor of the Sterling type, having the same general principles of design as those previously described.

The location is close to a group of residences, and 1,800 feet from a large hospital, and it is stated that there have not been any complaints regarding nuisance, while the surrounding property has actually increased in value. Mixed garbage and combustible rubbish are burned, the general incombustible rubbish collected, as well as ashes, not being delivered to the plant. The labour cost per ton of garbage consumed is given as 87 cents, and the total charges $1.29 per ton. The labour employed, including yard men, plant tenders, and foremen amounts to 1.4 man-hours per ton. No attempt is made to utilize the waste heat.

Brief reference may be made to two types of incinerators which have been built in Canada, and which possess features of interest. One of these is at Winnipeg, designed by the former city engineer, and has a capacity of 50 tons in 12 hours. Figure No. 3, taken from the patent drawings, copies of which were kindly furnished by Mr. Brereton, the present city engineer, shows a plan and cross-section of one unit. This comprises four separate furnace cells set back to back in pairs, connected through a common flue to a combustion chamber.

Each furnace has a perforated arch on which the refuse is dumped and dried before being raked off to the main grates. Forced draft is used, the air being preheated by the combustion chamber gases and passing through a duct set over the main flue on its way to the ash pits. About 40 tons of garbage, mixed with a small amount of rubbish, but no ashes, is burned during the 12-hour daily run, the labour costs for one foreman, two firemen, two floor men and two labourers being approximately 82.2 cents per ton.

The De Carie incinerator of which one is installed at Outremont, employs water cooled pipe baskets set in a

Figure No. 3.
Ruttan Incinerator, Winnipeg.

high brick furnace, and in which the refuse is dried before dropping on the grate. The baskets are operated hydraulically from the firing floor. In a test made on this incinerator by the writer, it was found that steam could be generated from the water in these baskets in quantity up to approximately one-quarter of one pound of steam per pound of refuse burned. These incinerators are of the comparatively low temperature type.

Economics

In districts served with hydro-electric power, there is possibly not the same incentive to utilize the heat from the combustion of refuse for generating electricity as in localities using steam-electric power, but other opportunities and possibilities should not be overlooked or lightly considered. Steam is required in every large town for many purposes, not only in factories but, particularly in this climate, for heating buildings.

A modern high temperature destructor will furnish sufficient waste heat for the evaporation of from one to two pounds of steam per pound of refuse burned, depending upon the composition of the materials, in addition to any preheating of air required for the furnace operation. Taking a conservative figure of 1,750 pounds of steam, or 50 boiler horse power per ton of mixed garbage and rubbish burned per hour, as available for actual outside use, then a 200-ton destructor plant, which normally would take care of a population of 200,000, equipped with boilers and operating 16 hours per day, as is common practice, can supply over 20,000 pounds of steam per hour for manufacturing purposes, or say 1,000 engine horse power.

The household ashes collected from a district containing the same population can be utilized to generate up to 70,000 pounds of steam per hour, 24 hours per day, throughout the heating season, depending on the outside temperature. In other words there would be sufficient fuel to operate a central station to heat, and supply domestic service for buildings aggregating over 10,000,000 cubic feet volume. To appreciate better what this means it may be mentioned that the cubic contents of the entire group of buildings of McGill University are approximately 8,000,000 cubic feet.

Operating Cost and Revenue of a 200-ton Destructor

The following figures will give some concrete idea of actual costs and revenue for the case under consideration. The total annual cost of operating a 200-ton destructor alone, consuming 50,000 tons of garbage and rubbish per year can be taken as about $65,000., including interest on investment, depreciation, and all overhead charges. If boilers were installed to utilize the waste heat, the increased annual charges would be approximately $5,000. The revenue derived from the sale of only 25 per cent of the steam produced, at 75 cents per 1,000 pounds would be $15,800., leaving a net return of $10,800. to help pay the destructor operating costs. With a higher load factor, the revenue would be correspondingly increased.

If then a further boiler plant were installed to utilize the combustible in the ashes, the additional annual charges might be $50,000., including extra hauling and preliminary treatment of the ashes. The net revenue from steam supplied for heating, after deducting total distribution charges, would amount to around $150,000. per year, leaving a net return of $100,000., or more than sufficient alone to pay the whole operating costs of the destructor plant. The treated ash fuel is not limited to use in a central steam plant. It can be stored or it can be marketed, and actually, if cleaned, might be a better fuel than that from which it originated.

Because some cities have found that they cannot profitably burn anthracite coal ashes in their incinerators or destructors, mixed with refuse, it is often concluded that there is no way of profitably utilizing their fuel value. In the district of Montreal there is thrown away in the ashes from heating furnaces a potential fuel, equivalent to over 50,000 tons of coal during each heating season. The recovery of this at the present time of coal shortage would be of material assistance, apart from its marketable value. Many other uses for the steam available from destructors might be considered. One interesting purpose, to which a part of the power developed from a plant in France is put, is to charge storage batteries for electric collection trucks.

In addition to actual power production there is a considerable revenue to be derived from the clinker and also from the marketable wastes. The city of Buffalo has shown a profit over cost of disposal from the sale of such material alone. In Great Britain and Europe it may be said to be the invariable practice to utilize the heat from the destruction of mixed refuse and usually to show a profit over cost of destruction, yet here, where we have opportunities of heat recovery far in excess of those prevailing in Europe, and probably unequalled in any country in the world, due to our climate and conditions, this source of revenue is largely disregarded. Westmount is one of the few cases where the heat is utilized, and although this is a small plant, burning usually only garbage and rubbish, and the steam is used to generate electricity, which is not the best load from a revenue standpoint in this district, yet it has proved worth while.

A plan which suggests itself as a possible means of obtaining the maximum value from city wastes in a large city on this continent is a combination of reduction and destructor plants wherein the ashes and rubbish — after sorting out marketable incombustible materials — would be burned to generate steam for the reduction of the garbage, but considering the many factors entering into such a scheme, the conditions for successful application would be somewhat exceptional.

The separate collection of ashes, which is advisable when household refuse is burned in districts using a considerable quantity of American anthracite coal, does not involve much difficulty or extra expense. Householders in any case usually place ashes in a different receptacle to that used for kitchen refuse, and the additional cost of cartage is more than made up by the short hauls made possible by a centrally located destructor and the possible surplus revenue from the operation of the plant.

The above covers only a few features of destructor practice and design which call for particular attention, but it is hoped that it may suffice to show the importance of this subject and the necessity of treating a plan for

refuse disposal as something more than the mere purchase of incinerators or destructors — based on the lowest tender received, or, as is often done, on the success of a particular design in another city where the condition may be entirely different. The points to be emphasized are: — (a) A modern destructor will operate without producing any odors or causing nuisance. (b) For this reason it can be placed in a central district of a city, or wherever is most convenient to minimize length of collection hauls and for the utilization of power. (c) The economic possibilities from the utilization of the heat from burning garbage and rubbish, and more particularly that from the combustible household ashes, provide opportunities for savings and revenue which call for considerably more study and attention than is usually given.

The Fuel Situation in Canada

A review of Canada's Fuel Resources with various suggested Solutions of the Fuel Problem.

B. F. Haanel, M.E.I.C.

Chief Engineer, Division of Fuels and Fuel Testing, Mines Branch, Department of Mines.

Paper read before the Ottawa Branch, The Engineering Institute of Canada, December 7th, 1922.

The fuel resources of Canada comprise the coals of British Columbia, Alberta and Saskatchewan in the west, the coal deposits of Nova Scotia and New Brunswick in the east, the large areas overlain by peat in all parts of the Dominion, the oil and natural gas fields of Ontario, New Brunswick and of the province of Alberta, and the standing forests. If by "fuel resources" is meant all sources of heat and energy we must add the enormous potential energy represented in the developed and undeveloped water powers distributed throughout the entire Dominion. The total sources of heat energy are then:— (*a*) solid fuels, — coals of all kinds, peat and wood; (*b*) natural gas; (*c*) crude oil, and (*d*) water powers. When the sum total of the heat energy represented in these four classes of fuel resources is considered it will be seen that Canada possesses sufficient energy for heat and power to answer her requirements, at the present rate of use, for an indefinite period if these fuels could be used and distributed where required economically. So far as fuel resources irrespective of their localities are concerned, this country does not appear to be on the brink of a fuel famine.

Distribution of Canada's Fuel Resources

If now we examine the geographical location of these resources we will understand why people are discussing "Fuel Problems". Nature unfortunately placed the enormous coal resources of this country in the extreme east and west, and apparently passed by that wide stretch of land represented by the provinces of Manitoba, Ontario and Quebec. These provinces, according to geological explorations, are devoid of any high grade coal bearing formations whatever, and possess to only a very small, — practically negligible, — extent, deposits of the lower grade lignitic coals; but are well supplied with numerous deposits of peat suitable for the manufacture of fuel. Nature, therefore, has not forgotten entirely this portion of Canada. The provinces of Quebec and Ontario, especially Ontario, are further generously supplied with water powers.

A consideration of the location of Canada's coal resources reveals the isolated position of the provinces of Ontario and Quebec. These provinces are the most thickly populated, and Ontario is more highly industrialized than any of the others. Her position, to a greater extent than that of Quebec, as regards an assured supply of fuels suitable for industrial and domestic purposes is exceedingly unfortunate, and one which may, if immediate measures are not taken to ameliorate the situation, become of great gravity.

The trend of the civilization of to-day makes it imperative that any country which desires to keep pace with the intense industrial rivalry of the nations of the world or even economically exist, must have *energy* for both heating and power purposes on equal, or nearly equal, terms with the most favoured. This will readily be understood when one realizes that mechanical power and heat, more than any other agencies, are the backbone of our civilization. An interruption of a continuous supply of energy for power and heating will throw multitudes out of work, and, if of continued duration, make life itself, in this northern climate, impossible. But while *energy* is of absolute necessity to the industries, railways and commerce of a country, the first essential is a requisite quantity of *heat energy* to keep the homes of Canada's eight millions of people warm during eight months of the year. If homes cannot be heated, industries will not matter.

Fuel Situation in Western and Eastern Canada

The western and eastern provinces of Canada, as stated previously, are well supplied with fuels of all kinds, with the possible exception of crude oil, and viewed from this angle they are not worried with a fuel problem. However, the development of numerous new mines in the western coal fields has created a problem, viz: that concerned with the marketing of the full output of all the operating mines. This unfortunate condition can only be corrected by reducing the number of operating mines and increasing the output of a few of the most favourably situated, to meet the demands of the present market. Nova Scotia on the other hand is faced with an entirely different problem, — that of producing a sufficient quantity of coal to meet present day and future requirements. Thus we are faced with these peculiar conditions, in the west an over production of coals of all kinds suitable for any and every purpose, for which a market cannot be found, and in the east a real difficulty of meeting the requirements of a market which might readily be created on account of difficult and expensive mining operations. This adverse situation in the west is further aggravated by the substitution of cheap oil for purposes for which

British Columbia coals were formerly used. This inroad made by American oil during the last few years has produced serious results and, though necessarily of only a temporary character, may eventually succeed in seriously crippling certain of the British Columbia collieries. Patriotism, however, is no panacea for this evil. If oil can be imported into Canada at a price which permits it to be used as a fuel at a lower cost per heat unit than local coal, then it is economically right to import and use it. In fact this is an advantage which the inhabitants of any country cannot afford to pass by.

The question may now be asked why the central provinces of Canada, relatively thickly populated, and highly industrialized, hence requiring large amounts of energy, do not or cannot absorb a large portion of the output of western collieries, thus reducing the large quantity of coals annually imported from the United States and at the same time placing the western provinces in a more prosperous position. This question has been raised by several of the interested western coal operators, who believe that it is economically possible to put their coals in Ontario as far east as Toronto and Ottawa, at a price which will permit competition on a cost basis with the American coals now imported. The one obvious answer is *prohibitive freight costs*, due not only to a 2,000-mile haul, but also to the impossibility of balancing freights. Coal cars destined from western coal mines to Ontario would of necessity have to return empty. This would, consequently involve a one-way haul which is impracticable. Even if the existing freight rates could be cut in half, it is quite possible that western coals could not compete on a cost basis, with American coals. Western coals, however, are admirably suited for domestic and other purposes, and certain of the western lignitic coals would constitute a most excellent substitute for American anthracite were it not for the high cost of haulage.

Manitoba is rapidly becoming independent of American coal through the increasing use of Alberta coals for both industrial and domestic purposes, hence for this province it may safely be said that no fuel problem exists. The same may be said of Saskatchewan. The principal towns and cities of that province are learning to use with satisfactory results Alberta and British Columbia coals. So far as a supply of fuel suitable for domestic and industrial purposes is concerned, no fuel problem exists in that province.

Acute Fuel Area — Ontario and Quebec

This brings us now to the provinces of Ontario and Quebec which area has been termed the "Acute Fuel Area". These two provinces import practically all the American anthracite coming into Canada and in addition the greater portion of the bituminous coal required for industrial and railway purposes. Quebec receives a part of her requirements of bituminous coal from Nova Scotia but practically the entire requirements of Ontario are met by imports from the United States.

How can this adverse condition be improved? The total consumption of coal in Canada for all purposes is approximately 30,000,000 tons, a little less than four tons per capita, and of this amount, very nearly 60 per cent is imported from the United States. Anthracite coal, the annual imports of which amount to about 5,000,000 tons, constitutes a large percentage not only of the total coal imported, but of the total fuel consumption of Canada. It is this quantity of coal with which we are most vitally concerned, since it is used almost entirely for heating homes and in some instances public buildings. Can a reduction be made in the quantity of this coal it is necessary to import, and is there a possibility of eliminating it altogether through the substitution of other fuels or other forms of heat energy?

Impractical Substitutes for Imported Fuels

Many suggestions have been offered as answers to this question, but many of them are impractical or impossible. Among the impractical and impossible suggestions may be mentioned the substitution of western coals for the anthracite and bituminous coals required for domestic heating and industrial purposes, the substitution of fuel oil for domestic heating and finally the use of hydro-electric energy for domestic heating. Taking these in their order, an attempt will be made to show that they cannot be given serious consideration.

Western Coals

Western coals, though suitable for domestic and industrial purposes, cannot be purchased in Ontario and Quebec at points much further east than Port Arthur on account of the exceedingly high cost of haulage from point of production to point of consumption. Previously it was remarked that this freight rate is prohibitive, no matter what efforts the railways might make to reduce the rates on train load lots to the lowest possible minimum. This, it must be understood, is not a reflection on the railways. It is not conceivable that railway operation can be so improved as to make possible the haulage of coal cars over a distance of 2,000 miles, with a return journey of empty cars, at a cost which would permit five—or six-dollar coal at the point of production to be placed in the consumers' cellars in Toronto and Ottawa at a price reasonably near that which bituminous and anthracite coal can now be delivered to consumers. In the case of bituminous coal the proposition is manifestly impossible. The special freight rates, under consideration by certain railways, on coal shipped from Alberta mines, is in the vicinity of twelve dollars per ton to Toronto and Ottawa. If this were cut in two, would it then be possible for western domestic coals to compete with anthracite on a heat unit basis, ignoring for the moment the impossibility of making such a reduction? Even under such favourable conditions it is not probable that these coals could be landed in Toronto and Ottawa unless substantial reductions were made in the cost of mining and hence the cost f.o.b. cars. This suggestion, therefore, may be eliminated.

Fuel Oil

The use of fuel oil, it is believed by many, is the solution of this difficult problem, and with this belief firmly fixed in the minds of some, old reliable coal burners have in several instances, actually been removed and an expensive oil burning equipment installed in its place. Can anything be more absurd? We are informed by the highest authorities that the anthracite coal of Pennsylvania, will be exhausted within the next eighty years or within the life time of our children's children. In fact, the Federal Department of Mines has been advised by

the United States Bureau of Mines that Canada must look for some substitute for anthracite since the exports of this coal from the United States cannot continue indefinitely. If so much alarm is manifested concerning the depletion of anthracite coal, which by the most competent authorities is given a life of eighty to one hundred years longer, what should be the state of mind of Canadians concerning crude, refined or partially refined oils, of which 98 per cent of all Canada's oil requirements, are imported, — practically all from the United States, — where the reserves of well petroleum have been estimated to be sufficient to meet that country's requirements for only twenty-five years. This source of oil, it is easily conceivable, may be cut off at any moment, and what then for the capital invested in oil burning heaters? This suggestion is not only impracticable but may actually do harm.

Hydro-Electric Energy

Hydro-electric energy as a source of heat is not impracticable in the same sense, since its source may be considered as continuous and inexhaustible. Nevertheless, hydro-electric energy is a high grade of energy, being the conversion of a lower form of energy into a higher and much more valuable form. It may be likened to the conversion of coal into electric energy through the media of the steam generator and steam engine, or in general the conversion of any fuel, liquid, solid or gaseous, by any means whatsoever, into electric energy. Hence this form of heat energy, whether developed from falling water or other means, will cost more than heat generated through the burning of coal. Moreover, electric energy should be reserved, to serve the best interests of all concerned, for those industries to which its use is indispensable, and only in a few isolated and favoured localities used, even on a small scale, for heating homes.

Suggestions for Reducing Dependency on Imported Fuels in Acute Area.

We may now pass to more practical suggestions, viz: — the utilization of our own high grade and low grade fuels and the use of imported fuels in the most efficient manner possible. The Canadian fuels which may be utilized to a limited extent, in the acute fuel area, to reduce the quantities of imported domestic and industrial coals are, the bituminous coals of Nova Scotia and the numerous peat bogs of the provinces of Quebec and Ontario, and the standing forests. The imports of fuels for industrial purposes, which have already been reduced by several million tons through the wise and intelligent development of the water powers of Ontario and Quebec, can be still further reduced by the more intensive development of new water powers and those already partially developed.

Nova Scotia, in all probability, can increase her exports of bituminous coal to Quebec to a maximum of three millions of tons. The coking of a large portion of this quantity in by-product recovery coke ovens, situated for example at Montreal, and the intensive development of those peat bogs favourably situated with respect to short rail hauls to points of large consumption will very materially reduce the annual requirements for anthracite coal.

Ontario on the other hand cannot hope to obtain much assistance in this direction from Nova Scotia, but must depend for her supply of bituminous coal on the United States. The resources of this coal in that country are still so great that for all practical purposes they may be regarded as far from depletion. Moreover the bituminous coal fields of the United States are over developed and are capable of producing, and do produce, far more coal than is required for home consumption. Hence a foreign market for the excess above home consumption will always be sought. The coking of imported bituminous coal in by-product recovery coke ovens situated at Toronto, together with the intensive development of peat bogs in the vicinity of cities, towns and villages, and in general those situated favourably with respect to short rail hauls to points of consumption, will not only reduce the quantity of anthracite coal annually required in Ontario, but might eventually entirely eliminate it. Approximately one-half of the anthracite coal annually imported into Ontario can be replaced by peat fuel, which can be burned during the early spring and late fall or about four months of the year while by-product coke could be burned during the four severe winter months.

However, when considering ways and means for reducing our dependence on foreign fuels, consideration should and must be given to the economies which would result through the more efficient use of fuels. For example the establishment of central heating plants, at strategic points in the large centres of population, and the substitution of hydro-electric energy for that generated from coal, wherever feasible, might result in a material reduction in the annual coal bill of Ontario. By the establishment of central heating plants, it will be possible to burn coal far more efficiently than is the case to-day with the average house heater and, what is of equal importance, a lower grade and hence cheaper fuel could be used with entire satisfaction. The economies resulting from the delivery of coal to a central plant instead of to a large number of dwellings, and the handling at one point of all the ashes represented by the coal which would be required to heat them, will in themselves be sufficient to make a marked reduction in the coal bills of householders served in this manner.

These are merely suggestions — their practicability can only be determined after careful and exhaustive investigation. Such an investigation would involve a survey of the methods employed throughout Ontario and Quebec for heating homes and generating power from coal, and the measure of success with which central heating plants have met in those countries where such plants are in operation. The Mines Branch of the Department of Mines has for many years past planned to carry through to completion such an investigation, but has had to postpone it from year to year through lack of technical assistance.

In conclusion it should be emphasized that no *master fuel policy* designed to benefit Canada as a whole, will ever be acceptable to all individuals or perhaps to even all the inhabitants of certain sections. and that no suggestions, however valuable they may be, for improving the present adverse situation can ever be effective without the whole hearted and unselfish co-operation of the people of Canada as a whole, with the technologists on whose shoulders may rest the burden of putting into effect the solution of the problems involved. The people of Canada must not forget the lessons of 1918 and 1922. There may be a lull but the storm will surely pass this way again and with increased fury.

Electrons, Atoms and the Ether

An outline of the present knowledge of the subject resulting from recent investigations.

W. B. Cartmel, M.E.I.C.
Fellow of The American Physical Society.
Transmission Engineer, Northern Electric Company, Ltd.

Paper read before the Montreal Branch, The Engineering Institute of Canada, March 30th, 1922.

In discussing electrons and atoms one is able to make a number of positive statements in regard to what we know at present on the subject, but it would probably take a course of at least five lectures in order to cover, in a satisfactory way, the amount of convincing evidence which modern science has brought to light. Therefore, in a lecture given in one evening, the evidence that can be brought forward will, of necessity, be less convincing, though it should be borne in mind that our present knowledge rests on the basis of a very much greater weight of evidence, in fact the amount of evidence that has been collected by scientific workers is stupendous.

To begin with, it is now well established that all matter consists of particles which we call atoms. Every kind of matter consists of atoms whether it be wood, iron, stone, water or what not; each atom has in its center a positively charged nucleus surrounded by particles of negative electricity called electrons. Figure No. 1 shows one writer's conception of the arrangement of electrons in the atoms of various substances. You can see that each of these atoms consists of a number of particles of negative electricity, a different number in each and differently arranged. There is also within the atom a minute positively charged nucleus, (not shown in the figure), the positive charge on the nucleus being equal to the sum of the charges of all of the electrons, so that the atom is electrically neutral. Figure No. 2, shows the simplest atom of all, the hydrogen atom, which consists of a central nucleus having a single positive charge around which revolves one electron. The singly, positively, charged nucleus of the hydrogen atom we call the proton, so the hydrogen atom consists of one proton around which one electron revolves.

Figure No. 3 shows the helium atom which has a nucleus consisting of four protons and two electrons; the net positive charge of the nucleus of the helium atom is therefore two units, and there are two electrons revolving around this nucleus, their negative charges making the atom electrically neutral. The nucleus of the helium atom is called the alpha particle for reasons which will be brought out later. It is fairly well established now that the nuclei of the atoms of all other substances are composed of protons and alpha particles.

Fig. No. 1

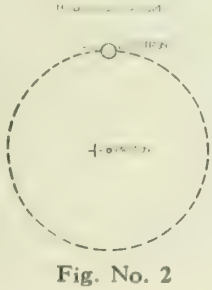

Fig. No. 2

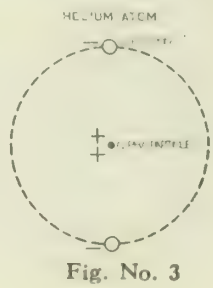

Fig. No. 3

To give an idea of the size of atoms and electrons, if we were to take a cricket ball and magnify it to the size of the earth then the atoms within it would be about the size of the cricket ball. However, a clearer and more accurate conception of these magnitudes may be formed by giving their dimensions in terms of a very small unit. The unit we shall use is called the Angstrom unit which is generally used to-day in tables of wave-lengths of light. The Angstrom unit is one ten thousand millionth (1/10,000,000,000) of a meter which is almost exactly one two hundred and fifty-four millionth (1/254,000,000) of an inch. The wave-length of yellow light is about one fifty thousandth (1/50,000) of an inch or more, (nearly six thousand Angstrom units), while the diameter of an atom of hydrogen is about equal to two Angstrom units. Engineers are fairly familiar with a thousandth (1/1,000) of an inch. If we were to take the one thousandth part of one thousandth of an inch, this would still be 254 times larger than the Angstrom unit. You will see from the minute dimensions of the atom how difficult it is to disabuse our minds of the fact that certain substances, such as for instance a piece of smooth polished metal is not continuous but consists of atoms. As a matter of fact, it has been suspected for ages that matter was made up of minute particles and although modern science was sceptical about this until recent years, there is now no question about it, it is beyond dispute.

Figure No. 4, shows a wave-length of light in comparison with the molecules of a body. It will be seen how difficult it would be for light having a wave-length relatively so much larger than the particles, to produce any image of these particles in our eye. Compared with a wave-length of light, atoms are relatively much smaller fhan shown in the figure. An atom of hydrogen is approtimately equal to two Angstrom units in diameter, the electron is about thirty-seven millionths (37/1,000,000) of an Angstrom unit in diameter and the proton is about one two-thousandth (1/2,000) the diameter of an electron.

What is Electricity?

In the past, theories as to the nature of electricity have been so vague that we will find it clears the matter up quite a good deal if we consider electricity as being made up of particles, and the flow of electricity in metals to be the passage of these particles between the atoms of the metal. Metals, as you know, conduct heat and electricity much better than do other substances. This is because there are a certain number of electrons which become detached from the atoms and can move more freely through the metal. Figure No. 5, shows what we may

imagine as the cross-section of a sheet of metal with its atoms and free electrons, atoms being represented by circles and the free electrons by dots. When a difference of potential is applied between the ends of a sheet of metal or a wire, the electrons move through the metal under the action of this difference of potential. Conduction of heat through the metal takes place somewhat

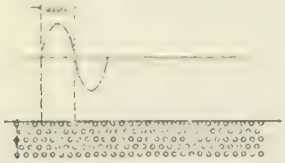

Fig. No. 4

Fig. No. 5

differently, the agitation of the electrons being passed on from one electron to its neighbour until all of the electrons in the metal have similar agitations, in other words the temperature is the same throughout the metal. It is because of the greater number of free electrons in metals than in insulating substances, that metals are good conductors of both heat and elecricity. It is not thought that the atoms of the metal are in violent motion due to the heat energy as are the molecules of a gas, but that the atoms of a metal or of any solid substances remain more or less fixed and the heat energy consists chiefly of the vibration of the free electrons.

You will note that in passing along between the atoms of a sheet of metal the paths are much more restricted if the sheet is very thin because the electrons do not leave the surface of the metal (except at very high temperatures) and therefore can only pass on one side of the surface atoms. Experiments made on sheets of metal a few molecules thick, show that diminishing the thickness causes more than a proportional increase of resistance, that is to say for very thin sheets a few molecules thick, halving the thickness more than doubles the resistance. It has also been found that at liquid air temperatures where the vibration of the molecules has practically ceased, the resistance of a metal decreases enormously. This is no doubt due to the absence of vibration of the electrons, in which case no electromotive force is lost by encounters between the free electrons and the atoms. Now if we heat the metal very hot, the agitation of the electrons becomes so violent that they escape through the surface, and "boil" out of the metal. This fact was first noticed by Edison in his incandescent lamps where the electrons were "boiled" out of the carbon filament. He placed a metal plate within the bulb of a carbon lamp and found that he was able to draw several milliamperes of current from it. That was in 1883. The arrangement is shown in figure No. 6, which shows a lamp with a metal plate inside, the carbon filament of the lamp being heated by a battery. Now as we know the free electrons in any hot body are vibrating very violently and the carbon filament being heated to incandescence, the agitation of the electrons is so violent that they fly out in all directions. However as there is a metallic connection between the plate and the filament, there will be a difference of potential between the plate and the middle portion of the filament, equal to half the battery voltage. The plate being therefore positive with respect to the filament, the emitted electrons are drawn to the plate and flow through the connecting wire back to the battery. It will be noted that the actual flow of electrons along the wire, is opposite to the direction ordinarily taken as the direction of flow of electric current. As a matter of fact the direction of flow of electric current in a wire is opposite to what it was formerly supposed to be. The Edison effect was never understood until the discovery of the electron in 1897 by Sir J. J. Thomson. This discovery disclosed the direction of flow of the electric current, showing it to be in the opposite direction from what had previously been assumed.

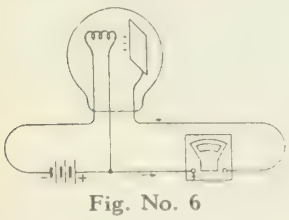

Fig. No. 6

The above, however, is not the only way in which electrons have been brought out of the atoms of substances. You would naturally suppose that if the atoms of all substances are made up of these particles of electricity we must be continually noticing electrical effects from ordinary substances in every day life, and this is as a matter of fact true. We are all perfectly familiar with the phenomena of frictional electricity. We know that if we rub sulphur or hard rubber, the sulphur or the hard rubber takes a negative charge. In other words, atoms and electrons are rubbed loose in the process and detach themselves from the hard rubber or the sulphur, or if we rub a glass rod with silk, we rub electrons as well as neutral atoms off the glass rod, leaving it with a slight deficiency of electrons or in other words positively charged.

Now in order to clarify our ideas in regard to the nature of electricity, it will be necessary to speak briefly of the ether and of the effect of electrons upon the ether. Moving electrons drag the ether with them. The simplest illustration of this is an ordinary wireless transmitting and receiving station. Consider two aerials arranged for radio telegraphy. The intervening space between the aerials is as we all know, filled with a mysterious substance which we call the ether. When a message is sent out from the transmitting aerial, electrons rush up and down through the metal of the aerial dragging the ether with them and setting it into violent motion, thereby causing waves to go out through the ether in all directions. These waves on reaching the receiving aerial drag the electrons therein up and down in accordance with the vibration of the waves and thus a message is received. It is not possible to-day to speak much about the ether; we know it is there and is probably a gas, but if it is a gas many of its properties are very different from those of any other gas. Probably because its particles are so extremely minute, we have not so far been able to find out much about it. However, we do know that this important inter-action between electrons and the ether takes place. It has been found that light waves are set up in the ether by vibration of the electrons just as waves in wireless telegraphy are set up. The difference between the two amounts only to a difference in wave-length. Light consists of waves having a wave-length of one thirty-five thousandth (1/35,000) of an inch to one seventy thousandth (1/70,000) of an inch, while electric waves vary in wave-length usually from fifty meters up to several thousand meters although electric waves have been produced having a wave-length of only a small fraction of an inch.

Vibrating Electrons cause the Ether Vibrations that we know as Light.

One of the means which led to the discovery of the electron was the role it played in the production of light. It was known that light was not produced by the vibration of atoms because they were much too large. In this connection, it might be well to say a word about the so-called Zeemann effect, which is an optical effect that led up to the discovery of the electron. When light falls on a grating, that is to say, on a piece of glass ruled with very fine distinct, parallel lines, the fine ruling causes the light to be bent through an angle. The angle through which it is bent depends on the wave-length of the light and the fineness of the ruling. On interposing this grating in a beam of white light you will notice that the light is bent, the violet light being bent least and the red the most. If we know the number of lines per inch in the grating we can tell from the angle through which the light is bent what the wave-length is. Now, in Zeemann's experiments, a sodium flame was placed between the poles of a strong electro-magnet and the yellow light from this flame was allowed to fall on a grating and the deviation of the light was noticed. An electric current was passed through the windings of the electro-magnet and then turned off again, and it was found that the deviation, (hence the wave-length), was slightly different in the two cases. The spectral line was really doubled or tripled. This was due to the action of the magnetic field on the rotating electrons in the flame. These rotating electrons set up electro-magnetic waves in the ether just as the electrons oscillating up and down in an aerial do. We all know what a powerful effect the magnetic field of a dynamo produces on the electrons in the conductors of its rotating armature and can therefore well imagine the effect of a strong magnetic field upon these rotating electrons. From measurements made of the change in wave-length it was possible to determine the ratio of the charge of the electron to its mass or weight, in fact this proved to be one of the most accurate methods of measuring this ratio. This has been mentioned because of the important effect produced by electrons on the ether. If we had two such sodium flames it could be shown that we would have virtually a transmitting and a receiving aerial. If white light is sent through a sodium flame it is found that the constituent vibrations in the white light which agree with the free period of the rotating electrons in the sodium flame are taken up by these electrons. This is quite similar to a wireless receiving aerial, where the aerial has to be in tune in order to take up the vibrations from the ether. If it is tuned to 200 meters, it will catch only 200-meter messages separating them out from other wave-lengths that may be present.

Conversely, Light sets Electrons into violent Vibration.

We may use an allied method for obtaining electrons from a piece of metal. Allowing ultra-violet light to play upon a sheet of zinc, it may be proved that electrons are emitted by it. If the sheet of zinc is first given a negative charge and connected to an electroscope, and the ultra-violet light from the spark of this industion coil allowed to fall upon the zinc, you will note that the emission of electrons causes it to lose its charge. In this case we have again a similarity to a wireless receiving aerial; the short electro-magnetic waves which we know as light falling on the metal plate set the electrons into vibration just is ordinary electro-magnetic waves do in the case of the aerial and if the vibration is sufficiently violent they fly out. Ultra-violet light which is light of very short wave-length, falling on the electrons in the zinc, agitates them so violently that they shoot out of the zinc. We can cause electrons to shoot out of almost any substance by using light of the proper wave-length. Even light of the visible spectrum falling on certain substances, such as the alkali metals will cause electrons to fly out from them. However, the shorter wave-lengths will cause electrons to shoot out of more substances than longer ones will. We shall see later that X-rays are merely light of very short wave-length, about one ten thousandth the wave-length of ordinary light. By means of X-rays, electrons can be brought out of almost all substances. This fact is easily illustrated and furnishes one of the most striking lecture experiments. The author gave a practical demonstration of this experiment explaining: — "I have here an electroscope, mounted in a projecting lantern. On charging the electroscope you will note the little leaf of aluminum foil stand out at right angles to the supporting wire. At the other end of the platform is an X-ray apparatus. On causing this to emit X-rays you will notice

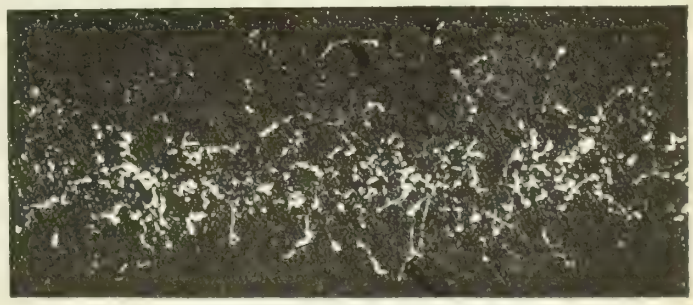

Figure No. 7

that the electroscope loses its charge, as indicated by the gradual fall of the aluminum leaf." This experiment may be explained as follows: Electrons being sensitive to the very short wave ether vibrations which we call X-rays, they fly out of surrounding matter when the X-ray machine is in action. They thus cause the charge on the electroscope to leak away. In particular the air surrounding the highly insulated aluminum strip gives out electrons, and in place of neutral atoms of air we have positively charged atoms of air, or positive ions, and electrons or negative ions. The electric charge on the aluminum leaf is conducted away by the joint action of the positive and negative ions moving in opposite directions. This so called ionization of air, or ejection of electrons from air by means of X-rays, was shown directly on a photographic plate by C. T. R. Wilson. It was known that if a sudden expansion was produced in moisture laden air, drops of moisture would condense on dust particles in the air. Wilson found out that positive and negative ions, that is to say positively charged atoms and electrons would serve as nuclei for the formation of drops of water. Photographs made by Wilson, (see figure No 7), show the ejection of electrons by X-rays from moisture laden air. The moisture in the air condenses around the ejected electrons, and around those atoms which having lost an electron are positively electrified, and thus these electrons and positively charged atoms are made visible as shown in the figure.

(This paper will be continued in the May issue of the Engineering Journal.)

The Cost of Industrial Power

A Comparison of the Cost of Steam and Electric Power in Industry, with a discussion of Operating Features of the Latter.

J. A. Burnett, M.E.I.C.,
Consulting Electrical Engineer

Paper read before the Montreal Branch, The Engineering Institute of Canada, November 23rd 1922.

(Continued from March 1923 issue, "The Engineering Journal")

Operation of Motors

Single-phase operation of a polyphase motor will cause the motor to fail to start and produce a dangerous temperature in the current-carrying phase; if the single-phase operation occurs during running conditions the motor may burn out due to the excessive load, or break down. The effect of unbalancing either phase, voltages or angles is to increase the heating and decrease the maximum output or torque. This effect is very important, as a 15 per cent unbalancing on a standard motor may nearly double the heating.

Small motors may be thrown directly on the line, but where large motors are treated in this manner there may be serious surges on the line and unless the motor windings are extremely well braced, there is apt to be injury to the insulation due to the crushing forces of the magnetic reactions. It is recommended that an oil switch be used for all motors of 100 h.p. capacity or over; below this size it is recommended that fuses be checked daily with pilot lamps. In this connection it is to be noted that a line of push button, magnetic switch starters have been brought out and can be purchased at moderate cost. These are applicable for three-phase motors rated from one to ten horse power and provide phase failure protection as they open all three legs of the circuit by means of the three pole magnetic switches.

Bearings

The great majority of motors use babbitt bearings. The white metal alloys are solid materials, composed of two or more items, such as aluminum, zinc, nickel, tin, lead, copper, antimony and bismuth, in varying quantities, and fluxed and alloyed in various ways. Originally babbitt metal had a fixed composition, being made up of 90 per cent of tin and 10 per cent of copper and antimony, the last to make it expand when it cools and fill the mould, but at the present time the term babbitt metal signifies no definite composition for there are babbitts made up according to fifty different formulas, on the market. Except in a few cases, but two babbitts, one a lead-base alloy and the other a tin-base alloy, each being the best that can be made, are required for a complete line of bearings, ranging in weight from a few ounces to several tons.

Lead-base babbitt is softer than tin-base babbitt, as a general rule, and is cheaper because lead costs from one-quarter to one-fifth as much per pound as tin. It is readily appreciated that babbitt can cost anywhere from the price of lead to the price of tin, depending on the proportions used. However, the cheapest kind of bearing metal which when properly lubricated will give efficient service, is equally desirable compared with the expensive metal which gives no better service. A successful bearing is attained only when the metals are melted slowly, thoroughly, without overheating, kept at a constant temperature while working, and poured properly at the correct temperature.

Lubrication

Mineral oils are all petroleum products, and form the whole, or the greater part of most of the lubricants employed. The generally accepted qualifications of a good lubricant are:—*first*, body (i.e. viscosity), enough to prevent the surfaces to which it is applied from coming in contact with each other; *second*, freedom from corrosive acid, of either mineral or animal origin; *third*, as fluid as possible, consistent with sufficient body; *fourth*, low coefficient of friction; *fifth*, high "flash" and burning point; and *sixth*, freedom from all materials liable to produce oxidation or gumming.

Ring lubrication is the preferred form for most horizontal motors. The oil reservoirs, dimensions of rings and oil grooves in the bearings must be carefully designed, as a defect in any one will materially affect the heating. A recent improvement is the substitution of a number of lamination instead of a single oil ring. This decreases the possibility of the oil ring sticking, because with a number of laminations it is not probable that all of them would stick at the same time. Ball and roller bearings have been used in electric motors to a limited extent, and it is generally admitted that at a low speed the friction of ball and roller bearings is less than the babbitt bearing. Both ball and roller bearings must be carefully mounted, otherwise they are liable to make considerable noise.

Voltage

The prevailing voltage in this district is 550 volts for motor loads up to 250 h.p., and 2,200 volts for motor loads above 250 h.p. It is worthy of note that some of the larger cities in the United States, such as Chicago and Detroit, adhere to 220 volts for the average installation, as compared with 575 volts, in practice here. The actual voltage is 575 volts and 2,300 volts respectively, and it is well-known that within the limits of saturation the output and torque are proportioned to the square of the voltage. This will usually hold good for 15 per cent and 20 per cent over or under normal voltage. The drop in consumers wiring will also be reduced, though it is to be noted that as a result of the higher voltage, a slight reduction in power factor will be noticed due to increase of magnetizing current in motors. This district is fortunate in having, at an early date, adopted

the higher voltages mentioned, and the saving in capital outlay to date in wiring, conduit, panel boxes and switches, without doubt represents a very large sum.

Motors of 200 h.p., or over may well be wound for 2,200 volts, especially as the public utilities sell at this voltage and transformer rental is eliminated. In every way the single-phase induction motor is inferior to the polyphase; the only reason for using it, is that it requires two wires instead of three.

No-voltage protection is essential in all installations in which, when power has failed, the resumption of power, causing the machinery to unexpectedly start, would be liable to injure anyone who might be at work about the machine. When the power goes off, it should be possible only for the operator to restart the motor. A large consumer of electric power should ascertain whether or not it is possible to be served with at least two primary circuits from the substation and should install double throw switches to make a quick changeover in case of failure to power supply.

Load Factor

Load factor, or the ratio between the average and maximum loads, has a considerable bearing on the cost of power. The following figures may be cited:

Load factor over 8,760 hours per annum.

Grain elevators	.12	General manufacturing	.25
Laundries	.13	Flour mills	.25
Clothing manufacturing	.14	Breweries	.30
Foundries	.15	Cotton mills	.30
Bakeries	.15	Electric traction lines	.33
Tanneries	.15	Abattoirs and refrigeration	.60
Machine shops	.18	Cement manufacturing under special conditions	.90

It may be said that the Canada Cement Company attain the very high load factor of .90 or more, a truly remarkable performance.

The very great importance of increasing the load factor cannot be too strongly emphasized, in other words, — reduce the peak and distribute the load as much as possible, consistent with production. In this connection it is felt that for an installation of 250 h.p. and upwards, a graphic watt-meter with current transformer and potential transformer is warranted. The outlay for a first class equipment will average $500., but the engineer in charge of the plant will be placed in a position to smooth out unjustified peaks and thus increase the load factor.

Power Factor

The writer now wishes to deal with the question of power factor, and quoting from D. M. Jones, lighting engineer, General Electric Company: — "Power factor, being a characteristic of a.c. distribution, is a phenomenon, whose field of influence already is widespread, and it is broadening at almost a cumulative rate. The fact that the electrical energy delivery team, (current and voltage), in an a.c. system have the capacity of doing more or less work for their size, as one might say, according to whether they pull together or not, suggests at once the advisability of seeing what can be done to get the most out of them. This advisability is accentuated by an appreciation of the fact that the capacity of the electrical end of the generating equipments and distributing system is based upon the size of "current", the "off-horse" of this team, and not upon the work the team accomplishes. Again since the electrical losses throughout are dependent, not only upon the magnitude of the current value alone, but even increase with the square of the current value, it is also evident that in a large measure this animal eats according to the size of his frame and not according to his productive activities."

The consumer is therefore penalized for low average power factor. The public utility does not consider the charge it makes, as a penalty for low average power factor, as a part of their rate. They take the position that the consumer could and should eliminate this charge by raising the power factor in the plant to the required per cent, usually .85. The question is then: Can the consumer raise the power factor to .85 at a cost per annum of less than the charge made by the public utility as a penalty? If he cannot do so, then the penalty charge of necessity becomes part of the cost of power paid by the consumer (see figure No. 2).

The penalty is locally computed by the ratio of the readings of the two watt-hour meters usually installed and is applied to both the fixed rate (to a certain extent) and the kw.hrs., (secondary rate). The following table illustrates this method:

Ratio	Average power factor	Ratio	Average power factor
1 to 1	1.00	1 to 4.5	.67
1 to 1.5	.925	1 to 5	.655
1 to 2	.86	1 to 6	.63
1 to 2.5	.805	1 to 7	.61
1 to 3	.76	1 to 8	.59
1 to 3.5	.72	1 to 9	.58
1 to 4	.695	1 to 10	.575

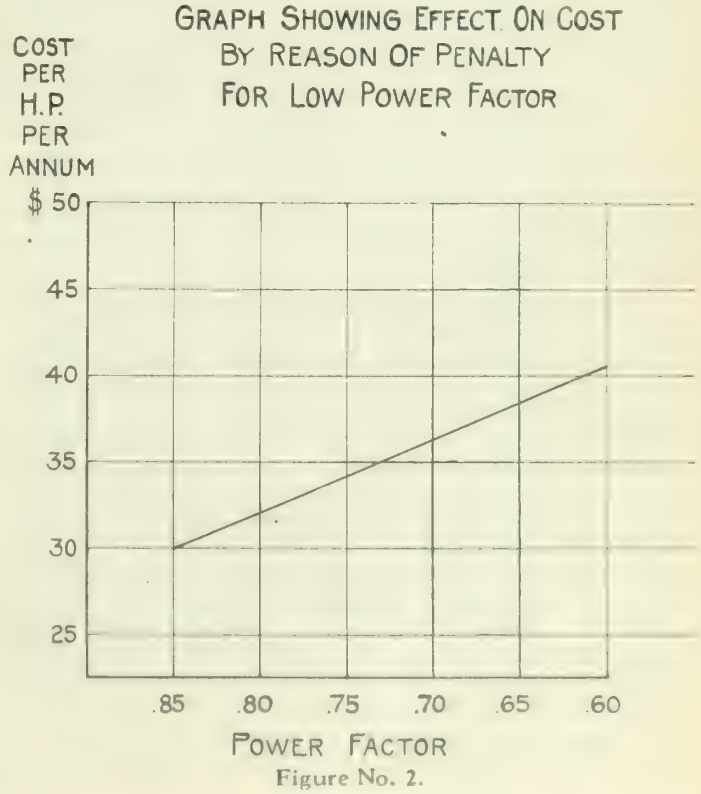

Figure No. 2.

The present time, while many industries are running at reduced capacity, offers an opportunity for investigation and study of these conditions with a view to improvement. A careful check on the power consumption of each motor should be made taking maximum, minimum and average condition kilowatts of load, voltage at the motors and power factor.

As above set forth, the penalty for low average power factor demands a remedy and the function of the consulting engineer is to recommend one. The question is, what course to adopt?

As a result of the test outlined above, a schedule of the motors should be made with a view of judicious relocation and increased loading of the individual motors. Under this project several motors may be needed to make up. It is worthy of note that for a number of motors, aggregating, say 300 h.p., to be exchanged for a total of 280 h.p., a considerable sum of money will be demanded, even for used motors, possibly $500. will be required. There is also an installation cost of about $300. to take care of. Further it may be found that the power factor only moves up, say, ten points, where twenty points are required to attain the contractual demand.

The next solution is the installation of a synchronous motor and exciter, preferably installed where the exciter may receive due care and attention. The location should be such that the exciter is not unduly affected by coal dust, or cement dust, or other objectionable agents. There is reason to believe that many such installations will be made in the near future. It is well to note that in case of this equipment being installed, an induction motor will be taken out of service.

The oil immersed static condenser is also receiving considerable attention. This class of equipment costs about $25 per kv.a., installed and should be located in a brick compartment similarly to an oil insulated transformer. Great care must be used in preventing any moisture from entering the metal housing, as this will shorten the life of the elements.

Next in order of merit is the synchronous condenser, floating on the line, with fields set for proper power factor correction. This method has the disadvantage of introducing some noticeable losses, but in some cases there is no alternative.

The synchronous motor is now receiving special attention from our manufacturing companies and it is satisfactory to note that the starting conditions have been simplified, no manipulation of switches being required. This equipment is now almost as simple as the induction motor. Recently there have been installed in Ottawa, two 200 h.p., synchronous motors, 164 r.p.m., and direct connected to refrigeration compressors. These are self-starting with autotransformer taps at 80 per cent line voltage. The starting rush of current is said to be 150 per cent of full load and time to accelerate and attain full speed, 50 seconds. In case a synchronous motor is installed of a certain rating, for power factor correction, this equipment will simultaneously deliver about 50 per cent in mechanical load, at a trifling additional loss as compared with an induction motor.

The synchronous motor may be used to drive line shafting when the starting torque required does not exceed, say, 50 per cent of the normal rating of the motor. The synchronous motor may also be used to drive centrifugal pumps or fans when the pull in torque demanded near synchronous speed does not exceed approximately 40 per cent of the normal rating of the motor, and use is made of a suitable low resistance squirrel cage winding, which decreases the starting current and increases the pull in torque. The synchronous motor is especially adapted for the direct drive of low speed air compressors, since these generally require about 50 per cent of normal torque for breaking from rest and there is seldom difficulty experienced in pull-in torque requirements. Further, an induction motor for such low speed has a very low power factor. Figure No. 3 shows the relative cost of these types of equipments.

Considerable attention should be paid to the details of installation of the power and lighting transformers. The vault or house should be commodious and well ventilated. The oil switch should be in a separate compartment from the transformers. The metering point should be so located that the meter reader can readily obtain access to the meters. The transformer disconnecting switches should be quite high and so wired

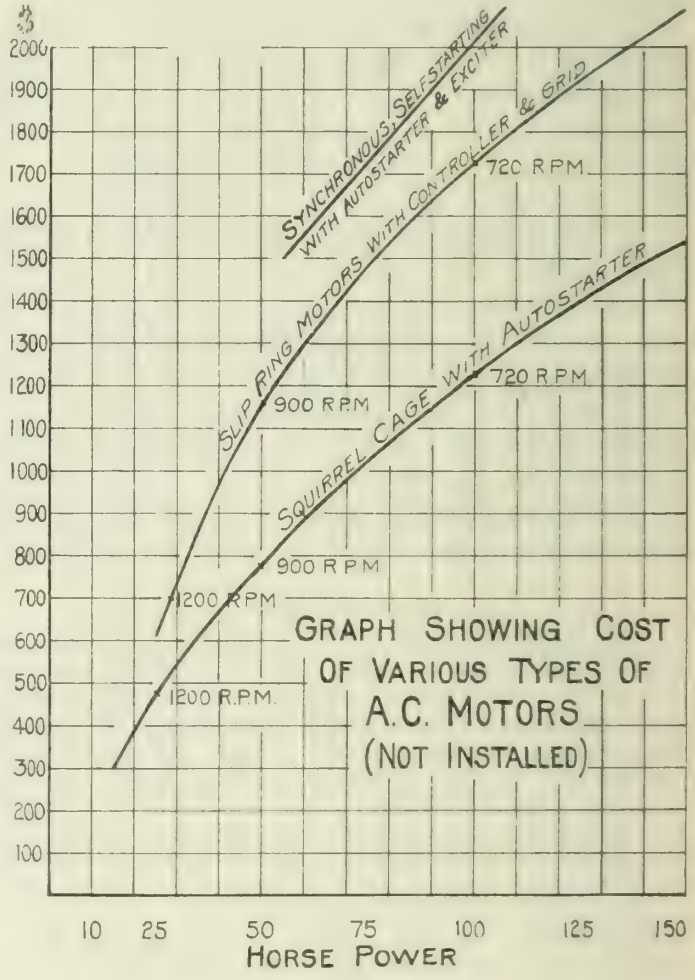

Figure No. 3.

that in case the transformers are replaced by a larger set, no changes in switches and wiring need be made. The Canadian Board of Fire Underwriters require that a curb be made in the floor to retain any oil that may leave transformer casings. Twice a year the transformer oil should be tested to show any humidity and periodic tests for temperature should be made to show any impedance in the water cooling coils.

By diversity factor is meant, the ratio of the sum of the maximum power demands of the subdivision of any system, to the maximum demands of the whole system, measured at point of supply. In case of a consumer operating two plants, the percentage may be taken at .90 approximately. It naturally follows that the metering should be done at one point only. For example, a consumer has one plant, (a), using 200 h.p., and one plant, (b), using 300 h.p. In the event of metering separately, the total would be 500 h.p., but by metering at one point the net total would be 300 plus 200 × .90, (assumed diversity factor), or 450 h.p. There is also the saving in rental of meters.

Electric Heating

The question is often asked: — Why not call upon the public utilities to distribute a block of power for residential heating? Unfortunately, this heating load would come on at a time of year when the power companies' plants are loaded to capacity, and no special rate could be quoted to meet this demand.

The rate necessary to equal the cost of coal at $17. per ton would be $0.00165 (0.165 cent) per kw.hr., and a large block of power would be left unsold for the summer months. As the lowest manufacturing rate is equal to $0.018 (1.8 cent) per kw.hr., it is clear that a rate of but 10 per cent of the present lowest rate would be required.

General

From a motor load of 1,000 h.p., in 1890, the use of electric power has grown at an amazing rate, and this growth is reflected in the industrial supremacy of the district ot Montreal. Without this abundant supply of hydro-electric power and its daily application for light and power, one cannot but conclude that the city of Montreal and district would occupy second place instead of first.

Having reviewed the past and analyzed the present, let us visualize the future. The cost of hydro-electric development, transmission and distribution, compared with pre-war, or 1914, prices reached a maximum in 1920. These costs were 220 per cent of normal. The costs to-day are 175 per cent of normal, and the trend is toward a continuance of present conditions.

The question may be asked: — What will be done to serve this great and growing district with electric power, so steadily in demand?

The St. Maurice river, with its minimum flow of 12,000 cubic feet per second, will furnish in the near future a new hydro-electric development of 150,000 h.p.

As this district demands 10 per cent annual increase in supply or 30,000 h.p., this will probably suffice for five years. Other developments are in view for the Ottawa river and extensions to the Cedars plant on the St. Lawrence river have been decided on.

Individual and corporate initiative, based on solid credit and on capital furnished by investors of the province of Quebec, will be found to be forthcoming and subject to commission control, will face the increased costs and will deliver the energizing force as required, reliable as to service and reasonable as to cost.

Electricity for Heating Buildings

An Explanation of why the general use of Electrical Energy for Heating is Impractical.

G. Gordon Gale, M.E.I.C.,

Vice-President and General Manager, Hull Electric Company.

Paper read before the Ottawa Branch, The Engineering Institute of Canada, December 7th, 1922.

Electricity in the form of heat is being very generally used in connection with numerous appliances, but the application of electricity for appliances does not come under the same classification as electricity for heating buildings. With large quantities of undeveloped water power surrounding us, and with the difficulties of obtaining coal which must be transported hundreds of miles, it does seem reasonable to the casual observer that the development of electricity for heating should be altogether desirable from every possible point of view. It is desirable to the individual consumer in many ways, but to the power supply company, and in the national interest, the problem of heating by electricity in the usual manner is quite different. If we discuss this subject from these three points of view, the individual, the power company and the nation, we shall finally determine what we must and what we must not expect in regard to heating our buildings directly with electricity.

The Individual Consumer

How does it appeal to the individual consumer? The convenience, cleanliness and low fire risk, make electricity for heating altogether desirable. The installation in the dwelling will cost about the same as a furnace and hot water system, but with the electric heaters there are no ashes, no furnace man, no yearly worry about a fuel supply. When the heat is required, a convenient switch is turned on, and immediately you have as much or as little heat as you require, controlled automatically, if you will, by a thermostat regulating the amount of heat to give a certain predetermined definite temperature. Nothing could be more convenient or desirable than a heating system of this kind, and therefore, the individual consumer does not and will not believe that the system is not economically possible, for the very good reason that he does not wish to do so. The main reason, so far as the consumer is concerned, for not heating electric-

ally is, of course, the high cost, and without elaborating further upon the delights of heating by electricity, let us consider the power supply company's point of view, and the reason for this high cost.

The Power Supply Company

It does not take much study for one to realize that electricity produced from coal or other fuel cannot be used economically for heating. The fuel burned under boilers develops heat, this heat is used to make steam, the steam is used to drive a steam turbine, the steam turbine is used to drive an electric generator, and the electricity so generated is transmitted, transformed and distributed to the consumer, who then turns it back into heat. The heat developed by this electricity is only four per cent of the heat contained in the fuel used under the boilers in the first place. For the present, therefore, let us consider the possibilities of electricity produced from water powers.

The capacity of an hydro-electric plant depends upon the flow of the river through the different seasons of the year, and the flow during the winter months is usually much less than the summer flow. The water which flows over the dam and not through the water wheel is wasted energy — a loss to the power company, to the community and to the country. It is therefore, the duty and should be the desire of the power company to encourage a demand for electricity which will result in the most efficient and complete use of this natural source of power.

Tariff

If you will consult the tariff sheet covering the rates charged for electricity in Ottawa and Hull, which by the way are the lowest rates the writer is aware of anywhere in the world, you will find that the lowest charge is made to the consumer who takes power throughout the year with a maximum demand perhaps during the summer months coinciding with the maximum supply of water at the power plant. The next rate is charged to the consumer who uses electricity throughout the year for appliances such as cooking stoves, irons, toasters, vacuum cleaners, sewing machines and a large number of other devices. A higher rate is charged for lighting which is used to a moderate extent during the summer months with the maximum demand during the dark days of the winter when the water shortages occur,- a use which develops what is known as a *peak*. The highest charge is made to the consumer using heating apparatus for the reason that his requirements extend over the winter months only, developing a very distinct *peak* in the power house load chart.

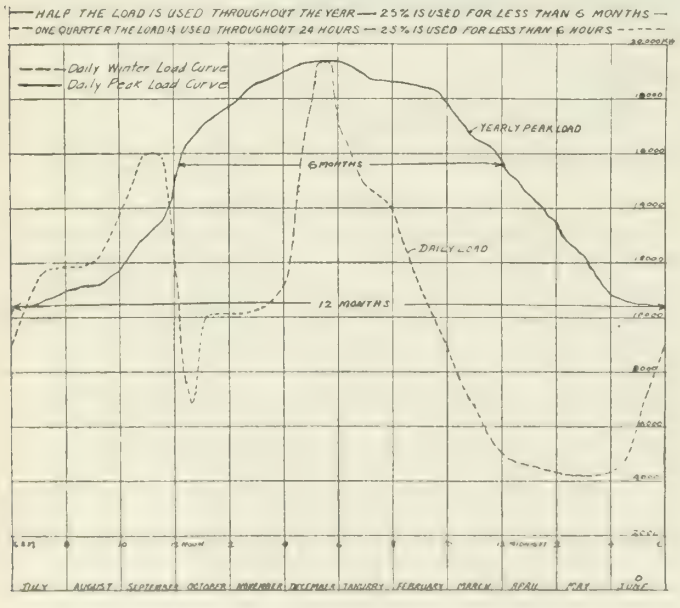

Figure No. 1.
Load Curve showing combined output of local distributing companies.

Peak Load

The installation of equipment in a power plant must, of course, be sufficient to take care of the maximum or *peak* loads, and the fixed charges run up the cost of electricity when this apparatus is not in full use at all times throughout the year.

This will be more readily understood by looking at figure No. 1, which shows the usual load curve of the power plant supplying light and power in a city the size of Ottawa. The chart shows the peak load for each day and variations in this peak load throughout the year, also the daily load variations throughout the twenty-four hours of an average day about this time of the year. From these curves one is immediately impressed with the large quantities of power available during the daily and yearly *off-peak* periods. The curves also indicate that electricity is used very much like street railway transportation — there are the rush hours when everyone requires accommodation, and there are the dull periods when few are interested in the existence of the service. In other words, — we want what we want when we want it.

Power Costs and Power Charges

Speaking very generally, if power costs $14.00 per horse power at the power house, it will take another $14.00 for administration and distribution to the customers, and still another $9.00 to pay interest charges taxes and depreciation. For the purposes of this illustration therefore, a horse power will cost $37.00 per year, or say $50.00 per k.w., per annum, and assuming a year is composed of 8,000 hours, the cost per k.w.hr. would be ⅝ cent if each kilowatt were used throughout the year and at all times. If this electricity is used for power during ten hours for 300 days, the cost would be 1⅔ cent per k.w.hr., or for lighting during five hours per day 3 cents per k.w.hr.

These figures are costs, not charges, and it will no doubt occur to you that the lowest rates charge for electricity in this district are below these costs. How can this be? The explanation is, of course, that the sale of electricity for certain purposes is perhaps higher than it should be, enabling the power company to sell below cost for other purposes, and this condition will probably last just so long as the demand for heating does not overbalance the demand for, say, street lighting. The basic principle is that each kilowatt consumed should give a return of $50.00 per annum, and the shorter the period of use, the higher the rate of charge. Hydro-electricity is, as you see, manufactured on a yearly basis,

and the most desirable consumers are those having uniform loads thruoghout the whole year.

For electric heating used during the three cold winter months, a return of $50.00 per k.w., of maximum demand should be obtained unless the surplus energy can be used during the other months of the year. However, if you will consult the chart again, you will find that the power companies have not been able so far to discover a daily use for off-peak power or a summer use for the electricity used for lighting during the winter months.

In this climate a house using about eight tons of coal would require an installation of about 12 to 15 k.w., or say 20 horse power. The cost of the electricity at $50.00 per k.w., per annum for 12 k.w., would amount to $600.00 which is, of course, very much in excess of the cost of eight tons of coal even at the rate of $16.50 per ton. The consumer cannot indulge in the luxury of electric heating at such prices, but this, you will say, is not a good reason why the power supply company should oppose electric heating. There are, of course, other reasons of great importance to the power company. There is the question of quantity, and there is also the difficulty of distributing these large quantities of electricity.

When you remember that there are about 40,000 houses in Ottawa and Hull, each taking about 500 watts for lighting, or a total of say 20,000 k.w., and that each house would require at least 12 k.w. for heating or an additional 480,000 k.w., you can easily see what a very large development of electricity would be necessary to supply heating for the present buildings, also that all the hydro power available in the vicinity would not provide enough electricity to heat the two cities when they grow to two or three times their present size.

While power companies have surplus power, consumers have been permitted and even encouraged to purchase equipment for heating to use up this surplus. Then when the supply of power is all taken up restrictions are placed on heaters to the discomfort and inconvenience of those who have become accustomed to their use. We shall probably reach the state of mind here which actually exists in some other countries where it is an indictable offense to use electricity for heating dwellings.

The Nation

This brings us to the national point of view, and a consideration of the energy value of electricity. Electricity is essentially a high grade form of energy. It is easily and efficiently converted into mechanical power. The same 12 k.w., already referred to, which would be required to heat a dwelling, will operate 100 sewing machines, will cut 6,000 cords of wood per annum, will pump millions of gallons of water every year, or will transport twenty people 200 miles a day.

Figure No. 2 shows very plainly the comparatively low heating value of electricity and incidentally the great losses sustained in raising the heat energy in coal to mechanical energy. The chart also shows in a very striking manner the wisdom of replacing coal-consuming power plants by electric motors supplied with energy from waterfalls. The war time fuel controller, C. A. Magrath, M.E.I.C., fully appreciated this point, and he reports that in one instance alone, through the good work of our fellow member Murphy, M.E.I.C., who was associated with him in this work, he was able to save the consumption of 60,000 tons of coal per annum.

To degrade this electric power into heat is equivalent in the metals to using high grade gold for a sewer pipe instead of the proper metal. Fortunately, just as we have iron for the sewer pipe, so we have coal and other fuels for heating. The importance of using electricity for mechanical energy has already been stressed, and it is, of course, of equal importance that the lower form of energy, fuel, should be used for heating, and not for purposes of mechanical energy with attendant heavy losses.

The conservation of electrical energy for industrial expansion in its many branches is, therefore, a matter of national interest, for we must depend largely upon our water powers to supply the many and ever increasing demands of manufacturing and transportation.

The possibility of utilizing off-peak and summer surplus power for electric heating has been tried out in this way. Electricity has been passed through water separating it unto the two gases of which it is composed,—hydrogen and oxygen. These gases have been collected compressed and stored in cylinders. Subsequently these gases have been burned giving a flame having a temperature of 5,000 degrees. Use the electricity when it is not otherwise needed — on the off-peak hours and in the summer — fill up the coal bin with gas cylinders and when the Jack Frost comes along turn on the gas. As a matter of fact it takes so much energy to produce the gas that the whole procedure cannot be carried out on a commercial scale.

In conclusion we may summarize this whole subject in the following words: — The direct use of hydro-electricity for heating is not desirable to the individual because the cost is too high, it is not possible to the community because there is not enough to supply everyone, and it is not in the interest of the country because electric power has another and more useful sphere.

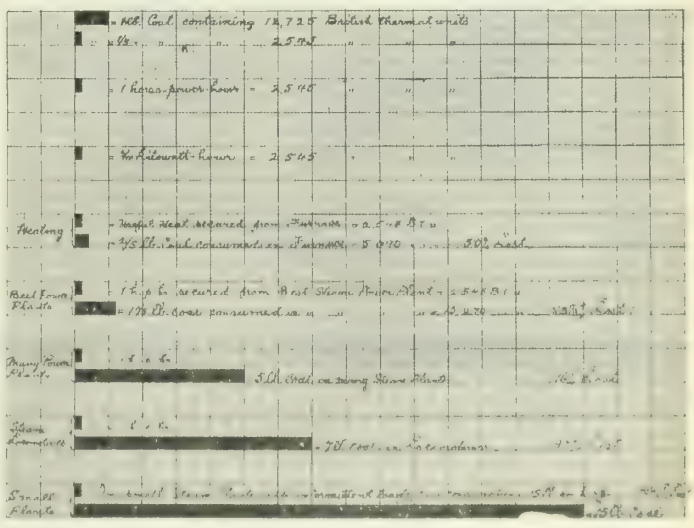

Figure No. 2.

THE
ENGINEERING JOURNAL

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VOL. VI April 1923 No. 4

New Institute Officers

As the senior vice-president of *The Institute*, Walter J. Francis, was confirmed in office as president at the regular meeting of Council, held on March 27th., 1923. To fill the vacancy of the vice-president, Fred. P. Shearwood was appointed vice-president. This left a vacancy of a Montreal councillor and Colonel A. E. Dubuc was named to that office. These appointments are all for the balance of *The Institute* year only.

A resolution of condolence and sympathy to the wife and family of the late President St. Laurent was passed, the secretary being instructed to have it suitably engrossed and forwarded to Ottawa.

The ballot relative to the amendments of the by-laws was opened and a special committee appointed to analyze the vote and report at the next meeting.

Engineering Employment

While the employment situation regarding engineers is much better than a year ago, owing to local conditions, particularly in the west, a large number of qualified men are looking for change of employment, due not in any way to their lack of capacity, but to conditions over which they have no control.

In Ontario and Quebec engineering work is apparently above normal, and the demand for engineers for individual positions continues in a fairly steady manner. There is a scarcity of draughtsmen, which in general is an index to coming activity. It is hoped that the work in Ontario and Quebec will absorb the men from the west so that they can remain in this country.

In this issue will be found a list of students who are looking for employment for the summer months and some of them for permanent positions, and it is hoped that all employing engineers will do what they can to provide work for these young men. While it is true that there are altogether too many engineering students in the Canadian universities, that is not their fault, but rather the fault of the profession as a whole, in that no steps have been taken, or are being taken, to regulate the supply so that it will be, to some degree, commensurate with the demand. At the present time there are two students graduating from engineering colleges each year for every position available. This condition will have to be remedied in the near future. In the meantime, however, it is felt that every encouragement should be given young men who are in need of work, and even if not in actual engineering capacity, in some position whereby their services may be retained to Canada.

Arthur T. St. Laurent, B.A., C.E., M.E.I.C., President of The Engineering Institute of Canada, died at his home, 75 Stewart Street, Ottawa, Ontario, on Tuesday, March sixth, in his sixty-third year.

Fraternal Relation

The happy spirit of fraternal relationship existing between *The Institute* and other engineering and technical bodies is becoming more and more evident year by year. During the recent annual convention of the Canadian Institute of Mining and Metallurgy a general invitation was issued to all members of *The Institute* to attend their sessions and functions, the convention being devoted mainly to a study of the fuel problem. The invitation was accepted by a large number of the members of *The Institute*. At the present time a committee of the Montreal branch, which has as a member George C. Mackenzie, secretary of the Canadian Institute of Mining and Metallurgy, is making a thorough study of the fuel problem from the domestic viewpoint and will doubtless have valuable suggestions to offer before another winter arrives.

The Canadian Institute of Chemistry will meet in Toronto, May 29th, 30th and 31st, and through their secretary, L. E. Westman, an invitation has been extended to all members of *The Institute* to attend their meetings.

A recent mail brought a letter from Magnus Mowat, secretary of the Institution of Mechanical Engineers of Great Britain, thanking the Council for its congratulations on the seventy-fifth anniversary of the Institution, and expressing an anxiety to co-operate for the benefit of the profession.

Within the past month a letter was received from Doctor J. H. T. Tudsbery, for many years active secretary of the Institution of Civil Engineers of Great Britain, and now secretary emeritus, expressing his approval of a proposal previously made, that during the year of the British Empire Exhibition advantage should be taken of the occasion to hold an engineering congress.

Under date of March second a very cordial invitation was received from the Société des Ingénieurs Civils de France, requesting *The Institute* to participate in their seventy-fifth anniversary celebration to take place May fourth, fifth and sixth, at the first session of which the President of the French Republic will preside, and strongly urging that *The Institute* be personally represented.

This year the American Society of Mechanical Engineers decided to hold their spring meeting in Montreal, and immediately a committee of the Montreal Branch of *The Institute* was formed to look after the local arrangements, which are now well under way. In that connection there is a letter from the good friend of all engineers and engineering progress, Calvin W. Rice, secretary of the society, who writes the President and Council of *The Engineering Institute of Canada* in a characteristic vein as follows:—

Greetings:—

The President and Council of the American Society of Mechanical Engineers has peculiar pleasure in extending to you and to the membership of *The Engineering Institute of Canada* a hearty invitation to attend the coming Spring Meeting of the Society in Montreal, May 28-31.

We invite you all to join in the social events and to participate in the technical discussions. The officers of our Society ardently hope that this meeting will extend the already pleasant understanding between the representatives of the engineering profession of the two countries.

Further, the Council of the American Society of Mechanical Engineers wishes to gratefully acknowledge the wholehearted co-operation with which the Montreal Branch of *The Engineering Institute of Canada* is assisting the Montreal members of the A.S.M.E. in the plans for the meeting.

Cordially yours,

(signed) CALVIN W. RICE, *Secretary.*

Truth in Advertising

Occasionally advertisements are seen which are believed by many to have some suspicious qualities, but few are sufficiently interested to investigate. In the fall of nineteen twenty-one, the American Association of Engineers called the attention of the Associated Advertising Clubs of the World to certain advertisements appearing under the name of Chief Draughtsman Dobe. Following the action of the American Association of Engineers, the National Vigilance Committee of the Associated Advertising Clubs of the World, of which H. S. Van Scoyoc, M.E.I.C., is a vice-president, investigated the advertisements and have issued the following circular which has been forwarded for publication by the A.A.E.

"Chief Draughtsman Dobe" purports to be an experienced employer of draughtsmen for a large and well-known engineering firm of engineers. He offers to train personally, (by correspondence), candidate student draughtsmen.

Advertising extensively in magazines, "Chief Draughtsman Dobe" tells an interesting story.

By assembling various statements taken from the Dobe copy and follow-up literature, it is found that a 15 year old boy with ability to read, write, use figures and follow instructions, can study under Dobe for the equivalent of three to six weeks of solid eight hour days, and then be prepared to earn, and in fact, is guaranteed a salary of $250 to $300 a month with $450 on the side at home

A magnificent set of draughting tools are advertised "free" as an inducement to prospective students. However, the approximate sum of $65.00 is charged for the course and must be paid before the "free tools" become the student's property. Of course, nothing requiring an expenditure of that amount of money can be considered "free".

Investigation of the truth of the claims that positions paying $250 to $300 per month will be available to Dobe graduates, shows that not one of a number of engineering contractors will retain a draughtsman in a permanent position paying $250 a month, unless he has years of experience.

The "Chief Draughtsman Dobe" copy is exceedingly misleading. Young men expecting exceptional results are disillusioned because of the exaggerated promises made. The so-called "Free Offer" is used in direct violation of the recommendations of this Committee inasmuch as the "Offer" cannot be acquired without the expenditure of money.

The confidence of the public and the reputations of the advertising and engineering professions are ridiculed and belittled by advertising of the "Chief Draughtsman Dobe" type. This Committee cannot recommend the "Dobe" and typical copy.

NATIONAL VIGILANCE COMMITTEE

THIS MONTH'S CONTRIBUTORS

The Design and Economics of City Refuse Destructors

The subject of city refuse destructors and incinerators was presented before the Montreal Branch on December 7th, 1922, in a paper by F. A. Combe, M.E.I.C., consulting combustion and steam engineer, Montreal, Quebec.

Mr. Combe was born at Gorlestone, Suffolk, England, in 1882, and received his education at Framlingham College, as a private pupil of G. P. Knowles, London, and at the Bedford and Manchester Technical Schools. For five years, from 1899 to 1904, he was a pupil with W. H. Allen Son and Company, Limited, Bedford, England, following which he joined the staff of the British Westinghouse Electrical and Manufacturing Company, Manchester, during which time he was chief assistant on gas engine erection and testing in England, Spain and France. In 1906 he again joined the staff of W. H. Allen Son and Company, Limited, as chief assistant of the testing department. On coming to Canada the following year, he became engaged on the design, construction and operation of power plants, being connected with Messrs. Ross and Holgate, consulting engineers. From 1908 to 1910 Mr. Combe was in charge of the design and construction of the mechanical equipment of the central power house and distribution system also the heating and ventilating systems of the new medical building at McGill University and, during this period, prepared designs and reports on various heating, ventilating and power-plant projects. In 1910 he was appointed chief draughtsman and, later chief engineer for Canada, for Babcock and Wilcox. In 1920 he entered private practice as consulting engineer engaged on steam power plant, combustion, heating and ventilating engineering.

Electrons, Atoms and the Ether

The discoveries of recent years, on this subject, have been treated in considerable detail in a paper by W. B. Cartmel, M.E.I.C., transmission engineer of the Northern Electrical Company, Limited, Montreal, which was read before the Montreal Branch on March 30th, 1922.

Mr. Cartmel was born in Liverpool, England, in 1872, and received his engineering education on this continent, having attended the Case School of Applied Science, Cleveland, Ohio, from which he graduated with the degree of B.S., in 1900. Two years later he received his degree of M.A., from the University of Nebraska. He was then appointed laboratory assistant at the Bureau of Standards, Washington, D.C., where he remained until 1903, when he accepted the instructorship in physics at the University of Cincinnati from 1903 to 1905, and was awarded the Whiting Fellowship in physics attending Harvard University, 1906 to 1907. In the fall of 1907 Mr. Cartmel was appointed professor of physics and electrical engineering at the University of New Brunswick where he remained until he joined the engineering staff of the Northern Electrical Company, Limited, in 1911. In 1915 he was placed in charge of the transmission division of the company.

The Fuel Situation in Canada

The "fuel problem", which is attracting such general attention at the present time due to the necessity of immediate action against a recurrence of the coal shortage of the past winter, has been summarized by B. F. C. Haanel, M.E.I.C., in his paper entitled, "The Fuel Situation in Canada," read before the Ottawa Branch, on December 7th, 1922.

Mr. Haanel is a native of the province of Ontario, having been born at Cobourg, Ontario, in 1877. He undertook his engineering studies at Syracuse University and received his degree of Bachelor of Science from that university in 1899. After graduating, Mr. Haanel spent two years at the Massachusetts Institute of Technology on special engineering studies. Before entering the Federal service, as chief engineer of the division of fuels and fuel testing of the Mines Branch, Department of Mines, Ottawa, he was engaged on engineering work with the American Bridge Company, the United Engineering and Contracting Company, and other structural companies.

Electricity for Heating Buildings

When the subject of Canada's fuel problem was discussed at a meeting of the Ottawa Branch on December 7th, 1922, a paper on "Electricity for Heating Buildings", by G. Gordon Gale, M.E.I.C., was presented, which should disallusion those who had looked to the use of electrical energy for domestic heating as a solution of the problem.

Mr. Gale is vice-president and general manager of the Hull Electric Company, operating the electric lighting, power and traction services in the city of Hull, Quebec. He was born at Quebec city in 1882, where he received his primary schooling. In 1903 he graduated from McGill University with his degree of Bachelor of Science in Mining, and, continuing his studies at McGill, he received a similar degree in electrical engineering the following year, and Master of Science in 1905. His first work after graduating was with the Canadian Rubber Company as assistant engineer until 1906. The following year he was resident engineer for Messrs. Ross and Holgate, at Deschenes, Que. The same year he was appointed superintendent of power with the Hull Electric Company, being promoted to acting general superintendent and later general superintendent in 1909, and general manager in 1914. Mr. Gale was chairman of the Ottawa Branch for the year 1918, and was member of Council from 1919 to 1921. He was also elected president of the Canadian Electric Railway Association at the annual convention last year.

Publication

Burning Liquid Fuel; by William N. Best; published by the U.P.C. Book Company, Inc. This is a practical treatise on the perfect combustion of oils and tars, giving analyses, calorific values and heating temperatures of various gravities with information on the design and proper installation of equipment for all classes of service. It contains over three hundred illustrations and diagrams showing various installations of liquid fuel.

OBITUARIES

Death of President St. Laurent

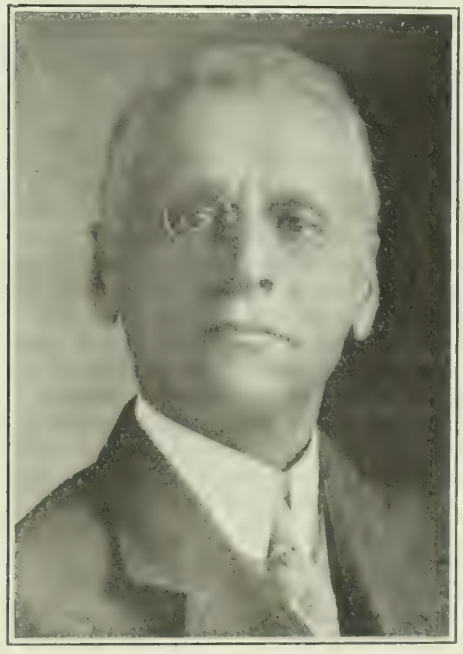
Although in poor health for some time, President Arthur St. Laurent had been gaining in strength so that his death, which took place at his home in Ottawa, on Tuesday, March 6th, was unexpected.

The Institute mourns its President, and the engineering profession in Canada has lost one of its shining lights, one who maintained in a firm, but kindly manner, the highest traditions of the profession. The Department of Public Works of Canada is bereft of its thoroughly capable and highly respected chief engineer, to whom all under him were devoted in their loyalty. The city of Ottawa has lost one of its best citizens, and his sorrowing wife and family, a kindhearted and loving husband and father.

The funeral was held at nine o'clock on the morning of March 9th at Sacred Heart Church, Ottawa, thence to Notre Dame Cemetery. The service at Sacred Heart Church was most impressive. Rev. Father Leon Bouvet, O.M.I., superior of the Oblate Scholasticate, officiated at the requiem high mass, attended by Rev. Father C. E. Paquette, O.M.I., as deacon, and Rev. Father A. Jacques, O.M.I., as sub-deacon. Rev. Father Sylvain, O.M.I., of Hull, a nephew of deceased, officiated at the blessing of the remains. During the requiem mass, Rev. Father M. Sylvain, of Montreal, a brother-in-law, read low mass at a side altar. The Sacred Heart Church choir under the direction of Henri Lefebvre, choir-master, rendered with solemn effect Perosi's Mass for the Dead. The chief mourners were two sons of the deceased, Adrien St. Laurent and Lucien St. Laurent, of Ottawa; four brothers, Valmore and Alphonse St. Laurent, of Rimouski; André St. Laurent, of Boston, and Emile St. Laurent, of Winnipeg. Other relatives present included J. C. Letellier, Antoine Garneau and R. Sylvain, all of Montreal.

A remarkable token of the esteem in which Mr. St. Laurent was held was in evidence by the effusion of floral tributes and the very large attendance at his funeral. The attendance included the leading officials and a large representation of the staff of the Department of Public Works; his confreres of the engineering profession, fellow-officials and representatives of various branches of *The Engineering Institute of Canada*, members of the judiciary and various other professions, representatives of many government departments, and citizens in many walks of life. The engineering profession and Department of Public Works were represented by members and officials from points as far east as Rimouski and as far west as Port Arthur.

Among those present at the funeral were the following members of *The Engineering Institute of Canada:* G. J. Desbarats, acting deputy minister of national defense; representatives of the Council of *The Institute* including K. B. Thornton, F. P. Shearwood, Frederick B. Brown, J. A. Duchastel, Past-Presidents George A. Mountain and Lieut.-Col. W. P. Anderson, and the Secretary; O. S. Finnie and F. C. C. Lynch, chairman and secretary respectively of the Ottawa Branch and A. B. Lambe, representing the Peterborough Branch; Major D. L. McKeand, president of the Civil Service Federation of Canada; K. M. Cameron, assistant chief engineer, Public Works Department; A. R. Dufresne, former assistant chief engineer; W. A. Bowden, chief engineer, Department of Railways and Canals; J. B. Challies, director. Dominion Water Power Branch, Department of the Interior; W. J. Fuller, district engineer at Sault Ste. Marie; Col. H. J. Lamb, superintending engineer, Public Works Department, Toronto; J. M. Wilson, Roy Millar, and W. R. Macdonald, of the Toronto district of the Public Works Department; A. R. Decary, P. E. Amyot of the Rimouski district; H. B. R. Craig of the London district, and J. L. Dansereau of the Montreal district; R. de B. Corriveau, and C. R. Coutlee of the Ottawa district; Ulric Valiquet, W. J. Stewart, Commander C. P. Edwards, R. A. Davy, J. Somerville, F. J. Smith, John Murphy, J. E. Larochelle, S. J. Kingston, F. G. Smith, P. Sherrin, H. M. Davy, Noulan Cauchon, P. H. Leblanc, J. L. Rannie, W. J. Lynch, and many others.



ARTHUR T. ST. LAURENT, B.A., C.E.

Bearing further testimony to the wide-spread regret and sympathy occasioned by the passing of Mr. St. Laurent were numerous letters of sympathy, spiritual offerings and a wealth of beautiful floral tributes. Letters of sympathy were received from Hon. Doctor J. H. King, minister of public works, Hon. Rodolphe Lemieux, speaker of the House of Commons, His Worship Mayor Frank Plant, the Professional Institute of Civil Service of Canada, the Knights of Columbus, Ottawa, and others. Among the organizations which sent spiritual offerings were the Champlain Council, Knight of Columbus, the staff of the Chief Engineer's Branch, Department of Public Works, the Sacred Heart Convent, and the Montreal staff of the Department of Public Works.

Floral offerings were received from Hon. Doctor J. H. King, minister of public works, Hon. Jacques Bureau,

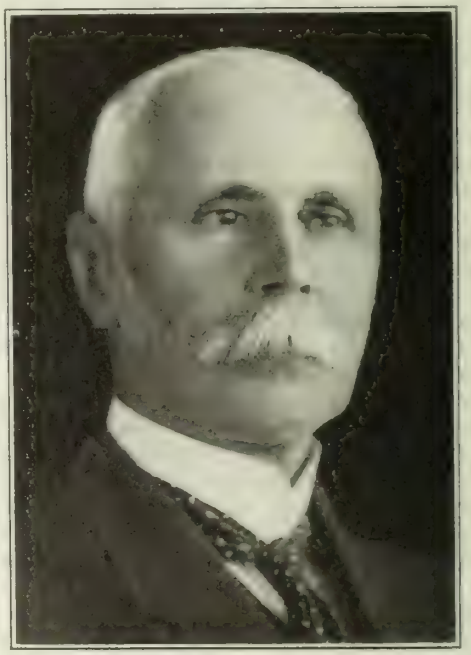
deputy minister of public works and Mme Bureau, J. B. Hunter and Mrs Hunter; the executive staff of the Department of Public Works; the engineering staffs of the Department of Public Works at Ottawa, New Westminster, B.C., Victoria, B.C., Winnipeg, Man., London, Ont., Port Arthur, Ont., Fort William, Ont., St. John Harbour, N.B., Halifax, N.S., Nelson, B.C.; *The Engineering Institute of Canada;* the members of Council of *The Institute*; the chairman and members of the Ottawa Branch; the Cape Breton Branch; the Peterborough Branch; the executive committee and members of the Montreal Branch; the Toronto Branch: the chairman and members of the Quebec Branch; the staff of the Laboratory for Testing Materials; members and staff of the Board of Hearing and Recommendation; president and executive of the Canadian Club; chief engineer and assistant engineers of Department of Railways and Canals; estimates branch, the Public Works Department; P. Lyall and Sons; Campeau Fish and Game Club.

In the House of Commons on March 9th, the Right Honourable Mr. Arthur Meighen, referring to the death of Mr. St. Laurent, said: "Before the minister replies I would like to take the opportunity of expressing, in common, I know, with others, the high appreciation I feel, and have always felt, of the services of Mr. St. Laurent who, unfortunately, has died lately. I came in contact with him very intimately, and over a long period of time. I was the means of having him appointed on the Dominion Power Board, and in other special matters of great engineering difficulty I availed myself of his services. I found him a man of high professional capacity, and as well, possessed of a keen sense of duty; to duty he devoted himself unceasingly throughout all the period of our acquaintance. I learned with the very deepest regret of the death of a servant of the public, such as he, and I desire to record before this House my sense of our loss." A further tribute was paid by the Hon. Doctor J. H. King, minister of public works, who replied as follows, "I am sure I can concur in every word that has been stated by the Right Honourable Leader of the Opposition (Mr. Meighen) and the member for New Westminster. It was my good fortune as minister of the department to come closely in contact with the late Mr. St. Laurent while he was acting in the capacity of chief engineer of the Department of Public Works. As has been stated, he was a man not only of excellent engineering knowledge and ability, but of excellent parts and character, a very lovable man, and his loss is and will be greatly felt by the department and in government circles."

William McNab, M.E.I.C.

Profound regret is expressed at the death of William McNab, M.E.I.C., of Montreal, one of the most widely known members of *The Institute*, at the Montreal General Hospital on February 23rd, 1923, after an illness of six weeks. At the time of his death, Mr. McNab was chairman of the Valuation Committee of the Grand Trunk Railway System, having been with the system for over half a century. He had been a resident of Montreal since coming to Canada in 1870, and had a great many friends and admirers in private life as well as in engineering and railway circles. The funeral was from his late residence, 25 Essex Avenue, Montreal, on Monday, February 26th, and among the very large number present were many officials of the railway and representatives of engineering profession.

Mr. McNab was born at Irvine, Scotland, and on his arrival in Canada entered the service of the Grand Trunk Railway at Montreal, in 1870, as draughtsman, being then in his fifteenth year. In 1887 he was appointed chief draughtsman and nine years later, in 1896, assistant engineer. In 1907 he became principal assistant engineer, in 1916 valuation engineer, and in 1918 chairman of the valuation committee. His standing in his profession led to his being chosen for important offices in the various engineering associations, both in the United States and Canada. He was elected a director of the American Railway Engineering Association in 1905, and after holding the office as second vice-president, first vice-president and chairman of many committees, he became president of the association in 1908, and was re-elected



WILLIAM McNAB, M.E.I.C.

to that office in the following year. In 1910 he delivered the address of welcome to the president of the United States, William Howard Taft, on the occasion of the convention of the American Railway Engineering Association, at Chicago. His work in the interests of the engineering profession in general, and railway engineering in particular, was most valuable. The specifications for roadbeds adopted by the railways of this continent, were contained in his report presented as chairman of the committee on roadways of the American Railway Engineering Association.

He was a member of St. Andrew's Society, a past-president of the Caledonia Society, and an honorary life member of the Montreal Amateur Athletic Association.

Mr. McNab was one of *The Institute's* earliest members, having been elected Member on February 3rd, 1887. He was always keenly interested in its activities and for nine years, from 1891 to 1899 was librarian; and for two terms, 1900 and 1907 he served on the Council.

PERSONALS

L. S. Dixon, A.M.E.I.C., has been appointed chief engineer for the three plants of the Eddy Paper Corporation in the vicinity of Three Rivers, Michigan.

F. H. Job, Jr.E.I.C., who until recently has been with the Bethlehem Steel Company at Welland, has accepted a position with the McClintic-Marshall Construction Company.

P. G. Gauthier, Jr.E.I.C., of Montreal, is with the Quebec Development Company at St. Joseph d'Alma, Lake St. John. Mr. Gauthier graduated in civil engineering from McGill University in 1921.

Thomas H. Dickson, Jr.E.I.C., is on the engineering staff of the New Brunswick Power Company, where he has been engaged in mapping distribution systems, testing, and general power plant work.

A. G. Barrett, S.E.I.C., is located at Kingston, Ontario, as instrumentman, with the department of public highways of Ontario. Mr. Barrett graduated from Queen's University in 1921.

Tom. A. Allan, A.M.E.I.C., has been appointed chief signal inspector of the Canadian National Railways, with offices at Toronto. Mr. Allan was formerly located at the Montreal office of the Grand Trunk Railway Systems.

E. H. Darling, M.E.I.C., J. J. Mackay, M.E.I.C., E. R. Gray, A.M.E.I.C., and S. T. J. Fryer, were appointed an advisory committee of the Town Planning Board of Hamilton, at a meeting of the board held on March 8th.

James McAdam, A.M.E.I.C., who has charge of the highway department of the firm of Frank Barber and Associates, Limited, Toronto, has just returned from a trip to the Old Country, where he was combining business with pleasure.

J. D. Calvin, A.M.E.I.C., is now with the Bayline Steamships Limited, Montreal. Mr. Calvin graduated from Queen's University in 1907, and has been recently connected with the Century Coal Company, Montreal, as superintendent of docks.

R. C. McCully, A.M.E.I.C., has accepted a position with V. D. Simons, industrial engineer, Chicago. Mr. McCully graduated from McGill University in 1916 and has had considerable experience on construction work in Canada.

J. L. Busfield, M.E.I.C., of the firm of Beaubien, Busfield and Company, consulting engineers, Montreal, has returned to Montreal after spending the winter months in Winnipeg on work for the Manitoba Power Company.

A. M. Reid, S.E.I.C., and C. A. Norris, S.E.I.C., of Toronto, were elected by acclamation, president and secretary-treasurer, respectively, of the permanent executive of the class of 1923 of the University of Toronto, with which class they graduate this spring.

Daniel T. Main, M.E.I.C., formerly sales engineer and works inspector, National Steel Car Corporation, Hamilton, has been appointed Montreal manager of the corporation, in charge of sales, his offices being 902 McGill Building.

F. W. Pearson, A.M.E.I.C., formerly municipal engineer for Wawanesa, Manitoba, has been appointed city engineer of Prince Rupert, British Columbia. Mr. Pearson has had a wide experience in railway location and maintenance construction, and municipal engineering.

Robert E. Butt, A.M.E.I.C., of Wolverhampton, England, has been appointed chief engineer with Messrs. Kindred and Company of that city. For the last nineteen years Mr. Butt has had a wide and varied experience in electrical and mechanical engineering both in Canada and England.

W. S. Wilcock, Jr.E.I.C., is located with the Jewel Collieries, Limited, at Wayne, Alberta. Mr. Wilcock graduated from the University of Toronto with the degree of B.A.Sc. in 1920, and after graduation he was with the department of mines as assistant surveyor at Copper Cliff, Ontario.

Howard J. Williams, A.M.E.I.C., formerly assistant engineer with the Maine Water Power Commission has joined the staff of Vaughan Engineers, Boston. Mr. Williams graduated from Queen's University with the degree of B.Sc., in 1917 and subsequently received the degree of M.Sc., from the Massachusetts Institute of Technology in 1920.

W. H. Abbott, A.M.E.I.C., formerly resident engineer of the Hull Electric Company of Hull, Que., has accepted a position with the Manitoba Power Company, Ltd., with headquarters at Winnipeg. Mr. Abbott has charge of the development of the western business of the company, with special reference to the transmission of power from Great Falls to the western part of the province.

E. A. Childerhose, A.M.E.I.C., is now with the Pennsylvania Water and Power Company, Baltimore, Maryland. Mr. Childerhose graduated in 1917 from the University of Manitoba with the degree of Bachelor of Electrical Engineering, and since that time has been connected with the city of Winnipeg as assistant to the chief engineer in charge of all work on new substations and installations, and later as electrical engineer of the Manitoba Power Commission.

R. M. Calvin, A.M.E.I.C., who graduated from Queen's University with the degree of B.Sc. in 1911, has resigned from the staff of H. S. Taylor, Ltd., of Montreal, and is with the Hanover Converters, Limited, at Hanover, Ontario. Mr. Calvin was connected with the Canadian Stewart Company, Toronto, and in 1914 enlisted with the Canadien Engineers. He was later with the Water Power Branch of the Department of the Interior, Ottawa.

D. Keith MacLeod, A.M.E.I.C., manager for the Dominion Insulator and Manufacturing Company, Limited, Toronto, Ontario, is now located at Niagara Falls. Mr. MacLeod graduated from McGill University in 1912 and has been connected with the Ohio Brass Company, both in the United States and Canada, for the past three years. Previous to this he was engineer of equipment and assistant superintendent of rolling stock for the Montreal Tramways Company.

Roy A. Crysler, Jr.E.I.C., is on the staff of the plan examining branch, City Architect's Department of the city of Toronto. Mr. Crysler graduated from the University of Toronto in 1920, and after graduating was assistant engineer at the experimental station of the Provincial Board of Health of Ontario, and later as engineer and surveyor to the Town Planning Commission of Niagara Falls, Ontario. For the past two years he was with the Hydro-Electric Power Commission of Ontario as field draughtsman at Niagara Falls.

A. E. Foreman, M.E.I.C., of Vancouver, district engineer of the Portland Cement Association of Chicago, was elected president of the Vancouver Automobile Club at the annual meeting on February 20th, last. Mr. Foreman is an active member of the Vancouver Branch and was recently elected president of the Association of Professional Engineers of British Columbia. He is a member of the executive of the Convocation of the University of British Columbia to which he was re-elected recently for a further term of three years.

H. G. Hunter, M.E.I.C., Canadian representative and resident engineer of the New York Continental Jewell Filtration Company for the past fourteen years, has associated himself with Francis Hankin and Company, Limited, Montreal and Toronto, and through their combined endeavours will now manufacture the equipment of this company in Canada. Mr. Hunter has been actively engaged on water works and sewage disposal works for many years, and came to Canada as resident engineer for the New York Continental Jewell Filtration Company in 1914, with headquarters in Montreal.

R. A. C. Henry, M.E.I.C., is director of the bureau of economics of the Canadian National Railways, his appointment to this position having been announced recently. Mr. Henry has been for some time assistant engineer with the Department of Railways and Canals with which department he was first appointed, in May 1912, as inspecting engineer, the following year having been promoted to the position of assistant engineer. Mr. Henry was born in Montreal in 1884, and graduated from McGill University in arts and science, having received his degree of B.Sc., in 1912.

Harold B. Fisk, A.M.E.I.C., of Drummondville, Que., has been appointed president of the Laurentian Hydro Electric Limited, Montreal, which company has been organized to distribute power in the Laurentian district. Mr. Fisk is a native of the Old Country having been born at Evesham, Worcestershire, England, in 1883. Since coming to Canada in 1907 he has been engaged on power work almost continuously, having been at various times on the engineering staffs of the Shawinigan Water and Power Company; the Mines Power Company (now Northern Ontario Power Company); the Kaministiquia Power Company, and the Southern Canada Power Company.

S. C. Wolfe, A.M.E.I.C., has resigned from the staff of Lockwood Greene and Company, and has been appointed chief engineer of the Horton Steel Works, Limited, of Bridgeburg, Ontario, in which position he has immediate charge of engineering as well as supervision of purchasing and field erection. After graduation from the Massachusetts Institute of Technology in 1906, Mr. Wolfe was employed as field bridge inspector for the Rhode Island Company, and later, in 1908, he was associated with Stone and Webster, Inc., on structural design until 1911 when he was appointed estimating engineer for the Minneapolis Steel and Machinery Company. From 1912 to 1914 he was with Messrs. Purdy and Henderson on concrete design, following which he accepted a position with the Trussed Concrete Steel Company. In 1915 he came to Canada in charge of all design for the Lockwood Greene and Company of Canada, Limited.

Appointed Engineer of York Township

F. B. Goedike, A.M.E.I.C., was appointed township engineer of York Township recently, and entered upon the duties of his new position immediately. Mr. Goedike is a graduate of Queen's University of the class of 1910 and since graduating has had a wide engineering experience in municipal work and other fields. Following graduation in 1910, Mr. Goedike was in charge of a party on plane table surveys for the Irrigation Department of the Canadian Pacific Railway and the following year was appointed assistant engineer for the same department on the construction of twenty-two miles of main canal and fifty miles of small ditches. The main canal, which was designed to carry seven feet of water with a bottom width of forty-two feet, required the use of steam shovel and tractor excavators and elevating graders.

In 1912 Mr. Goedike took charge of a party on the hydrographic survey of Toronto Bay for the Toronto Harbour Commission. In the latter part of the same year he was appointed resident engineer with the sewer department, of the city of Toronto, with which department he was engaged on sewer construction of all classes until the middle of 1915, when he was appointed locating and estimating engineer for a commission investigating radial railway entrances for the city of Toronto. In 1916 he became assistant engineer of the Toronto Harbour Commission, and in 1918 became associated with the firm of Barber and Wynne-Roberts, consulting engineers, Toronto, on water works and sewage systems. Towards the end of 1918, and for the following three and a half years, he was engaged on designing and estimating work of bridges, sub and superstructures, for the Hydro Electric Power Commission of Ontario. For a short period in 1922 Mr. Goedike was engaged on the water works extensions for the city of Toronto, and in the same year was appointed resident engineer on the tunnel sewer construction for the city of Hamilton.

New Engineering Corporation.

John T. Farmer, M.E.I.C., M.A.S.M.E., chairman of the Montreal Branch of *The Engineering Institute of Canada*, has been appointed chief engineer of the newly formed Combustion Engineering Corporation, Limited, whose head office is in Toronto, with branches at Montreal, Winnipeg and Vancouver. The president and managing director is A. J. T. Taylor. The vice-president is Winifred R. Wood, managing director of the Underfeed Stoker Company, London, England. Georges Usher of the Société Anonyme des Foyers Automatiques, Paris, is a director, and the secretary-treasurer, John Anderson.

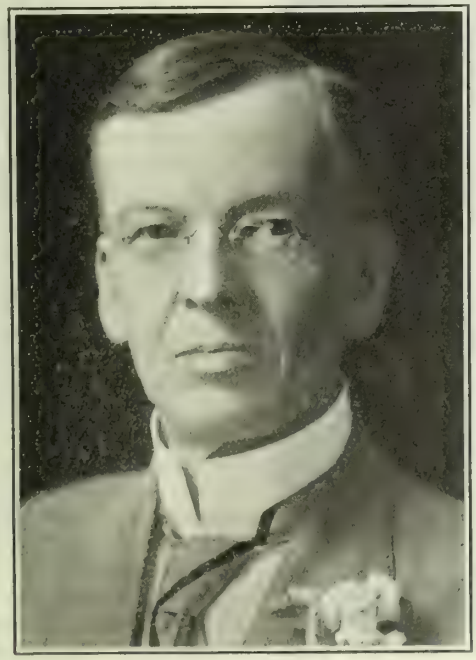
The Combustion Engineering Corporation Limited has acquired the sole manufacturing and sales rights in

Canada for the complete line of power plant equipment owned by the Combustion Engineering Corporation of New York — the Green Engineering Company of Chicago — the Coxe Travelling Grate Company of Port Carbon, Pa. — the Coshochton Ironworks of Monongahela, Pa. — Underfeed Stoker Company, Limited, London, England — International Pulverized Fuel Corporation of New York, and Sopulco Systems, Inc., New York.

The corporation will co-operate closely with all consulting engineers and will place freely at their disposal the services of its own engineers. The company is establishing a research department, to give special attention to some of the fuel problems of Canada, particularly those relating to the coals of western Canada. The new corporation has the benefit of British, Frenchand Ameican practices in connection with power plant equipment.

President, Ontario Association of Professional Engineers.

As a tribute to the man who, more than any other, may be considered as the father of legislation in Ontario, it is fitting that Willis Chipman, B.A.Sc., M.E.I.C., should be the first elected president of the Association. Those who associated with Mr. Chipman in securing legislation in Ontario are most fully appreciate of his



WILLIS CHIPMAN, B.A.Sc., M.E.I.C.

tireless energy, persistent effort and constant optimism, which was always an inspiration to the members of the advisory conference committee. That the legislation secured was not all that was hoped was due to adverse conditions rather than to any lack of foresight or neglect of opportunity on the part of those particularly interested.

Born at South Crosby, near Brockville, Ontario, on October 10th, 1855, Mr. Chipman was educated in the Athens and Weston high schools, and later graduated with first rank honours in civil and mechanical engineering, and in natural science, from McGill University in 1876. Following graduation he joined the staff of the geological survey for that summer, and in the autumn became engineering assistant on the construction of the Toronto water works. For three years following he was mathematical master of the Napanee high school, and for part of the following year was assistant on the survey of the steamship channel, Lake St. Peter.

During 1880, 1881 and 1882, Mr. Chipman engaged in land surveying in the Northwest Territories. From 1883 to 1886 he was supervisor of the Brockville water works construction. During part of those years and up to the present date Mr. Chipman was engaged in general engineering practice as a civil, sanitary, and hydraulic engineer, having been retained for the design and construction of water and sewerage systems of many places including Brockville, Cornwall, Pembroke, Gananoque, Galt, Orangeville, Petrolea, Barrie, Brantford, Berlin, Toronto Junction, Newcastle, N.B., Goderich, Moose Jaw, Sask., Edmonton, MacLeod, Alta., Sault Ste Marie, London, Port Arthur, Dalhousie, N.B., Welland, Halifax, N.S., etcetra.

In 1881 Mr. Chipman became an Ontario Land Surveyor and a Dominion Land Surveyor. He was one of the early members of the Canadian Society of Civil Engineers, having accepted membership on June 13th, 1887. He was a member of Council for the years 1899, 1901 and 1902, and has taken an active constructive part in the affairs of *The Engineering Institute* for many years. Mr. Chipman founded the Ontario Land Surveyors' Association of which he is a past-president. He was for a time secretary, and later president, of the Engineers' Club of Toronto. He also holds membership in the National Club, Toronto. Mr. Chipman is keenly interested in outdoors, and is an authority on bird and plant life of Ontario.

Standardization of Methods of testing Wood

Innumerable misunderstandings and disagreements concerning strength of lumber and timbers, and such accidents as grow out of miscalculation of the strength of various kinds of lumber, should be greatly reduced as a result of the standardization of methods of testing wood, recently undertaken by the many interests involved, under the auspices of the American Engineering Standards Committee. The U. S. Forest Service and the American Society for Testing Materials have been appointed joint sponsors for this undertaking, and 16 additional organizations are represented on the sectional committee which is to make an intensive study of the subject.

The scope of the committee's activities embraces the standardization of physical (including mechanical) tests of wood specimens. Of immediate importance is the application of these tests to (a) small clear specimens, and (b) structural timbers. The most important desideratum involved is the establishment of standard practice in testing wood which will make data obtained at different sources of the broadest possible value and insure the attainment of comparable results.

WALTER J. FRANCIS, C.E., M.E.I.C.,
PRESIDENT
The Engineering Institute of Canada.

No member of *The Institute* has been a more zealous worker in its interests or a more active participant in its activities than Mr. Walter J. Francis, who, as senior vice-president of *The Institute*, is called upon to assume the office of president for the remainder of the presidential year. His outstanding capacity, sincerity of purpose and abundant energy are well known, and are characteristic of him both as a man and as an engineer.

Mr. Francis was born in Toronto, in eighteen seventy-two, the son of Joseph and Elizabeth Francis, and was educated in Ontario public schools, and the Toronto Collegiate Institute. He is an honour graduate, with the degree of C.E., of the University of Toronto, eighteen ninety-three.

WALTER J. FRANCIS, C.E., M.E.I.C.
President
The Engineering Institute of Canada.

After graduation he became assistant to the chief engineer in charge of design and construction, Toronto Union Station. In 1896 he was appointed chief draughtsman on bridge construction with the Central Bridge Engineering Company, where he remained for one year. Subsequently he was engaged with the Department of Railways and Canals, and in that period he designed and was in charge of construction of two hydraulic lift locks on the Trent Canal, one at Peterborough and the other at Kirkfield, for a paper on which he was awarded the Gzowski Medal in 1906. During this year he was in charge of the 32,000 h.p. hydro-electric plant, Bonnington Falls. In 1907, Mr. Francis was assistant manager and chief engineer of the Dominion Engineering and Construction Company, Montreal, as well as engineer to the Royal Commission on the Quebec Bridge disaster. In 1908 he was appointed exclusive writer for "The Engineer", London. In 1909 he reported on various hydro-electric power propositions including those of Campbellford, Ontario, and North Saskatchewan River, Edmonton. In 1910 he reported on public utilities of the city of Edmonton, the Herald Building disaster, Montreal, Boxer Building collapse, Montreal, construction of the Don Syphon for main sewers, city of Toronto, hydro-electric and steam plants, city of Quebec, and represented the Canadian Society of Civil Engineers on the committee appointed to revise the by-laws of the city of Montreal.

In 1910 Mr. Francis formed a partnership with Mr. Frederick B. Brown, M.Sc., M.E.I.C., which still continues under the name of Walter J. Francis and Company. This firm has had an active career, having designed and reported on numerous hydro-electric and steam power plants including the construction of the Moose Jaw water supply, the hydro-electric plant at Carillon, water supply and underground electric distribution, Edmonton, and roads, sewage and other municipal undertakings in various Canadian cities, the Lower St. Lawrence Power Company, and a very large hydro-electric development on the Gatineau River. The firm was a member of the Water Board of Montreal, having been appointed on its creation and continuing until the work was taken over by the city staff.

A year ago when the Royal Commission was appointed by the provincial government of Ontario to make a complete report on the activities of the Hydro-Electric Power Commission of Ontario, Mr. Francis was appointed consulting engineer to the commission, the work involved in which has taken up the major portion of his time for the past twelve months.

Nearly every activity of *The Institute* has seen Mr. Francis taking a prominent part, and important membership committees, such as the Committee on Society Affairs and the Committee on Policy, as well as numberless Council committees, have received the benefit of his active participation. After the adoption of the report of the Committee on Society Affairs, Mr. Francis was mainly instrumental in the establishing of the Montreal Branch of which he was the first chairman. He holds the remarkable record of being continuously an officer of *The Institute*, either as councillor or vice-president, since the beginning of 1910, having been councillor from that year until 1918, and vice-president since that date.

Mr. Francis was vice-president of the Corporation of Professional Engineers of Quebec in 1920; has been president of the Engineering Alumni Association, University of Toronto, since 1920; holds membership in the American Society of Civil Engineers, the Institution of Civil Engineers of Great Britain, American Institute of Consulting Engineers (Charter Member), the Engineering Society of Toronto (Life Member), American Public Health Association, Montreal Board of Trade, the Rotary Club of Montreal of which he was president in 1917, the University Club of Montreal, National Club of Toronto, the Royal Societies Club London, England, and numerous other organizations. In Rotary International he held appointment, for seven years. In the Boy Scout and Wolf Club movements he is an active officer, and finds time in addition for hospital work in two different institutions, as well as being the Secretary of the Shriners' Hospitals for Crippled Children. He is a 32nd degree Free Mason, a member of the Royal Order of Scotland, and a past Grand First Principal of the Grand Chapter of Royal Arch Masons of Quebec.

It is well known to all who have been associated with Mr. Francis that, in anything in which he becomes interested, he gives freely of his time and his ability, and *The Institute* may look forward to able guidance from the presidential chair while he holds that important office.

Employment Bureau and Members' Exchange

***McGill University**

Name	Year	Course	Home address	Work preferred	Engineering experience
H. W. Buzzell	III	Civil	Abbotsford, P.Q.	Civil engineering, Montreal distr.	
B. A. Culpeper	IV	Civil	Montreal	Water power maintenance or construction, Que. or Ont.	3 years land surveying; summers—river survey, rail gauger.
T. O. Evans	I	.....	Montreal	Engineering work or drafting, Montreal district	2 years patent drawing office.
H. J. Goldberg	IV	Elec.	Montreal	Commercial dept. of electrical Co'y.	Hollinger Mine elect. maintenance
J. H. Holden	IV	Mech.	Montreal	Immaterial, Montreal	Shawinigan Eng. Co. drafting office.
J. G. Layne	IV	Metall.	Montreal	Metallurgical, non-ferous preferably	2 summers Mond Nickel Co.; 1½ yrs. land surveying; 4 yrs. H.M. Navy. Speak Spanish.
E. G. Maxwell	III	Civil	Montreal	Hydro construction cost work	House wiring, cost clerk, general office work, rodman.
M. Nathanson	I	.....	Montreal	Immaterial	
J. B. Pringle	III	Elec.	Montreal	Electrical	Northern Electric laboratory and telephone assembly.
E. W. R. Steacie	IV	Chem.	Montreal	Chemical engineering	Physical testing of steel; forest protection; dyes.
J. S. Wickwire	III	Civil	Kentville, N.S.	Surveying or construction, Nova Scotia	N.S. Highway Board assistant and instrumentman.

*More detailed information may be obtained on application to the Dean of the Faculty of Applied Science, McGill University.

***"Ecole Polytechnique" of Montreal**

Name	Address	Work desired	Experience work
Graduating class			
F. L. Desaulniers	34 Ave. Laval, Montréal	Chemist or engineer	Paper industry.
P. de Guise	443 E. Sherbrooke St., Montreal	Chemistry	Dairy industry.
Paul Berthiaume	2291 St. Dominique St., Montreal	Ch. engineering & laboratory	Dairy and ores essay.
J. R. Roy	23-16th Ave., Lachine	Construction	Concrete construction.
J. Jobin	38 Durocher Ave., Montreal	Metallurgy—Paper mills	Hydrographic survey.
J. G. Clément	536 Outremont Ave., Montreal	General construction	Construction.
Third year			
J. M. Portugais	Rimouski, P.Q.	Civil engineering	
G. Molleur	2510-A Park Ave., Montreal	General engineering	R.R. surveying.
L. P. Couture	Rimouski, P.Q.	General engineering	
R. Parent	1300 St. Hubert, Montreal	General engineering	Surveying and drafting.
W. Janelle	2240 Waverley, Montreal	General engineering	
F. Bossu	Ave. Prince de Galles, Longueuil	General engineering	Mining—Surveying.
P. Brodeur	1097 St. Denis, Montreal	General engineering	
C. Tourigny	Magog, P.Q.	General engineering	Surveying and Gen. eng.
H. Gendron	430 MacKay, Montreal	Chemistry—Paper mills	Surveying and chemistry.
F. Choquette	Beloeil, P.Q.	Chemistry—Paper mills	
J. Mayer	St. Augustin, Co. Deux Montagnes, P.Q.	Chemistry	R.R. surveying.
L. Fortier	1869 Cote des Neiges, Montreal	Chemistry	
R. Sauvage	1960 St. Denis, Montreal	Electricity	
G. Bathalon	St. Liboire, P.Q.	Work in a plant	
A. de Passillé	192 Cherrier, Montreal	Surveying	Surveying.
F. J. Leduc	2342 St. Hubert, Montreal	Metallurgy	Metallurgy.
Second year			
J. Ethier	1073 Mt. Royal Blvd.	Chemistry	
First year			
J. P. Lalonde	46 Blvd. Monk, Montreal	General engineering	Surveying.
T. M. Dechêne	50 Ave. Bougainville, Québec, P.Q.	Construction	
P. A. Villeneuve	Calumet, Que.	General engineering	
G. Gingras	124 St. Thimothée, Montréal	General engineering	
J. M. Forget	Labelle, Co. Labelle, P.Q.	General engineering	
P. Labelle	1031 St. Denis, Montreal	Chemistry	
Preparatory course			
P. E. Collin	60 Ste Cécile, Trois-Rivières, Qué.	Chemistry (P. and P. mills).	
R. Dubuc	218 Berri St., Montreal	Electricity	Electricity.
A. Décarie	6622 Western, Montreal	Electricity and chemistry	Electricity.
A. D. Cossette	St. Narcisse, Co. Champlain, P.Q.	General engineering	
L. Dufresne	13 rue de l'Eglise, St. Laurent, Que.	Construction	
W. Dupré	Verchères, Qué.	General engineering	Surveying.
A. Lefebvre	2468 Park Ave., Montreal	General engineering	
E. Loignon	178 de l'Epée, Montréal	General engineering	
T. D. Bernier	Cap St. Ignace Sta., P.Q.	Marine	
L. Bizier	Thetford Mines, Que.	General engineering	
G. Proulx	63 St. François, St. Hyacinthe	General engineering	
J. C. Bernier	2590 Park Ave., Montreal	Marine	
J. Asselin	545 Marie-Anne, Montréal	Mines	
J. Paradis	Ancienne Lorette, Québec	General engineering	

*All students in this list speak and write both French and English.

*Queen's University

Name	Work preferred	Experience
CIVIL		
Graduating class		
Brown, T. A.	Surveying construction or design	3 yrs. overseas, 2 yrs. with Geodetic Survey, recording and observing.
Corneil, F. M.	Hydraulic and heavy conc. cons.	3 yrs. overseas, 6 mos. in charge railway construction; 1 season instrumentman on surveys; one season power house construction.
Currie, R. V.	Highway construction as instrumentman	3 seasons dept. of highways; in charge of construction of macadam.
Chalmers, A. E.	Hydraulics or structural work	One season office staff on structural costs; 2 seasons concrete inspector and Tarvia work.
Foster, A. R.	Construction work	3½ yrs. overseas; 2 seasons instrumentman on surveys; one season office work, macadam inspection.
Gibson, J. C.	Construction or design	3 seasons highway and culvert construction.
Koen, J. D.		One season instrumentman, construction work.
Ludgate, J. V.	Field work with construction company	2 seasons instrumentman on surveys.
MacDonald, N. T.	Construction and highways in office or field	17 mos. electricians helper and lineman; one season instrumentman on highways.
Marlatt, C. E.	Construction work	3½ yrs. overseas; 2 yrs. tracer and surveyors asst.; 6 mos. foreman in charge of building construction.
McIlquham, W. S.	Municipal or reinforced concrete work	One season instrumentman with Geological Surveys.
Reynolds, W. M.	Hydro-development or heavy construction	15 mos. instrumentman and charge of construction of waterworks; 5 mos. field engineer.
Robertson, D. G.	Construction or structural design	2 seasons with inspector and instrumentman on highways.
Robinson, D. O.	Construction work	2 seasons instrumentman; asst. engineer in charge of construction.
Rousell, Frank		4 yrs. overseas; 2 seasons concrete inspector on highways; one season municipal work. Hot top and asphalt.
Swift, E. R.	Field or office work	3½ yrs. overseas, instrumentman, foreman on highways construction; bookkeeping experience.
Veale, F. J.	Construction or design	One summer instrumentman highways dept.; 2 seasons stone quarrie.
Tomkins, J.	Municipal or construction work	2½ yrs. overseas; one season Geodetic Survey; 4 yrs. foreman wood working plant, designing and estimating.
Webster, G. B.	Structural or reinforced construction	2 yrs. navy; 3 yrs. highways.
Warner, G. W.	Construction work in field or office	3½ yrs. overseas; 2 seasons instrumentman, Sask. Dept. of highways.
Third Year		
Hanna, H. B.	Reinforced concrete work	2 yrs. overseas; 2 seasons railway construction; one season foreman reinforced concrete construction.
Hipburn, D. O.	Construction work reinforced or structural	Concrete inspector D.P.H.O.
Macpherson, D. C.	Structural and reinforced construction	3 seasons timekeeping and construction.
Taylor, W. A.	Any work	3½ yrs. overseas; speaks English and French; 2 seasons surveys.
Whitton, J. B.		Overseas, fire ranging; one season instrumentman on railway location.
Snyder, H. H.	Desire work with hydro-electric development. Reinforced concrete and structural work	4 yrs. instrumentman on power house and dam construction H.E.P.C.
Holmes, E. I.	Surveying or drafting	Instrumentman highways.
Lewis, D. J.	Surveys or construction work	One year articled student D.L.S. surveys; inspection on highways.
MECHANICAL		
Graduating class		
Askin, R. J.	Production and efficiency work, or design of paper mill	18 mos. design with car company; 4 mos. detailer; 10 mos. layout and design pulp and paper plant 3 years.
Bastedo, T. F.	Production, combustion or drafting	2 seasons foundry and shop experience; one yr. motor car shop.
Climo, C.	Efficiency work, test work or drafting	3 yrs. overseas; shop experience, instrument; work two seasons production work.
Hipwell, J. E. H.	Production manager, efficiency or test work	3½ yrs. overseas; 3 seasons production in automobile plant.
Hansuld, S. B.	Efficiency work, drafting shop experience	One season shop experience; 3 seasons public utilities.
Harvie, A. C.	Drafting, efficiency or production experience	2 seasons machine shop experience; one season drafting and design.
Hay, M. N.	Sales work, efficiency and time study work	4 yrs. overseas; one yr. sales organization of motor co.
Read, G. W.	Mechanical installation, paper mill or foundry drafting	15 mos. engineering staff of mechanical meter company; one yr. sales work; one season shop and drafting experience; 2 mos. pipe fitting.
MacKay, L.	Drafting or office work	Timekeeper and office work; one season machine shop experience.
Moulton, R. H.	Efficiency work, drafting or design	2 seasons shop experience; one year time and office work.
Rapley, B. P.	Machine design or production work	Shop experience, automobile and machine repairing.
Morrison, N. A.	Machine design drafting or production	Shop experience.
Finkle, C. S.	Hydraulic installation; paper mill work or design	5 mos. railway shop; 10 mos. electrical installation; 14 mos. in repair garage and repair shop office experience as stock keeper and bookkeeper for automobile accessories shop.
Sulley, E. A.	Machine shop production; sales engineering or design	3 yrs. overseas; machine shop experience.
Geiger, D. G., B.Sc.	Electrical engineering; electrical or mechanical work	Testing lab of electrical shop; 2 seasons demonstrator; one season experienced in internal combustion engines and radio.
Saunders, J. B., B.Sc.	Electrical; mechanical design or installation	2 seasons apprentice work in electrical plant, house wiring and electrical transmission estimating.
Davison, C. F.	Shop production work, drafting and efficiency work	4½ yrs. C.E.F.; one yr. punch press operator; 16 mos drafting and design machine shop.
Third year		
Henderson, D. A.	Internal combustion	2 yrs. office of automobile company; machine shop practice.
Philp, Louis	Position in machine shop as tool maker	Expert tool maker.
McNeil, K.	Work in pulp and paper machinery installation or design	One season motor car co.; one season mill wrights assistant in pulp and paper mill; one yr. foreman of construction.

*Further information concerning these students may be obtained from the Employment Service Manager, Queen's University Kingston, Ont.

(*List continued on next Page*)

Queen's University (*continued*)

Name	Work preferred	Experience
ELECTRICAL		
Graduating class		
Affleck, W. E.	Electrical work or telephone line work	3 mos. sub-foreman for plant; 3 mos. electrical helper; 10 mos. concrete inspection.
Hicks, A.	Electrical work.	
Nayler, J. B.	Electrical drafting or testing work	3½ yrs. overseas; 10 mos. machine, and installation work.
Jones, V. C.	Designing or testing of motors	28 mos. overseas; 10 mos. drafting for A. C. motors and generators.
Collyer, E.	Power house work	11 mos. electrical wiring, and testing.
Bracken, W. C.	Electrical transmission work	10 mos. hydro-electric transmission inspector.
Taggart, H. A.	Electrical testing or machine design	8 mos. coil wiring.
Couse, H.	Electrical sales work or drafting	8 mos. electrical drafting; 3½ yrs. overseas.
Third year		
McKenzie, H. B.	Work with radio and vacuum tubes manufacture or telephone work	1½ yrs. thermionic valve manufacture; 3½ yrs. radio design; overseas with R.N.C.V.R.
Lyons, G. S.	Electrical testing, telephone work	2½ tel. installation and switch board repair.
Murphy, C. B.	Electrical work	10 mos. shop work.

*Further information concerning these students may be obtained from the Employment Service Manager, Queen's University Kingston. Ont.

Situations Wanted

Civil Engineer

Civil engineer, A.M.E.I.C., age 32, with varied experience as designer, checker and detailer on structural steel and reinforced concrete, desires change. Two and a half years on hydro-electric power house design. Location vicinity of Toronto or Montreal. Apply box 2-W.

Electrical

Third-year student in electrical engineering at McGill University desires summer employment preferably on hydro-electric work; holds a Nova Scotia third class stationary engineer's certificate and has had four summers' experience on repair and construction work. Apply box 91-W.

Sales and Combustion Engineer

Sales and combustion engineer, A.M.E.I.C., familiar with all types of town-plan equipment, construction, plant lay-out, maintenance, office routine, etc., desires position with responsible concern. Moderate salary. Apply box 97-W.

Civil Engineer

Wanted by graduate civil engineer, age 29, position with engineering or contracting firm, or industrial organization. Experienced in handling men. Apply box 98-W.

Mechanical

Student member of *The Institute*, graduating in mechanical engineering from McGill this year, desires a position either on mechanical or general construction work. Experience on building construction. Apply box 99-W.

Chemical Engineer

Position wanted in Toronto by young chemica engineer, graduate of Toronto University, 1921, experienced in plant operation, layout and design, present position cost and design engineer. Apply box 100-W.

Civil Engineer

Civil engineer, graduate of a university, fifteen years experience with a large industrial concern in Ontario, desires to become connected with an aggressive corporation. Has made a special study of, and has had experience in construction of hydraulic developments, docks, sewers, property administration, tax and land records. Full details of experience will be submitted on request. Apply box 101-W.

Situations Vacant

Highway Engineer

An industrial corporation in the province of Quebec requires the services of a thoroughly experienced man on the construction of asphalt pavements in a municipality. The position is one of foreman in charge of the work, and the applicant must be capable of assuming complete charge of the construction. The work in hand should last three or four months and possibly the entire summer. Applications with complete statement of qualifications should be addressed to box number 32-V.

Electrical Engineer

Electrical engineer with mechanical experience, graduate of a few years' standing, required for inspection work in Montreal. Apply box 10-V.

Draughtsmen

First class experienced draughtsmen required for work on steam power plant and general engineering in Nova Scotia. Apply box 16-V.

Electrical Engineer

Electrical engineer with extensive experience in the design of high voltage steel tower transmission lines required at once. Qualifications should be included with application. Apply box 18-V.

Mechanical Draughtsmen

Two or three first class mechanical draughtsmen with experience on plant and building layout required by an industrial company in the St. Maurice Valley. Immediate requirements for three or four months only, and possibility of one or more of the positions being permanent. Apply box 29-V.

Structural Daughtsman

Structural draughtsman, with considerable experience, required by firm in Montreal. Salary $175 per month or more, according to qualifications. Apply box 30-V.

Trade Publications

The Hamilton Gear and Machine Company, Toronto, Ontario, has published in a small forty-eight page book entitled "Hamilton's Gear Book" a large amount of most useful formulae, tables and gear data in as condensed and convenient a form as possible, which should prove of great value to gear users. This book is being distributed by the company at a nominal charge.

The Graduate Employment Plan of the University of Toronto.

The readers of *The Journal* should be interested in the organization and work being done by the Faculty of Applied Science and Engineering of the University of Toronto toward absorbing the graduating class into the work of the country.

Readers who are employers of university men will, under the plan being followed, have at their disposal a fund of information the value of which is unlimited. Employers who heretofore have never thought of university graduates for certain positions in different vocations, now have presented to them many fields that may be enhanced by the knowledge and training obtained by a science graduate.

Any employer who has a progressive outlook can see the nature and value of such a scheme. The success of any enterprise is directly dependent on the personnel. In the building up of an organization the infusion of young blood is essential. It is costly to train young men and yet with the realization of this fact how seldom is any careful investigation involved with the employment of a junior man.

The Faculty of Applied Science of the University of Toronto have now a scheme whereby they can give a prospective employer special information regarding graduating students. A particular man can be found for a particular position. The life of four years at the university is one which gives a tremendous insight into the character, ability and possibilities of the student. This particular information about the student, which cannot be gleaned from his academic standing, has been obtained not only from the staff, but from the students themselves.

This year this university has endeavoured by this new departure and through a special department under C. C. Rous, (a graduate of 1913), to obtain this valuable information and give it out to the desired source. This is an endeavour to get a perspective of the men and the various positions so as to eliminate if possible haphazard methods and try to fit the "square peg into the square hole". This, however, does not mean that the Faculty of Applied Science is securing positions for the graduates. It is held as a cardinal principle that they must secure their own positions but an effort is being put forth to assist them and put them in touch with the openings for which they are best suited.

Dean Mitchell has been in communication with those who might need men and with his letters have gone printed pamphlets showing the various branches of engineering for which graduates have received preparation. This pamphlet is reproduced below to show the remarkable professional and vocational scope, which cannot fail to impress the readers of *The Journal* whether they are employers, non-employers or employees.

Various Branches of Engineering for which Graduates have received Preparation.

The following is an outline of various branches and sub-divisions of applied science and engineering for which graduates in the various departments in this Faculty have received their fundamental technical preparation.

This has been supplemented by practical experience in both field and shop during summer vacations, which has been obligatory in the departments of mechanical, electrical, mining and metallurgical engineering. In the civil and chemical engineering departments, in which there is a wide diversity of work, graduates have had various kinds of engineering and scientific employment in summer vacation, during which many of them have secured useful experience. Such university training and practical experience as has been obtained, will enable a graduate to be immediately useful under proper supervision, in office, laboratory, shop or field.

Many graduates have also gained valuable preliminary experience in general business methods, in offices and elsewhere.

Civil Engineering.—Transportation; steam and electric railways, ship canals, river improvement. Public Works; including harbours, docks, navigation, river and flood control. Municipal; water supply, drainage, sanitation, streets and pavements, traffic and town planning. Surveying; including mapping geodetic and topographical work, aerial surveying. Hydraulic; hydro-electric power development, water supply and control, pumping, dams, canals, reservoirs, also irrigation and reclamation work. Structural; foundations, buildings of all descriptions requiring engineering treatment in design and construction in steel, brick and concrete. Bridge; connected with foregoing, steel and reinforced concrete bridges and fabrication of all material and its inspection. Highway; closely related to transportation and municipal, location, foundations and road surfacing, and structures accompanying. Contracting; engineering connected with all kinds of works usually built under contract, included in the foregoing.

Mining Engineering.—Exploration of mining areas and primary development, Mine surveying, Mining processes involving civil, mechanical and electrical work of underground workings, mining machinery and operation; Milling and treatment of ores, laboratory work of assaying and other forms of analysis and research.

Mechanical Engineering.—The design, construction, erection, testing and operation of machines for the generation, transmission and application of power to the various demands of industry. More particularly: Power generation; steam, gas, oil and hydraulic, especially hydro electric. Transportation; motive power for steam and electric railways, automobile and trucks, aeroplanes, marine engines. Manufacture; machinery of all kinds for milling, textiles, pulp and paper, wooden ware, agricultural implements, tools, rubber, leather, and for production of basic materials, steel, oil, cement, clay products. Handling; of materials, conveyors, cranes, dock equipment. Heating; ventilation and refrigeration.

Electrical Engineering.—Investigation, design, construction and operation of equipment and devices for generating, transmitting, distributing and applying electricity for all purposes. Power; by hydro electric, steam and oil generation. Transportation; by electric railways, urban and suburban and trunk and all equipment connected with them. Illuminating; involving all phases of electric lighting and its application. Communication; including telegraph, telephone and radio. Manufacture; the application of electricity to all forms of manufacture by motors and other appliances either in new works or by electrification of existing ones involving efficiency surveys; application to electro-chemical processes; the manufacture of all kinds of electrical machinery and apparatus for public utilities and industrial and domestic uses. Operation; the process of operating electrical plants, machinery and apparatus for all purposes.

Chemical Engineering.—The design, construction and operation of plant for the production of chemical products of all kinds; operation, investigation and control in numerous branches of manufacturing such as factories producing rubber goods, leather, pulp and paper, soap, oils of all kinds, meat products, flour and other food stuffs, illuminating gas, glass, paints and varnishes, Portland cement, printing inks, sugar, salt, glue, etc.; and in dye houses, distilleries, electro-chemical plants and many other works. The chemical engineer can render valuable services wherever raw materials are compounded or mixed or altered in their nature.

Metallurgical Engineering.—The production of metals from the ores produced by mining engineering and the working of the metals so produced, including alloys and their treatment. This involves investigation and research in the laboratory and study of the design, construction and operation of metallurgical plants comprising furnaces, foundries, smelters, refineries and lixiviation works.

Business and General.—As Applied Science and Engineering involves so much in economic development, there is a great demand for young technically trained men in the business side of many industries and business organizations where they can quickly adapt themselves and become especially useful in cost keeping, salesmanship and other branches of business leading up to administrative and executive positions.

The foregoing outline is merely suggestive and is not intended to be complete or in detail.

BRANCH NEWS

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

The February dinner-meeting was held at the Welland Inn on the 22nd. N. R. Gibson, M.E.I.C., consulting engineer, Niagara Falls, Ontario, delivered a very interesting talk on "Systems of Water Measurement for Hydraulic Efficiency Tests". The speaker reviewed briefly all the recognized methods of measuring flow of water, describing the equipment required and procedure followed in the application of each system, with particular reference to its possibilities for flow in large penstocks.

After pointing out the practical difficulties encountered when utilizing the older established methods for metering pipes of large diameter, Mr. Gibson described the method and apparatus he has developed in an effort to secure accurate measurement without elaborate and expensive preparatory work and without lengthy shut down of plant, involving loss of revenue. An active discussion showed the interest taken by the members, and it is hoped that at some future date Mr. Gibson will find it convenient to prepare his paper for publication.

The April dinner-meeting to be held on April 10th, at the Hotel Reeta, Welland, will be addressed by Fraser S. Keith, M.E.I.C., general secretary.

Plans are under way for a dinner dance on the occasion of the annual meeting in May. This will be held at Niagara Falls. The date and further details will be announced later.

Border Cities Branch

J. Clark Keith, A.M.E.I.C., Scretary-Treasurer.

The first regular meeting of the Border Cities Branch in 1923 was held in the Windsor Club on January 12th at 7 p.m. There were thirty-four present, including the following members: — Messrs. Allen, Considine, McGorman, Molitor, Newman, G. F. Porter, Bowman, Bradley, Davies, Fletcher, McIntyre, McMordie, Nelles, Porter, Richardson, Riddell, Tillson, West, Collins, Murphy, Wilson, S. L. Coulter and Dunbar. W. H. Baltzell, M.E.I.C., the newly-elected chairman for 1923, presided at the meeting and he expressed his pleasure in calling upon D. A. Molitor, M.E.I.C., to address the meeting.

The isthmus of Darien was discovered in 1502 by Columbus. In 1513 the isthmus was crossed by Balboa with a considerable force of Spaniards and they were the first white men to gaze upon the Pacific. For the next three hundred years of Spanish occupation no active progress was made towards establishing an isthmian communication between the seas. In 1823 Spain lost her colonies in Central and South America through secession. Between 1826 and 1850, five complete surveys were made across the isthmus culminating in the construction in 1855 of the French Panama Railway.

Under instructions from the United States government, surveys of the Tehuantepec, Nicaragua and Panama routes were made between 1870 and 1879, the commission then in charge favouring the Nicaragua route. While these surveys were under way, a provisional company was organized in France to investigate the feasibility of an isthmian canal. In 1876 Lieut. Wyse, a representative for this company, secured exclusive privileges for 99 years for building a canal, the route of which was to be selected by an international congress. This congress met in 1879 and decided upon a route which is practically the same as the now finished canal. In 1881, Ferdinand de Lesseps formed the Panama Canal Company, secured the concessions granted Wyse and proceeded to construct a canal between Panama and Colon.

This canal was to be of the sea level type, 72 feet wide at the bottom, 29.5 feet deep, 47 miles long, and to cost $169,000,000. This plan was soon changed to a lock canal and after expending $260,000,000. the work was abandoned in 1889 for want of funds. A new Panama Canal Company was formed in France in 1894 and an additional $7,000,000. was expended. In 1887 a concession was granted to A. G. Menveal to build a canal across Nicaragua, the company being incorporated by Congress in 1887. After the expenditure of considerable money, Nicaragua declared this contract forfeited and the company then sought aid from Congress, which resulted in the creation of the Nicaragua Canal Board in 1895. This board made an investigation and reported that the work could not be concluded with the limited time and means allotted, and in 1897 the president was authorized to appoint a commission which in 1899 reported and advised a more general investigation with a view of examining all feasible routes across the isthmus.

This resulted in the creation of the Isthmian Canal Commission in 1899, which made a complete investigation and in 1901, submitted an exhaustive report covering their findings for nineteen different routes, four of which were selected as offering the most advantageous conditions, and of these the Panama route was advocated as the most favourable.

After numerous complications resulting in Panama declaring her independence from Colombia, a canal treaty was signed by Panama in 1904, granting to the U.S., a zone 10 miles wide for a consideration of ten million dollars and after nine years an annual rental of $250,000. was to be paid. On May 4, 1904, the U.S., purchased the Panama canal property at a cost of forty million dollars and thus came into possession of property and rights which cost the French people $267,000,000 and many thousand lives to acquire.

The president then appointed a new commission with John F. Wallace as chief engineer to look after the construction work of the canal. This commission resigned November 16th, 1904, and was succeeded by the Shonts Commission. On June 13th, 1905, Mr. Wallace resigned and was succeeded by John F. Stevens. On June 24th 1905, the president appointed a board of consulting engineers for the purpose of considering the various plans proposed by the canal commission for the construction of the canal and this board submitted two reports February 5th, 1906; a majorit yreport favouring a sea-level canal, a minority report advocating a lock canal with

artificial lake and summit level at 85 feet above sea level. The plan of the minority report was adopted and carried out with slight modifications. Mr. Stevens resigned in March 1907, and was succeeded by Col. Geo. W. Goethals, and the work was turned over to the Corps of Engineers, U. S. Army.

In January 1909, the president appointed another board of consulting engineers to accompany Mr. Taft to the isthmus and look into the condition of the work and to report upon the feasibility and safety of the Gatum dam. This board submitted its report the following month, approving unanimously the type and dimensions of the dam and commending the general canal plans as adopted.

Of all the routes investigated by the Isthmian Canal Commission, there were only four which warranted making any complete surveys and estimates. Two of these were rejected as impracticable and the choice was reduced to the Panama or the Nicaragua routes. After much study and prolonged diplomatic relations, the United States acquired by purchase the best route for the Isthmian canal, offering as it did, the greatest possibilities from an engineering standpoint.

Before an actual decision was made, much discussion and thought was given to the type of canal to be adopted. A sea-level canal according to popular impression is a waterway affording unrestricted navigation. The lock type is assumed to be decidedly inferior to the former, owing to delays caused in lifting and lowering vessels. These conceptions are quite inaccurate. The sea-level canal would have been a deep narrow gorge which no large ship could safely navigate except at very low speed. A tide lock would also have been necessary at the Pacific and where the tidal fluctuation is 22 feet. The most serious objection to the sea-level canal was in its lack of control of the flood waters of the Chagres River.

The principal feature of the lock canal was an earth dam at Gatum designed to close the Chagres valley to form an immense lake into which it and its tributaries would empty. At Gatum ,vessels are raised 85 feet through three flights of locks. At the Pacific end of the canal another lake is created, closing the valley of the Rio Grande. At this point sea level is reached by a decent through two flights of locks. By using the lock type, the rivers, which presented such an obstacle to the sea-level project, were transformed into friends, excavation was reduced to a minimum and the only structures of any importance were readily built. The estimated cost of the lock canal was $360,000,000., as compared with $563,000,000. for one at sea level, requiring six years additional time to construct.

Possibly the greatest obstacle which attended the isthmian undertaking and which to a high degree brought about the failure of the French company was the danger to human life. A department of health and sanitation was created and as a result malaria was reduced to comparative insignificance, while yellow fever was stamped out.

Considering the canal in its relation to commercial life in Canada, it can be said that it opens the way to the Canadian northwest and brings Vancouver within eighteen days of New York city or twenty-one days of London. All this is accomplished without rehandling of bulk freight and at greatly reduced cost compared with trans-continental railway transportation. The chief benefits are thus derived by the wheat growers and lumber interests of the west who can market their products in competition with those from the eastern and northern districts. The Panama canal to-day stands as one of the greatest engineering undertakings in all the world.

With the aid of lantern slides, depicting profiles and interesting points in this work, the address was made most interesting.

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

A meeting of the branch was held at 8 p.m., on Monday, March 12th, 1923, to discuss the report on the railway situation in Hamilton made by W. F. Tye, M.E.I.C., and N. Cauchon, A.M.E.I.C., in 1917.

Before proceeding to the debate, J. L. Weller, M.E.I.C., moved, seconded by H. U. Hart, M.E.I.C., that the Hamilton Branch of *The Engineering Institute of Canada*, extend sincere sympathy and condolence to the family of our honoured late president, in the sad bereavement which they have sustained.

J. J. Mackay, M.E.I.C., who presided, outlined the events which led up to the report of Messrs Tye and Cauchon. Since then, two of the parties to the proposed common route had not materialized, viz. the Canadian Northern and the Hydro-radials. He then called upon Mr. Tyrrell to open the debate.

Mr. Tyrrell stated that 90 per cent of the traffic in Hamilton was bound to be east and west, because of the location of the city, between the lake and the mountain. It was exceptionally important that main highways should be unobstructed. Yet, what do we find? At Ferguson avenue the G.T.R., trains block traffic many times a day, and you see motorcars lined up sometimes for more than a block. That condition of affairs is intolerable, and while it exists, Hamilton can never expect to develop as it should. The Gage avenue crossing is becoming a worse obstruction from year to year. Then we have that box car of a depot on the G.T.R. People who pass through Hamilton once always judge us by our depot, and are not anxious to return, because they think the rest of the city is like the station. The great need at the present time was to do away with the cross-town lines, and to construct a new terminal station, which would serve the best interests of the railway company. An offer of one form of relief was brought before the people in the shape of the Hydro-radial scheme. But for one event it might have been approved at the polls. We were all interested when Sir Henry Thornton wisely made the promise to take up in the near future the electrification of the G.T.R. Sir Henry has been as good as his word and has already taken up the matter, is giving it serious consideration, and we are hoping for great things as a result.

Mr. Cauchon was then called upon, and first referred briefly to the late Mr. St. Laurent. He then complimented the Hamilton members of *The Institute* for their choice in debating a question of such immediate importance. In all railway improvement schemes in the

past, the most important factor was the G.T.R., but this company has been unable to undertake any of the planned improvements through lack of funds. It was hoped that now that the railroad has a head, the government would remedy this condition to a certain degree and make it possible to proceed with certain improvements. It was decidedly encouraging locally that one railway had come forward to offer to investigate the question of service and terminal equipment. It should be remembered in considering railway questions that all railways, whether privately owned or not, were supported directly by the public. Any duplication of service was therefore paid for by the public. The public benefitted through reductions in the cost of operation. The busiest railway line in Canada is the section between Hamilton and Toronto. During the war there were 87 trains a day hauled over the two tracks, though the right-of-way could have accommodated a larger traffic. It had been found that the providing of terminal facilities was by far the most costly portion of railway construction.

This district has the greatest railway system and service, the best electric service, and the richest soil in Canada. There are only some districts in British Columbia which can be compared to the Niagara Peninsula for richness of soil. There are in the Niagara district a most extraordinary traffic condition. There are about 250,000 persons in the country and the same number living in the cities. No better adjustment could be desired. It is up to the people to develop the district, especially up to the engineers. Hamilton has the harbour for western Ontario if you will get busy and have it developed.

During the war there were some 35,000 cars per month passing over the Gage avenue cross-town line. These cross-town lines must sooner or later be removed.

Mr. Cauchon then dealt with the possibility of the G.T.R., building a cut-off at Albion Mills to abandon the Ferguson avenue line, and an uptown station, illustrating his explanation as to the plans with lantern slides. Several unique proposals which had been put forward were shown on the screen.

Referring to the cost of building a terminal at King William street and Ferguson avenue, Mr. Cauchon declared that two-thirds of the property required was already owned by the city or the G.T.R. Some of the city streets will have to be widened shortly, and King William street offers an opportunity at present. When the railway terminal was constructed at Ferguson avenue, the cost of the work would be largely paid back through the extensive construction of industrial buildings which would take place in the immediate vicinity.

At the conclusion of Mr. Cauchon's remarks, Mr. Paulin presented the case against the plan, in part as follows: — The T.H. & B., held its present location by special act of parliament and without its consent the line could not be moved to any other route. The proper scheme seems to be for the T.H. & B., the Canadian National and the city of Hamilton to appoint representatives to go into the scheme. Supposing that it were decided to concentrate the railways on one route through the northern part of the city, the whole length of the T.H. & B. from Dundurn street to the Red hill would be cut off. The union station proposition as planned called for the purchase of sixty acres of land. The estimated cost of the uptown station would be about $8,000,000. This included property, the destruction of existing buildings, construction of bridges, etc. The Red hill cut-off together with the northeastern yards, would involve the expenditure of about $1,250,000. The proposal to double track the Beach line and raise the grade would cut off about 100 cottages from the water front, and serious delays in the service would be caused by navigation passing through the canal. The work at the Beach, including subways at Burlington, would cost about $2,000,000. This line across the Beach would effectually destroy the only watering place left in Hamilton.

The Red hill cut-off would be directly in the line of the city's growth and would duplicate conditions at Ferguson avenue and Gage avenue in the future in a very much greater degree.

The G.T.R. line on Ferguson avenue had built up about it a number of industries because of its presence. The same was the case with the T.H. & B. It would cost $20,000,000 to move these industries. If we deprive them of track facilities we will have to compensate them for the cost of teaming their products to the freight lines. Between them all, they handle between 700,000 and 800,000 tons of freight a year. The whole cost of the Tye-Cauchon scheme would be about $24,500,000.

Other disadvantages the speaker declared to be the fact that the increase in the length of haul required to reach an uptown station would mean 15 minutes delay on passenger trains. It would also do away with competition in transportation. Nearly all congestion on railways is caused by situations just such as the one here proposed. In Toronto, the city was trying to clear the water front of railway lines. In this city, the plan called for lines to be built along the harbour front.

Mr. Cauchon, in replying to Mr. Paulin's remarks, said they had been trying to get a conference between the T.H. & B., and G.T.R., but the former refused to confer. All that he has advanced is manifestly from the T.H. & B., point of view — the cost to them. The question is not one of moving the T.H. & B., at the present time, but rather seeing what can be done with the G.T.R.

The question was asked as to what would be the first step for the city to take toward the accomplishment of the Tye-Cauchon scheme. "The first move would be to arrange with the G.T.R. for the construction of the Red Hill cut-off and an uptown station," Mr. Cauchon replied. "The Red Hill cut-off eliminates the G.T.R. on the mountain side. If you don't get an uptown station, you don't get full advantage of the radial feature of the G.T.R., electrification."

Mr. Paulin inquired in what way a station at King William and Ferguson avenues would be superior to one at Stuart and James streets. Mr. Cauchon declared the King William street site to be the better location and would place the G.T.R., on an equal footing with the T.H. & B., as far as convenience in the way of a terminal was concerned. Mr. Paulin replied that the C.P.R., did not enjoy a large passenger traffic to Toronto especially because of the location of the terminal, but because of the fact that it gave service. It was brought out in the discussion that the actual cost of the T. H. & B. tunnel under Hunter street was $220,000. It was built some

thirty years ago and is above 1,900 feet long. It was constructed by first making an open cut and then covering it over. The discussion came to a close with a vote of thanks being tendered the debaters.

The secretary announced that the next branch meeting would be a joint one with the Toronto Branch of the A.I.E.E., on April 6th, to hear Stephen Q. Hayes of Pittsburgh, speak on foreign electrical developments. The meeting then adjourned. The attendance was about 150, including Mayor Jutten and many other prominent citizens.

Victoria Branch

Hugh Peters, A.M.E.I.C., Secretary.

Professor R. W. Brock, M.A., F.G.S., F.R.S.C., dean of the Faculty of Applied Science of the University of British Columbia, addressed the members of the Victoria Branch on Thursday evening, February 22nd.

The lecture dealt primarily with the science of geology as utilized in the direction of war operations, strategical and tactical, and with particular reference to the Palestine campaign. Professor Brock first explained how very slow the great war staffs of the contending nations were in availing themselves of the service of trained geologists and stated that the Germans were so backward in this respect that at least one army corps went on active service equipped with hazel switches for locating wells in connection with water supply.

Later on during the mining and countermining operations of trench warfare in France and Belgium the British army employed two geologists, while at the same period the Germans were employing fifty. Fortunately the two British geologists were apparently very superior to the German geologists as the latter were reduced to the ranks in consequence of their calculations regarding ground water problems proving less accurate than that of their enemy. Samples of geological maps prepared for military purposes were shown and those of the British, French, U.S.A., and German compared.

With reference to the Palestine campaign the lecturer touched on facts indicating the pre-war preparations made by the Germans, the latter having constructed good roads and commodious "hospices" for the Turkish government, "to accommodate the many pilgrims and tourists to the Holy Land". The "hospices" proved remarkably suitable for military strong points and were strategically located for that purpose. The geological information in the possession of the British Government at the outbreak of war was chiefly based on a map made by the late Lord Kitchener, who, when a young lieutenant, was loaned to an expedition engaged in historical research work in that locality.

The scheme of campaign carried out by General Allenby was briefly sketched and the topography and scenery from the Dead sea to Jerusalem was described and illustrated with many views of extreme interest to all students of history, the battle grounds of biblical times being indicated, and the geological features explained with reference to their bearing as controlling factors in determining the strategy of all military operations which have taken place in this much fought-over area.

A vote of thanks to the lecturer was moved by F. C. Greene, M.E.I.C., seconded by F. G. Aldous, A.M.E.I.C., and heartily concurred in by the audience.

Saint John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

A graphic description of the St. John dry dock was given by E. G. Cameron, A.M.E.I.C., chief engineer of the St. John Dry Dock and Shipbuilding Company, Ltd., at the regular meeting of the branch on Thursday, February 15th. The address was illustrated by a large number of excellent slides, showing the progress of the work from the setting of the first blast in 1912, to the present day.

Mr. Cameron described the progress of the construction of the Courtenay Bay breakwater which has a total length of 7,700 feet, and the dredging of the entrance channel and turning basin by the large hydraulic and ladder dredges. The dry dock, which is 1,150 feet long and 125 feet wide on the sill, has a depth of water over the sill at extreme high water of 42 feet. Numerous devices have been installed to eliminate difficulties which have arisen in other large docks. The electrical features were installed under the supervision of F. P. Vaughan, M.E.I.C., and the pumping station which will be capable of unwatering the dock in four hours is equipped with three 47-inch Rees-Roturbo suction pumps, each driven by a 750-h.p., motor. Smaller pumps have been installed to take care of any seepage and to empty the sewerage system. The pumps are being supplied by the Goldie and McCulloch Company, Ltd., of Galt, Ont. The entrance to the dock is closed by a floating caisson built by the Dominion Bridge Company. Just outside the entrance are two docks 600 feet and 450 feet in length of concrete and timber construction. Electric energy will be supplied from a power house on the works capable of generating 3,000 h.p. A 1,500-ton marine railway, repair shops, etc., are now under construction.

At the close of the address a vote of thanks to Mr. Cameron was moved by G. Stead, M.E.I.C., and seconded by G. G. Murdoch. A. G. Tapley, A.M.E.I.C., was chairman of the meeting.

Professor A. F. Baird, A.M.E.I.C., of the faculty of the University of New Brunswick, was the speaker at the meeting of the St. John Branch on March 2nd. The address on "Economic control and transmission of high voltage electrical energy" was greatly appreciated by the large number present and at its conclusion a vote of thanks to the speaker was extended by A. G. Tapley, A.M.E.I.C., chairman of the meeting.

Economic Control and Transmission of High Voltage Electrical Energy

In introducing his subject, Professor Baird declared that all engineering finally resolved itself into a question of cost. "The day is past," he said, "when the problem is merely one of accomplishment. The requirement for good engineering is that results be accomplished by the most economic expenditure". By most economic expenditure was not meant the smallest outlay of money. The possibilities of subsequent requirements, guarantee of continuity of service and permanence, all may require a large investment first, but one that would prove most economical in the end. It was here, said Professor Baird, in his power to perceive the balance between small expenditure sufficient for immediate requirements and a

larger outlay to meet the demands of the future, that the real difference between an engineer and a mere builder, lay.

Speaking about electrical transmission, Professor Baird pointed out that there were two general types — overhead and underground. By far the greatest number were overhead, not only because a larger voltage could be used, but because the construction cost was much lower. In Europe, underground transmission was much more common and voltages as high as 45,000 volts had been used successfully. The longest transmission line was 240 miles long, operating at a voltage of 150,000 volts.

Dealing with the most economical form of transmission line support, Professor Baird said that this was something for which no ruling could be given which could cover all cases. The tendency among electrical engineers in the first days of long distance, high voltage, transmission was to recommend steel tower construction. To-day the pendulum is swinging the other way and some authorities declare that unless there are special reasons which make steel towers advisable, the most economical form of structure for a load up to 12,000 k.w. is a wooden pole line. At somewhere around this load the strains produced by the necessarily large conductors make the stronger support necessary. There was one point in favour of the wooden pole that was often overlooked and that is the fact that the insulators often lasted longer and avoided puncture better when placed on wooden supports.

The paper was splendidly illustrated by lantern slides which were shown during the address.

London Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.
E. I. Olmsted, A.M.E.I.C., Branch News Editor.

At the regular meeting of the London Branch held in the rooms of the Public Utilities Commission, H. B. R. Craig, M.E.I.C., was the speaker of the evening, and gave a most interesting and instructive address on "Harbour Engineering". R. I. Olmsted, A.M.E.I.C., read a paper on "The Safety of Industry", and E. V. Buchanan, M.E.I.C., a paper on "The Economy of Knowledge". W. J. Forbes-Mitchell, A.M.E.I.C., was the chairman of the meeting.

"A noted American educationalist, Professor J. B. Johnson, in an article some years ago," stated Mr. Craig in the opening of his address, "wrote of the engineering profession as follows: "Men in other professions may blunder or play false with more or less impunity. Thus the lawyer may advocate a bad cause without losing caste, the physician may blunder at will, but his mistakes are soon buried, a minister may advocate, what he no longer believes himself, and feels that the cause justifies his course, but the mistakes of the engineer are quick to find him out and proclaim his incompetence." Harbour engineering, he continued, reached back to the earliest times. The honour of creating the prototypes of modern maritime engineering undertakings is usually assigned to the public-spirited policy of monarchs of the early Egyptian and Phoenician dynasties.

The history of this maritime construction extends back through the aeons of time, is evident in the history of the seas of Britian, Holland, Spain, Venice, Genoa, Rome, Carthage, Greece, Phoenicia and Egypt, in the order named. For instance, one ancient harbour built by Rome over 2,000 years ago, viz, — Civitia Vecchia, is still in existence, and has a safe, navigable depth of 20 feet, and the first lighthouse (Pharos) was built about 200 B.C., of white marble, and with a visibility of more than 100 miles. The beginning of Britian's sea power was the formation of the "Cinque Ports". Most of the world's great seaports are of modern development, and navigation and harbour engineering are to each other as cause and effect, and are very closely allied.

Among such works the development of a navigable waterway of adequate size through the chain of Great Lakes from seaboard to Fort William and Port Arthur, holds probably the place of most importance. The outstanding works in this scheme are: (1) the St. Lawrence river improvements, Montreal to Gulf; (2) the St. Lawrence canal system; (3) the Welland canal system; (4) the Detroit river and St. Clair flats development scheme; (5) the Sault canal and the Sault river scheme; (6) the terminals at Fort William, Port Arthur and Montreal.

The total cost to Canada of the development of this great system of inland waterways to date, exclusive of the intermediate harbours in Canada, amounts to over $155,000,000., and by the time the Welland ship canal is completed, to over $225,000,000. To deepen and improve the whole system so as to allow sea-going ships with full cargoes to move from the head of the lakes to the seaboard again, exclusive of intermediate harbour improvements, will cost from $200,000,000. to $400,000,000. and this is proposed to be jointly borned by Canada and the United States, it being assumed that Canada will be credited with the cost of any completed works that could be utilized in the adopted system.

The growth of traffic through the Sault canals since their opening in 1855, is shown by the following figures: 1855, 14,000 tons; 1895, 15,062,580 tons; 1922, 66,067,257 tons. In 1921 the volume of tonnage passing through the Sault canals was nearly twice the combined tonnage that passed through the Suez and Panama canals. The record lake cargo for any ship is held by the Canadian ship "Grant Morden" with these cargoes: 1915, 760,066 bushels of oats, and in 1919, 503,156 bushels of wheat. This last cargo would weight 15,000 tons and would, if put in cars holding 30 tons each, take 4 miles of trains to carry.

Mr. Craig had charge of the harbour work at Fort William from May, 1915, to July, 1919, and during 1917 of the work at Port Arthur, and he gave many interesting facts and figures as to this part of the scheme. The important works on Lake Erie are Port Colborne, the mouth of the present Welland ship canal, Port Burwell, Port Maitland, Port Stanley and Rondeau. The quantity of coal brought annually to each of these ports is from 100,000 to 400,000 tons.

Other important works where surveys have to be made continually are the Detroit and St. Clair rivers. Then there is the Fighting channel in the Detroit river extending for 5 or 6 miles, where to obtain the requisite depth of 21 feet, more than 4,000,000 cubic yards must be dredged. There are also shoals in continuous formation between Sarnia and Port Huron which need constant inspection. At Goderich, where to date over $2,000,000.

has been spent, and through which port over 21,000,000 bushels of grain have passed this year, the turning basin of the harbour is being widened and the elevators being extended.

At the close of Mr. Craig's most interesting talk a general discussion took place before the members adjourned to the dining-room. Here a buffet lunch which had been prepared by several of the members was served by them. This feature was enjoyed to such an extent that a resolution was passed to continue these luncheons at future meetings. It was noted that, among the several visitors present, were several architects of the London Chapter of the Ontario Association of Architects. Upon a request from the chairman, L. G. Bridgeman, secretary of the local Chapter, made a few remarks in the course of which he said that they certainly would enjoy closer relations with our local branch.

The chairman announced that at our next regular meeting our genial general secretary, Fraser S. Keith, M.E.I.C., was expected to be with us.

Halifax Branch

O. S. Cox, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the branch was held in the Green Lantern on February 2nd. Supper was served at 6.15 p.m., after which the meeting was called to order for the purpose of hearing a lecture on "Some Problems of the Municipal Engineer", by F. W. W. Doane, M.E.I.C., city engineer of Halifax, and other routine business.

Mr. Doane opened his lecture with a general outline of the duties which a municipal engineer is called upon to perform. These duties he pointed out cover a vast field of engineering; highways, hydraulics, sewage disposal, water supply, sanitation, lighting, and many other branches of the profession. He must also anticipate the future requirement of the town or city. In addition to these multifarious duties he must also be able to draft agreements and specifications and when occasion arises assist the city solicitor with engineering advice.

Mr. Doane then proceeded to take up these duties in detail commencing with water supply. One of the first questions of this problem being the collecting of data upon which to base the requirements of the future. Halifax was recently faced with the problem of increasing its supply either by additional works or by improvements to the existing system. After a careful study of the whole problem it was decided that the most economical thing to do would be to completely overhaul the present mains and instal meters. In spite of considerable adverse criticism from the general public, Mr. Doane's plan was carried out and in vindication of his judgment the water consumption of Halifax has been reduced from 400 gallons per capita in 1908, to 130 gallons per capita at the present time. Another great advantage which has been derived by metering, is the added fire protection from increased pressure and supply. In connection with the clearing of pipes, Halifax is one of the few cities on this continent which uses a mechanical scraper propelled by water pressure for removing the hard incrustations which form in cast iron water mains. The turned and bored joint has now been in use for a number of years and in Mr. Doane's opinion has proved very successful.

The speaker then took up the connection of the city engineer with the electric department, and in this connection it is interesting to note that Halifax was the first city in Canada to adopt an ordinance requiring that all wiring should be supervised by the engineering staff, and to-day all journeyman must hold a certificate from the city board of examiners of which the city engineer is a member, before he is allowed to take charge of electric wiring. Incidentally Mr. Doane called attention to the new lighting system which has recently been installed in Halifax. This is said by authorities to be equal to the best systems of other cities in Canada of the size of Halifax.

Sanitation was dealt with next. The municipal engineer must be conversant with matters affecting the public health. He must be a sanitary engineer competent to deal with refuse and sewage disposal, ventilation, destruction of insects and germs, and also be competent to pass judgment on plumbing. The municipal engineer must be somewhat of an architect, as under his charge come such public buildings as markets, pumping stations, baths, abbatoirs, incinerators, etc. The building inspection by the city is also supervised by his department. If the city possesses a tramway system, the city engineer must advise and specify routes, location of tracks, radii of curves, weight of tracks, types of paving, location of poles, and generally protect the interests and comfort of the public where these matters are concerned.

Perhaps the most important of the many duties of a municipal engineer is that of the control of streets, not only in design and construction, but in the regulation of traffic. Mr. Doane pointed out the enormous problem this has grown to be to-day, many of the larger cities having adopted a system of control by day and by night of signalling towers. This huge growth in traffic, which is principally automobile traffic, is causing engineers the world over to give the matter a great amount of study.

In conclusion Mr. Doane evidenced the fact that a municipal engineer to be successful must be a sound business man. By quoting the large expenditures which the engineer directly and indirectly controls, and without wishing to be egotistical, the speaker referred to a sum of two and one-quarter million dollars which had been expended by the city of Halifax at a cost of 1¼ per cent. A very apt quotation was then given which brought the lecture to a conclusion. "A successful city engineer must have the wisdom of Solomon, the optimism of Bryan or Lipton, the energy and persistance of Lloyd George, the diplomacy of Balfour, and the patience of Job."

The guests were then introduced, Ex-Alderman Ritchie, City Clerk Monaghan, and Ex-Alderman Godwin, each paying high tribute to Mr. Doane's sterling values as city engineer of Halifax. A very interesting discussion on Mr. Doane's paper was then participated in by Messrs. Handy, Barnes, J. W. Roland, Dyer, and others.

Some Recent Developments in Ventilation

The regular monthly meeting of the branch, at which there were forty-two present, was held at the Green Lantern on March 9th, 1923, with Professor D. W. Munn, M.E.I.C., presiding. During the supper, which preceded

the main business of the meeting, the members joined in singing a number of songs from the sheets recently supplied from Headquarters.

W. B. Mackay, A.M.E.I.C., presented a very interesting address on "Some Recent Developments in Ventilation". The speaker stated that the science of ventilation consists of taking conditions as found, and as created by artificial construction and artificial heating, and, by mechanical means, adapting these conditions to the needs of the human system. The earliest civilized countries of which we have record had an average temperature of 73 degrees and consequently no artificial heating was required for the comfort of the human body.

As civilization has advanced, however, the tendency has been towards cooler climates which has necessitated artificial heating appliances, and as this latter need has been increased there has grown with it an increased need for ventilation. The heat supplied by nature from the sun is healthiest and best adapted to the human system and the further we get away from this form of radiant heat, in our modern heating systems, the greater becomes the need for ventilation to adjust conditions to meet our bodily requirements.

Theoretically it would appear that the only essential condition is to supply sufficient heat to keep the body warm. It was found that the thermometer alone was not a perfect indicator so the amount of humidity was also regulated, but even then our nervous systems were not satisfied. Mr. Mackay explained the reason for this by illustrating by means of barometric charts, that in nature there is a constant variation in conditions of heat and moisture, and that by artificially maintaining a constant, theoretically ideal condition, or in other words by supplying heat and moisture to the body in straight lines, we produce monotony and as nature abhors monotony our systems rebel. The human body is itself a heating and ventilating system which adopts itself to varying conditions and the conditions of the atmosphere in which we live and work should be made to approximate as nearly as possible the pure free atmosphere supplied by nature. This is done by a system of ventilation which provides a constant circulation of pure fresh air.

The first steam radiator was built by James Watt in 1784-85 and the first patent for steam heating was issued in 1791. From the industrial application of air washers it was discovered that this process could be beneficially applied to the air breathed in factories, theatres, and other large buildings. The speaker traced the development of modern heating and ventilating systems and quoted interesting figures to show the increased efficiency derived by the human system from proper insulation of buildings. Insulation preserves heat, lessens the need for artificial heating and thereby lessens the need for ventilation.

Mr. Mackay's address was supplemented by remarks by Dr. Royer, executive officer of the Mass-Halifax Health Commission and by Colonel Chisholm of the Provincial Health Department. These men, who were guests of the branch, very kindly consented to address the meeting and gave some very instructive facts on the sociological phases of the subject, on food values, preventive medicine and on public health generally. The very cordial thanks of the meeting were tendered the speakers at the close of the discussion.

Ottawa Branch

F. C. C. Lynch, Associate E.I.C., Secretary-Treasurer.

Mining in Ontario

That a very large proportion of the important metals and minerals of commerce are found in Ontario and a much greater variety are being actually mined than in any other province was a statement made by John McLeish, B.A., director of the Mines Branch, Department of Mines, who delivered an address on the evening of February 1st, at the Victoria Memorial Museum on "Mining in Ontario". The meeting, which was held under the auspices of the Ottawa Branch, was very well attended. K. M. Cameron, M.E.I.C., assistant chief engineer of the Department of Public Works, presided in the absence of the chairman, O. S. Finnie, M.E.I.C.

The speaker of the evening, Mr. McLeish, has been intimately connected with mining operations throughout the Dominion, but particularly in Ontario. The lecture was non-technical and was fully illustrated with lantern slides covering the phases of the mining industry. Motion pictures of the salt industry and of gold mining in northern Ontario were shown and were very much appreciated by the audience.

Mr. McLeish dealt with the favourable situation for prospecting and marketing, the early history of mining, the growth of production, the iron situation, the greatest nickel resources, the present and coming era of gold, and other phases of the subject. He drew attention to the important geographical position occupied by Ontario, not only in relation to the other provinces, but also in relation to the Great Lakes as a transportation system, and to the great industrial centres of the United States.

Referring to the iron situation, the speaker said Ontario had not yet, unfortunately, been able to develop a successful and continuous iron ore mining industry. Ores of merchantable grade in the natural state had not been found in great quantity.

The Sudbury nickel deposits were remarkable not only because of the fact that they supplied over 80 per cent of the world's market, but because of the very large ore resources. These were already sufficiently developed to maintain the present industry for close upon one hundred years, and even beyond that the prospects were alluring. The problem that chiefly concerned the operators in this industry at the present time was to develop a market for the metal to replace that which armour plate formerly provided. It was believed that good progress was being made in the demonstration of new uses for nickel.

Discussing the present and coming era of gold, Mr. McLeish stated that since 1906, a dozen important gold areas had been opened in Timiskaming and Sudbury district. A recent report of the Ontario Department of Mines contained a sketch map showing 24 lode gold areas distributed across the great pre-Cambrian area.

In concluding the speaker said: "Let me state that during the past five years northern Ontario has contributed over ninety-five per cent of the metal mineral production of the province, and about thirty per cent of the total mineral production of Canada, and notwithstanding the magnitude of the total quantities and

values of metal already mined, no other metal mining district in Canada can, at the present time, demonstrate better prospects for longer life or more profitable returns."

Canadian Arctic Expedition, 1922

The Arctic Archipelago, ordinarily looked upon as barren waste land, may become a prized territory of the Dominion if the resources are developed. J. D. Craig, B.A., B.Sc., M.E.I.C., commander of the Canadian Arctic Expedition of 1922, contended at a lecture on the evening of February 15th, in the Victoria Memorial Museum under the auspices of the Ottawa Branch. Mr. Craig said that the real development of the Archipelago would come when mineral resources were found in paying quantities. There was also a possibility of providing a world meat supply in game, principally muskox. Indications were that these resources would at some time be developed.

The lecture was one of the most interesting of its kind given in Ottawa and was thoroughly appreciated by the large audience present. Five thousand feet of film, showing the interesting parts of the expedition and the lands visited, were shown on the screen. This was the first time the film had been exhibited. It was announced by Mr. Craig that the picture would be edited within the next few weeks and released by the government for general distribution.

The film showed the route travelled, Baffin island, Ellesmere island, Pond's inlet and Greenland, being among the principal points visited. The expedition, Mr. Craig said, was quickly organized in June 1922 for the purpose of making a survey of the Archipelago for the further establishment of police posts. The intention of the government, he said, was to cover the whole territory with these posts in the next few years. He explained that the total area of the Archipelago was 500,000 square miles, Baffin island being the largest with an area of 211,000 square miles. Small moss comprised the vegetation; there was no timber but occasionally some willow was found. The difficulties of navigation due to icebergs and ice floes were clearly shown while many interesting panoramic views of the northland and portrayals of Eskimo life made up the bulk of the film. O. S. Finnie, M.E.I.C., chairman of the Ottawa Branch, presided and extended to the speaker the thanks of the audience.

Mount Everest Expedition

A story of a land above the clouds, a land so high that the air hardly sustains life, was unfolded to a large audience in the Victoria Memorial Museum on the evening of March 1st, by Major E. O. Wheeler, M.C., R.E., formerly of Ottawa, a member of the famous expedition which endeavoured to ascend Mount Everest and succeeded in reaching an altitude of over 27,000 feet above sea level. The lecture was under the auspices of the Ottawa Branch and was presided over by O. S. Finnie, M.E.I.C., chairman of the branch. The size of the audience was a remarkable tribute for the people of Ottawa to pay Major Wheeler.

Major Wheeler was born in Ottawa, the son of A. O. Wheeler, director of the Alpine Club of Canada, and has himself become famous in the circles of the Royal Geographical Society, the Alpine Club and the Alpine Club of Canada. He commenced the tedious journey through Tibet to reach Mount Everest in May 1921, and returned with another party the following year. By means of a wonderful series of still pictures and his interesting, graphic and detailed description, a new world of sunshine, snow and rugged beautiful scenery was unfolded before the audience.

Major Wheeler expressed the opinion that it was hardly possible that the summit of Mount Everest would ever be reached. It was possible, however, he stated, and was altogether a matter of endurance and climatic condition. It was just a possible chance that at some time a party might strike ideal conditions and the climb might be made without a casualty. Captain Finch, a member of the 1922 expedition, had gone to a height of over 27,000 feet by the use of oxygen, and G. L. Mallory, another member of the same expedition, had gone almost 27,000 feet without oxygen. The 1921 expedition had been mainly a reconnaissance while the definite objective of the later one was to reach the summit. It would be a great achievement if it was ever done, he believed. As a result of recent knowledge the estimate of the height of Mount Everest would likely be revised to 29,141 feet, stated Major Wheeler. Previously it was believed to be 29,002 feet above sea level.

It was Major Wheeler's duty to prepare topographical maps of the Himalayas and he did this by means of photography. The beauty of some of his ptohographs baffle description. They were the first pictures taken of Everest at such close range. Major Wheeler's description of the obstacles placed in the way of the photographer above the clouds was most interesting. Atmospheric conditions resulted in objects miles away appearing quite clear but great difficulty was experienced with clouds. His travelogue of the trip through Tibet, of the natives, their customs and villages was not the least interesting part of the lecture. Crops were secured by irrigation up to 15,000 feet and some of the Tibet villages were above the clouds. Above there was continual blue sky with never a blot to mar it. The first party had camped at 21,000 feet and the second made its final camp at 25,000 feet. In the snow above the clouds the natives told of a tribe of hairy wild men who imitated the actions of anyone they saw.

Lacking oxygen it was hard to sleep in such an altitude. Although never actually sick, Major Wheeler stated he had experienced continual headaches and a disinclination to work. This latter was a real obstacle in reaching great heights as it required great willpower to overcome it. Food used in the high altitudes must be carefully chosen. A large amount of fats, butter and sausages, and sugar must be taken. His personal opinion was that the chances for anyone ever reaching the top were very slim. He believed that there were no technical difficulties in the way but that it was a matter of altitude and personal fitness. The trip had been a most enjoyable one and its results were worthy of the effort, he believed. He had succeeded in mapping 12,000 square miles of absolutely new country. Of this 600 square miles in the vicinity of Mount Everest was in detail. In addition the first expedition had discovered a route to the North Point of Mount Everest and paved the way for the 1922 party. Major Wheeler ended his lecture by remarking that, "if prohibition ever came to Tibet Mount Everest would never be climbled".

Lethbridge Branch

G. S. Brown, M.E.I.C., Secretary-Treasurer.

The Lethbridge Branch held their dinner and annual meeting at the local Y.M.C.A., on Saturday evening, March 19th, with about forty members in attendance. Following the dinner a social time was held, selections and solos, which were greatly enjoyed, were rendered by the branch orchestra and R. S. Lawrence, A.M.E.I.C., respectively.

At the close of the musical programme the chairman, C. M. Arnold, M.E.I.C., appointed scrutineers to count the ballots for the election of officers for the coming branch year. A social intermission was then called, and at the resumption of the meeting the secretary was called upon to read the minutes of the previous annual meeting and give the report of the past branch year.

Annual Report

During the branch year there were seven executive and nine general meetings held. The attendance of the latter has averaged about sixty per cent. The total membership for the years 1922 and 1923 was shown as follows:—

	March 11, 1922	March 10, 1923
Members	6	9
Associate Members	11	17
Juniors	1	3
Students	..	3
Associate	..	1
Affiliates	29	29
Total	47	62

There are three applications pending, one of whom is at present an affiliate.

Trial Balance as at March 10th, 1923

	Debit	*Credit*
General fund	.....	$113.98
Treasurer	$113.98	.....
Headquarters	.....	50.00
Dues account	135.01	.....
Membership account	.....	135.01
Headquarters	50.00	.....
	$298.99	$298.99

Receipts

Cash in bank, March 11, 1922	$125.93
Rebates on members	59.25
Affiliates, including Journal subscriptions	90.00
Branch news	9.88
Refund on Journal subscriptions	1.50
	$286.56

Disbursements

Printing	$ 28.86
Books and stationery	18.65
Sundries	49.57
Journal	34.50
Dues collected on account Headquarters, forwarded	41.00
Cash in bank, March 10, 1923	113.98
	$286.56

Assets

Cash in bank	$113.98
Fees owing by Affiliates	59.50
Rebates due from sundrie members	75.63
	$249.11

Liabilities

Advance from Headquarters	$ 50.00
Net assets	199.11
	$249.11

The report of the scrutineers for the election of officers for the ensuing year was then announced by the chairman as follows:—

Chairman	C. D. MacKintosh, M.E.I.C.
Secretary-Treasurer	G. S. Brown, A.M.E.I.C.
Executive Committee	C. M. Arnold, M.E.I.C.
	S. G. Porter, M.E.I.C.
	J. Dow, M.E.I.C.
	G. N. Houston, M.E.I.C.
	H. P. Keith, A.M.E.I.C.
Auditors	G. H. Dunning.
	C. J. Broderick.

The chairman, C. M. Arnold, M.E.I.C., then spoke on the activities of the branch during the past year, thanking the members for their co-operation which had made such a success of the meetings. C. D. MacKintosh, M.E.I.C., chairman-elect, was then called upon and in a few well chosen remarks expressed his appreciation of the honour of being elected chairman for the coming year.

A resolution of condolence on the death of Arthur T. St. Laurent, president of *The Engineering Institute of Canada*, was adopted by a standing vote of the branch with instructions that it be sent to Headquarters with a request to forward same to immediate relatives of our deceased president.

The business meeting was followed by an interesting address by F. H. Hutton, on "Mining and Smelting of Previous Ores", in which he described the prospecting and operation of the plants. A discussion followed after which the meeting was adjourned.

Winnipeg Branch

George L. Guy, M.E.I.C., Secretary-Treasurer.

It has been remarked the meetings of the Winnipeg Branch are called for 8.15 p.m., but that the actual time at which the meeting is formally called to order is becoming later at each successive meeting. The members stand around in groups and indulge in a general "pow-wow", and it is believed that this unpremeditated feature of our bi-monthly functions is becoming very attractive, and is providing an opportunity for the free interchange of professional, if not knowledge, at least gossip, an opportunity which would not otherwise arise. At the regular meetings of the British Institute provision is made for this intercourse, and tea is served immediately prior to the meeting; it is not suggested that we should do that in Winnipeg, but the spontaneous growth of the custom of a general informal talk-fest is very commendable and ought to be encouraged.

Three-Wire Distribution as Applied to Electric Traction

At the meeting of February 15th, W. Nelson Smith, M.E.I.C., read a paper on "Three-wire distribution as applied to electric traction". It was announced that Mr. Smith had been recommended for the Gzowski medal, but that owing to technical provisions governing the award, it was not possible to grant it to him; he was, however, awarded the Plummer medal. Mr. Smith was

warmly congratulated on the well merited distinction, and the branch is basking in the reflected glory of having provided the president, the out-standing technical contributions, and a never-to-be-forgotten annual meeting in 1922.

Mr. Smith traced the development of the three-wire system from its invention by Edison over forty years ago, through its application to electric light distribution and down to the first application to electric traction. He showed that its value in railway distribution lies in its elimination of high potential differences along the track of a single trolley system. He discussed the theory of the selection of a number of zones of opposite polarity and demonstrated that under such conditions rail currents are necessarily continually reversing and of much diminished magnitude.

The use of an automatic reverse current switch would protect underground cables from possible corrosive action of reverse stray current. The enormous reduction of track drop without the use of insulated track feeders, the ease of accomplishment of safe cable drainage, and the corresponding safety to underground structures were sufficient, according to Mr. Smith, to justify the installation of a three-wire system in Winnipeg.

The Marketing of Grain

On March 1st, James Stewart, of the late grain board, addressed the meeting on "The Marketing of Grain". He traced the course of the production of grain from the provision of the seed until it was marketed and used by the consumer, explaining the methods of payment of the farmer through grain tickets, bill of lading and cash tickets. He dealt with the spread between grades of wheat and showed how prices were determined under options or futures. The general trend of his remarks indicated that the existing system should be advantageous to the farmer, since it would be difficult for any local wheat board to effect the price of wheat as it was controlled by the world's supply and demand. He gave statistics on the growth and production of wheat through the prairie provinces, also on the elevator systems and grain firms doing business. He dealt with the transportation of grain from the producer to the sea board, indicating the factors effecting the course of grain to its destination.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

The Executive Committee has held three meetings during the course of the month at which a number of important matters were dealt with. The committee that was formed to investigate the local coal situation has been quite active getting together data concerning this very important matter and a number of its members have called upon representatives of other local bodies and have likewise been prominent at the recent convention of the Canadian Institute of Mining and Metallurgy. The newspapers and the public have shown great sympathy for the movement and without doubt many beneficial results will come of the decision taken by the branch to take an active part in outside affairs. The committee is composed of F. A. Combe, M.E.I.C., consulting combustion and steam engineer, chairman, J. T. Farmer, M.E.I.C., chief engineer, Combustion Engineering Corporation, chairman of the Montreal branch of the E.I.C.; F. W. Gray, A.M.E.I.C., assistant to the vice-president of the British Empire Steel Corporation; J. R. Donald, A.M.E.I.C., consulting chemist; G. C. Mackenzie, secretary of the Canadian Institute of Mining and Metallurgy; R. Beausoleil, A.M.E.I.C., oil burning specialist, and W. L. Halliwell, A.M.E.I.C., expert on furnace design, all of whom are recognized as practical fuel engineers qualified to speak on one phase of the fuel problem.

One of the most important points emphasized at a recent meeting was that while the acute shortage of this winter will probably not be repeated next season, people must realize that the supply of American anthracite is limited; that it will gradually become lower in quality and higher in price; and that the consumer must turn to other fuels for domestic heating, not only for national considerations, but from an economic standpoint.

Reference was made to the misunderstanding that had arisen over, and the annoyance that had been caused during the present winter by some of the fuel substitutes. People had been supplied with inferior soft coal in the belief that it was good Welsh anthracite and, as a consequence, had formed wrong ideas on the latter.

One speaker mentioned also that some householders had installed oil burning devices and had been dissatisfied with them through lack of understanding of the possibilities or the nature of the equipment, and its conditions. The meeting was of the opinion therefore, that some source of information was needed and the committee resolved to use every endeavour to supply this.

Within the next month, articles will be prepared for publication in the press dealing with the fuels which will be available next summer and winter, their relative advantages and disadvantages for the different types of furnaces and stoves, and economy based on the prices charged.

At varying intervals, other information will be distributed regarding the availability of different fuels and early next fall, articles will be published and meetings held to illustrate the proper methods of burning the different fuels with the best results.

Gouin Dam

On February 5th, Major J. A. Brace, M.E.I.C., delivered a very interesting lecture on the construction of dams generally, in unsettled regions of Canada and with particular reference to the unusual features involved in the construction of the Gouin dam. He pointed out how such works presented problems to the engineer and contractor not generally found to apply in more settled regions and classified them chiefly under transportation and camp construction. He stated that large plants often require less exercise of judgment in regard to methods of transportation than those of moderate size. For the former a railroad is necessary, but for the latter it often becomes a question of whether it is more economical to build a railway to the site or to adopt hauling by wagon or perhaps water transportation or a combination of both.

Dealing with the housing problem on construction, Major Brace said in part: — "Of almost equal importance is the housing question. I will say at the outset I think

most engineers do not give this matter sufficient consideration either in making their plans or estimates. Most of the provinces have adopted fairly stringent regulations governing housing and sanitation. Many of these regulations, while reasonable for a permanent village, are very severe when applied to a camp that will only be used for one or two years. Nearly all projects of this nature require provision for housing the permanent operating force and at almost every plant I know the accommodations are insufficient. If before starting construction the permanent buildings are designed and properly located they can then be constructed at the beginning and serve to house the better grade of construction employees.

In too many cases no provision is made in the plans for housing during construction. The contractor is left to work out his own plans. He usually has to do this in a hurry and the result is that he does work that costs from one-half to two-thirds that required for permanent construction. The buildings erected are unsuitable for the permanent needs of the plant and are often located in the way of other structures. While in some cases the cost comes directly on the contractor, in the long run it must be borne by the owner and consideration should be given as to whether most of the work cannot be made of permanent use."

Students' Prizes

Prior to this lecture Students' prizes, for meritorious papers presented last year were awarded to C. P. Mills, S.E.I.C., and W. J. S. Dormer, S.E.I.C.

Loud Speakers and Public Address Systems

An address, possibly unique in the history of Montreal and *The Engineering Institute of Canada*, was given by H. J. Vennes, of the Northern Electric Company. Its effect was to show that loud speaking orators were no longer needed, since by voice amplifying methods, ordinary voices could be dissected, turned into electric waves, re-collected again, and then distributed so as to be heard by hundreds or thousands, without losing a particle of their original characteristics, — with the voices turned loose wherever there were people to hear them. Mr. Vennes' explanation of this proved technical but was simplified materially by the lantern slide charts. His examples of how it was accomplished were utterly convincing. From showing on charts how a human voice could be taken apart, sent in waves to another place and then re-assembled and distributed in all its original characters, dropped where it was most needed, he proceeded to show how this was done.

It was not one address, nor was it one audience, since one address was given at *The Institute* headquarters on Mansfield street, and the other was given by Professor A. S. Eve at his home on Mountain street. Both addresses were heard at both places, and they were interspersed with a piano solo by Mrs. Brookes, played by her at the home of Professor Eve, which was perfectly heard at the meeting at Headquarters.

Dual applause heard at each end of the wire, marked the end of the lecture and demonstration, and a warm vote of thanks was passed to the Northern Electric Company and the Bell Telephone Company which had made such a remarkable demonstration possible.

Story of Compressed Air

This proved also to be a novel lecture in that it consisted particularly of a film showing the exact happenings in an air compressor and other air driven machinery when used. E. S. Winslow, A.M.E.I.C., explained the various types of air handling apparatus in use to-day, the progress and modifications made in late years, and the efficiencies that are at present attainable.

He then proceeded to show, by means of a cleverly arranged film, first, the object and operation of the various parts of an air compressor, and then the subsequent work that could be done by the compressed gas. The purposes to which air can be put in the compressed states seemed unlimited — judging by the numerous devices illustrated and much benefit was derived by those present in seeing the practical adaptations to engineering and construction works.

"Causerie sur l'exploitation des Tramways de Montréal"

In conformity with a policy of the branch inaugurated last year a paper was given in French on March 1st. We were fortunate in securing Monsieur Paul Seurot, M.E.I.C., chief engineer of the Montreal Tramways Commission for the occasion. His subject is of timely interest in the metropolis and was very well received by a mixed audience of French and English speaking members. It was amply illustrated with slides and tables giving information such as is not generally obtainable nor readily accessible, and it was considered of such interest that it is being translated for later publication.

Considerable discussion followed the paper as a result of some of his statements, particularly as he could not make known confidential information concerning certain projects for the future. Many pointed questions were put by members who are actively engaged in transportation problems — notably those concerning municipalities adjacent to the metropolis.

Power Problems in Manitoba

The above subject was very ably handled by our former secretary-treasurer, J. L. Busfield, M.E.I.C., on March 9th. For some four months past he has been engaged on the study of power conditions in the city of Winnipeg and the developments on the Winnipeg river. His address proved to be of great interest. He outlined the various sources of supply existing and in project, and showed some very good slides of the construction of the new Great Falls, on the development of which the chairman for the evening, Julian C. Smith, M.E.I.C., was the chief engineer.

Mr. Busfield also brought back with him a moving picture film depicting various points of interest in the West which was shown at the lecture. This film was made for the Manitoba Government in order to indicate the water-power resources of the province, and was unique in the methods adopted.

During the meeting two-minute silence was observed as a mark of respect for our beloved late president, Arthur St. Laurent, M.E.I.C., and a motion of sympathy was proposed by J. A. Duchastel, M.E.I.C., seconded by O. O. Lefebvre, M.E.I.C.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
Floyd K. Beach, A.M.E.I.C., Branch News Editor.

On February 26th a "Coal" evening had been planned. Papers were to have been delivered by Major C. C. Richards, M.E.I.C., on "Coal Formations in Alberta", and by W. J. Dick, M.E.I.C., on "The Coal Mining Industry in Alberta". Major Richards was unable to be present, owing to illness, and his paper was read by Lt.-Col. F. M. Steel, D.S.O., M.E.I.C. Col. Steel had very short notice, but responded very ably and presented the subject in a very interesting manner. The other speaker of the evening was kept from attending owing to the death of his only son, and standing vote of condolence to Mr. Dick was passed.

F. W. Alexander, M.E.I.C., district engineer for the C.P.R., and for many years one of the main stays of the branch, is being transferred to Vancouver, and P. J. Jennings, M.E.I.C., chairman of the branch, made an address of appreciation and farewell which was responded to very briefly by Mr. Alexander.

I. P. MacNab, M.E.I.C., late superintendent of the Nova Scotia Tramways and Power Company, at Halifax, has come to Calgary to take an executive position with the Riverside Iron works and he was welcomed to the branch and replied very fittingly.

Discussion on the proposed changes in by-laws was opened by the chairman in order to bring out information and opinions and thus ensure a larger vote on them. Messrs. Craig, Beach and MacNab spoke briefly in favour of the proposed changes, and Messrs. Alexander. Trowsdale and Stockett against. The result of the ballot will be known before this appears in *The Journal*, so that an extended report of the discussion is not needed further than to say that all speakers were of one opinion, that it would be undesirable to offend any large minority by new legislation. Members who spoke for the change in by-laws felt that the number in active opposition is really smaller than might be supposed from the argument contra which appeared with the ballot.

Considerable interest in the newly completed Institute of Technology and Art is being taken by Calgary citizens. Meetings of interested persons have been held, at which methods of improving its service to the community have been discussed, and an advisory committee has been appointed. A request from the secretary of that committee has been received by the branch to name two members of *The Institute* to act on this committee, feeling that valuable assistance can be given by this body. The suggestion was made that one of these members should be a coal man, as Alberta's coal resources are highly important. At a meeting of the executive held March 7th, B. L. Thorne, M.E.I.C., was appointed as coal mining representative, and A. L. Ford, M.E.I.C., as representing general engineering education interests.

Annual Meeting

On March 10th a luncheon was held at the Board of Trade, attended by 40 members. The new E.I.C. song sheet was tried out, with A. S. Chapman, A.M.E.I.C., at the piano, and W. B. Trotter, A.M.E.I.C., as "precentor".

Reports of standing committees and of the secretary and treasurer, brought out the facts that the branch is in very flourishing financial condition, being third in Canada from the standpoint of net assets. Also that the branch year was very successful from a standpoint of number of meetings and regularity of attendance.

The branch news editor reported that the revenue from branch news in 1922 was 23 per cent of the total revenue from all sources, and over 40 per cent as great as the rebates on account of dues. Only one other branch received a greater revenue than Calgary in 1922. It was pointed out also that the secretary has been very active in securing local publicity for the branch, and the newspapers have beeen very good in sending reporters to meetings, and in publishing certain articles read before the branch as "features". In fact, most of the recommendations of *The Institute* Publicity Committee have been actively in force during the past year. Mr. Beach concluded by placing his resignation as branch news editor, owing to press of other duties.

P. J. Jennings, M.E.I.C., the retiring chairman, made a short address, thanking the retiring executive and committee for their assistance which had resulted in a very successful year. The report of the scrutineers announced the following elections:—*Chairman:* V. Meek, A.M.E.I.C.; *vice-chairman:* F. E. Emery, A.M.E.I.C.; *secretary:* J. A. Spreckley, A.M.E.I.C.; *Treasurer:* G. P. F. Boese, A.M.E.I.C.; *Executive:* W. J. Dick, M.E.I.C., A. S. Chapman, A.M.E.I.C., John Haddin, M.E.I.C.; *ex-officio:* P. J. Jennings, M.E.I.C., B. L. Thorne, M.E.I.C.; *auditors:* A. Fraser, A.M.E.I.C., J. J. Hanna, A.M.E.I.C.

Saskatchewan Branch

D. A. R. McCannel, A.M.E.I.C., Secretary-Treasurer.

On February 22nd a special meeting of the branch was held in the G.W.V.A. building, Regina, R. N. Blackburn, M.E.I.C., presiding. E. Markham, A.M.E.I.C., read a paper on engineering cost accounting, which he illustrated by charts and forms. The interesting nature of the subject was clearly shown by the active discussion which followed. At the close of the business session a pleasant hour and a half was spent playing progressive whist.

On March 6th, the sixth annual meeting of the branch was held at the Co-Operative Creamery building, Regina, J. R. C. Macredie, M.E.I.C., chairman, presiding. Reports from the various standing committees were received and the annual election resulted in the following officers being elected: — *Chairman:* Lieut-Col. A. C. Garner, M.E.I.C., Regina; *Vice-Chairman:* Professor C. J. Mackenzie, M.E.I.C., Saskatoon; *Secretary-Treasurer:* D, A. R. McCannel, A.M.E.I.C., Regina, (re-elected); *Executive:* H. N. MacPherson, A.M.E.I.C., Regina, (2 years), J. D. Peters, A.M.E.I.C., Moose Jaw, (2 years), Professor G. M. Williams, A.M.E.I.C., Saskatoon, (2 years), R. W. E. Loucks, A.M.E.I.C., Regina, (1 year); *Nominating Committee:* M. B. Weekes, M.E.I.C., Regina, Convener, J. McD. Patton, A.M.E.I.C., Regina, H. G. Phillips, A.M.E.I.C., Regina, E. H. Phillips, A.M.E.I.C., Saskatoon, S. Young, A.M.E.I.C., North Battleford.

The Legislation Committee reported that legislation was desirable but the majority of the committee were of

the opinion that an attempt to secure same at the present session of the Legislative Assembly would not meet with success and might prejudice our ultimate chances. The report was received favourably and the committee re-appointed.

A paper entitled "Underground Electrical Construction as a Factor in the Conservation of Streets and Highways" was submitted by J. R. Cowley, electrical superintendent, Saskatoon, and was read by T. McGuinness, A.M.E.I.C. Mr. McGuinnes complimented the writer and was of the opinion that the information obtained, should be interesting to the citizens of our western cities.

The retiring chairman, J. R. C. Macredie, M.E.I.C., read a paper on "The Engineer's Place in the Development of the Country including the Ethics of the Profession", in which he paid tribute to each class of engineer in the early history as well as the present history of the west. In the absence of Lieut.-Col. A. C. Garner and Professor MacKenzie, he consented to preside at the evening meeting, which took the form of a dinner held at the Kitchener hotel. The members' wives were invited to this function and a toast to the "Ladies" was one of the three toasts on the programme. The provincial government was represented by J. G. Gardiner, minister of highways, and the city of Regina, by Mayor S. C. Burton. Shortly after 8.00 p.m., the party adjourned to the Grand theatre where the balance of the evening was spent.

Edmonton Branch

R. H. Douglas, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the branch was held in the Edmonton Board of Trade rooms Wednesday, February 14th, 1923, at 8.15 p.m. Mr. E. Stansfield, M.E.I.C., occupied the chair, about twenty-five being present. Mr. Cunningham, superintendent Edmonton power plant, gave a paper dealing with the power plant, giving a description of the various electric units and switch-board arrangement. Mr. Cunningham also went into the question of fuel, showing how the local slack coal was being used and how the cost of producing electrical power was steadily being reduced.

H. G. Dimsdale, A.M.E.I.C., commissioner of highways, Alberta Government, gave a very comprehensive account of highways in general, and Alberta highways in particular. Types of construction were examined and comparative costs given. The use of our Northern asphalt was gone into and it was shown that the cost of producing this material had very nearly reached a point where it could be economically used as a road-making material.

Dr. Wyatt, of the University of Alberta, gave in his paper an account of what had been accomplished by the soil survey that has been carried on in Alberta during the past few years. Dr. Wyatt described how the work was carried on and showed by means of a map the territory that had been covered to date. In the discussion following the question of soil survey was thoroughly gone into and it was brought out that had the soil survey been established twenty-five years ago it would have prevented certain districts being farmed that were unsuitable for that purpose. Soil drifting was discussed and methods of prevention suggested.

Kingston Branch

L. T. Rutledge, M.E.I.C., Secretary-Treasurer.

A regular meeting of the Kingston Branch was held on February 20th, at which meeting Professor Lindsay Malcolm, M.E.I.C., professor of highway and municipal engineering of Queen's University, gave an address illustrated by slides and motion pictures on "Methods and Plant Used in Concrete Road Construction". Professor Malcolm is especially fitted to speak on this subject, first, from a theoretical standpoint due to his connection with highway engineering at Queen's and secondly, from a practical standpoint, since he has been engaged in road building as a contractor for quite a number of years. In his address he went into the details of his subject very thoroughly. Methods of procuring and handling of materials economically were first discussed. Then the various machines used by small and large contractors were described and illustrated. Lastly methods of construction and various operations in road-building were dealt with in a very comprehensive manner. The lecture called forth considerable discussion and the meeting was considered by all to have been a very successful one.

A New Measurement of Water Flow in Penstocks

On February 27th, the branch were especially honoured to have as the speaker, Norman Gibson, M.E.I.C., hydraulic engineer, Niagara Falls, N.Y. He spoke on the application of his new method of measurement of water flow in penstocks. Mr. Gibson first explained the relative merits of the various known methods of measurement of water flow. These are, briefly, the volumetric, weir, venturi meter, Pitot tube and a few others. After stating that no one of these is practical and dependable in installations such as those at Niagara, the speaker related how he came to make his invention. His method makes use of two well known principles, the first being Newton's second law of motion, sometimes referred to as the equation of impulse momentum, and the second being a corollary of the first, namely, the relation between change of pressure and change of velocity of a column of water expressed in terms of the velocity of the pressure wave. The application of these two principles makes it possible to determine the average velocity of a column of water in a pipe by recording the changes of pressure at a point in the pipe when the flow is gradually brought to rest by the closing of a valve or the gates of the turbine. The changes of pressure causes a movement of a column of mercury, in the pressure tube. This movement is recorded on a film by a light beam and a pressure time wave or diagram is obtained. The office work consists in measuring this diagram and by applying the necessary mathematics the discharge is obtained.

Remarkable accuracy is realized. This is due to the fact that a small change in velocity can be made to produce a relatively large change of pressure. In the Pitot tube the velocity head only is observed, or at best, by differential methods only some small multiple of it. In Mr. Gibson's method, a record is made with great precision of a quantity that is many times greater than the velocity head. The element of time, even though

very short, must, however, be considered. Time can be measured with great accuracy, but in this method, time is not measured directly at all, but only the product of pressure and time. Experiments were performed at Cornell University under the supervision of Mr. Gibson to obtain satisfactory proof of the accuracy and it was verified so that the American and Canadian governments place confidence in it.

In making a test on a plant very little preliminary work is necessary and very little convenience at the plant is felt. The recording apparatus is set up along the outside of the penstock and attached to a ¼-inch piezometer opening tapped into the wall of the penstock. The elevations of the headwater and tailwater are carefully observed. A system of signal bells are established for the operator at the instrument to signal to the observers at the forebay and tail race and the assistant at the turbine governor. At a signal the turbine gates are closed, the duration of closure being from eight to eighteen seconds, depending on the gate opening. Immediately preceding and during the closure of the gates and for a short time thereafter the apparatus records the variation in pressure relative to the time forming a wave diagram. A complete test can be made with about two hours of intermittent interruption of the commercial supply of power from the unit being tested, so that no serious or prolonged interruption is experienced. The process is simple and inexpensive since no special appurtenances in the pipe line are required.

A very hearty vote of thanks was tendered Mr. Gibson by Professor W. P. Wilgar M.E.I.C. on behalf of the branch for his excellent lecture and for his great kindness in making a special trip to Kingston to give this paper.

Toronto Branch

O. M. Falls, A.M.E.I.C., Secretary-Treasurer.

This past month the branch has held four regular meetings at which the attendance has been most encouraging. The Students of *The Institute* have not shown their usual enthusiasm, but the approaching annual examinations are looming in the not distant future and this no doubt explains their non-attendance. Several interesting and instructive discussions have developed arising out of the papers read, which were of an usually high standard.

It will no doubt be of interest to the membership of the branch to learn that negotiations have been opened up in an effort to hold one monthly meeting during the winter session in conjunction with the other engineering societies in the city, and it is hoped that before the winter session commences arrangements will have been completed so as to enable this to be carried out.

Meeting of Waterworks Association

On the evening of February 22nd the branch accepted the invitation of the chairman of the Canadian Section of the American Waterworks Association, R. L. Dobbin, M.E.I.C., to attend their annual meeting at the Carls-Rite hotel. A very attractive exhibit of waterworks materials, mechanical equipment and accessories was organized by the various manufacturers which was the subject of much favourable comment by those attending the meeting.

The major portion of the evening was taken up with a discussion of the paper presented at a previous meeting of the branch by Norman J. Howard, bacteriologist in charge of the Toronto filtration plant laboratories on "Methods of Purifying Public Water Supplies". Many points of absorbing interest developed during the discussion of this paper and to Mr. Howard is due the thanks of everyone attending for the many explanations, opinions and useful data supplied in connection with the many methods and processes involved in the purification of water.

Following this discussion there was a most enjoyable smoker and musical programme provided under the auspices of the Waterworks Manufacturers which was thoroughly enjoyed by everyone in attendance.

Electrification of Railways

At the meeting of March 1st the branch was favoured by an address by one of its own most energetic members, A. L. Mudge, A.M.E.I.C., on the "Electrification of the Chicago, Milwaukee and St. Paul Railway".

At the close of Mr. Mudge's address a general discussion of the subject took place during which the following members took part: J. R. Ambrose, M.E.I.C., G. W. Winckler, M.E.I.C., W. A. Bucke, M.E.I.C., Wm. Gore, M.E.I.C., A. G. Dalzell, M.E.I.C., Professor Young, M.E.I.C., E. T. Wilkie, M.E.I.C., and A. W. Ambrose, A.M.E.I.C.

Valuation of Railways

At the meeting of March 8th the branch was extremely fortunate in securing Arthur Crumpton, M.E.I.C., chief valuation engineer of the Grand Trunk Railway, who presented one of the most informing papers that has been delivered before the local branch on the subject of "The Federal Valuation of Railways in the U.S.A." Mr. Crumpton's duties of late in connection with the Grand Trunk lines in U.S.A., have brought him in close touch with the Federal Bureau for Railway Valuation at Washington, who at the instance of Congress have undertaken the valuation of all the railways in the United States.

At the conclusion of his address Mr. Crumpton answered a number of questions relative to the subject which were raised by the following members: A. E. K. Bunnell, A.M.E.I.C., A. C. Oxley, A.M.E.I.C., H. A. Goldman, A.M.E.I.C., P. W. Green, A.M.E.I.C., R. O. Wynne-Roberts, M.E.I.C., A. L. Mudge, A.M.E.I.C., and H. K. Wicksteed, M.E.I.C.

Annual Meeting

The annual meeting of the branch was held on Thursday evening, March 15th, and before proceeding with the general business the branch on the motion of H. J. Lamb, M.E.I.C., and Willis Chipman, M.E.I.C., unanimously adopted by standing vote the following resolution lamenting the loss which *The Institute* had sustained in the death of its esteemed president, the late Arthur T. St. Laurent.

"That the members of the Toronto Branch of *The Engineering Institute of Canada* assembled at their annual meeting this evening wish to record their deep and heartfelt regrets at the death of their lamented President, the late Mr. Arthur St. Laurent, by whose demise a deep void has been left in the engineering profession of this country, and by whose life and record the engineering profession and the public service has been enriched.

His unfailing courtesy at all times, his strict devotion to duty, his marked ability as an engineer, coupled with deep sense of justice, won for him the admiration and respect of all those with whom he came in contact, and endeared him to a marked degree to his brother engineers.

This branch hereby respectfully tenders its deepest sympathy to the bereaved widow and family of our late president, whose loss we so deeply deplore."

The secretary-treasurer presented the annual report of the branch reviewing its activities during the past year. The membership now totals 650, and the financial statement as presented shows a balance on hand of $436.77.

Following the discussion of the secretary's report the branch, on the motion of R. O. Wynne-Roberts, M.E.I.C., and T. L. Crossley, M.E.I.C., decided to forward a resolution to the provincial government urging them to proceed with the passage of the bill at present before the House to authorize the mines department to record the logs of all wells sunk in the province in connection with water, gas or oil.

During a general discussion of the welfare of the branch the following matters were raised for consideration, the revision of the branch by-laws to allow of the chairman being elected by acclamation, the formation of a municipal section, a broadening out policy as regards the subject to be discussed by the branch so that more prominence might be given such national matters as transportation, fuel and conservation.

The report of the scrutineers showed the following members elected to the executive for the year 1923-1924: *Chairman:* Professor C. R. Young, M.E.I.C.; *vice-chairman:* J. M. Oxley, M.E.I.C.; *secretary-treasurer:* J. A. Knight, A.M.E.I.C.; *committeemen:* Professor Peter Gillespie, M.E.I.C., Professor T. R. Loudon, M.E.I.C., J. G. R. Wainwright, A.M.E.I.C.

Brief and appropriate speeches of acceptance were delivered by Professor Young and Mr. Oxley following which a vote of thanks was accorded the retiring members of the executive for their services rendered in the interests of the branch during the past year.

Publication

The Blast Furnace and the Manufacture of Pig Iron; by Robert Forsythe (deceased), revised by Carl A. Meissner and J. A. Mohr; published by the U.P.C. Book Company, Inc. This book is considered to be of exceptional merit for those interested in metallurgy of iron. It is divided into the following headings: materials of manufacture; description of plant; operation of the furnace; burdening the furnace; actions within the furnace; furnace irregularities; furnace design and equipment; uses of pig iron and conversion methods, and the last chapter deals with principles of chemistry and physics.

OTHER SOCIETIES NEWS

The American Society of Mechanical Engineers

Spring Meeting in Montreal

The Montreal Committee is doing intensive work in preparation for the spring meeting to be held in Montreal, May 28-31, 1923.

Monday, May 28, will be given over to a meeting of the Council and business meeting of the Society, and in the evening there will be a joint meeting of the Councils of *The Engineering Institute of Canada* and The American Society of Mechanical Engineers. Technical sessions will be held on the mornings of Tuesday. Wednesday and Thursday, the afternoons being devoted to visits to points of engineering and historical interest in and near Montreal. On Tuesday evening there will be a "smoking concert" tendered by the Montreal Branch of *The Engineering Institute of Canada.* A programme containing the best that Montreal engineers can provide will insure the success of the evening. A dinner-dance will be held Wednesday evening.

Excursions of great interest are planned, both preceding and following the meeting, details for which have not been finally arranged.

Canadian Geodetic Society

At the thirtieth regular meeting of the Canadian Geodetic Society the chief speaker was H. F. J. Lambart, A.M.E.I.C., of the Geodetic Survey. Taking as his subject "Preliminary Reconnaissance by Airplane", Mr. Lambart gave a most interesting account of his work during the past summer. A short introductory speech was made by J. L. Rannie, M.E.I.C., president of the society, who spoke of Mr. Lambart's enterprise and of the cordial co-operation of the Air Board officials. He also referred specially to the great usefulness of the airplane as a means of transport in mountainous districts. Mr. Lambart then explained to his audience how he had been able in a few hours of actual flight to make a preliminary reconnaissance over a large area of mountainous country, extending from the Yellowhead Pass to the one hundred and twentieth meridian. The preliminary selection of triangulation stations in such a district could not be accomplished by an ordinary surveying party without a much greater expenditure of time and money.

Ontario Good Roads Association

The annual convention of the Ontario Good Roads Association was held in Toronto for two days commencing with March 1st. At the business sessions there was much discussion regarding the highway work of the province and some very interesting figures, relative to this work, were presented.

In the course of his remarks W. A. McLean, M.E.I.C., deputy minister of highways, province of Ontario, outlined briefly the extent of the financial support already given to the Good Roads work of the province.

The Canadian Institute of Mining and Metallurgy

The twenty-fifth annual general meeting of the Canadian Institute of Mining and Metallurgy, convened at Montreal, on March 7th, 8th and 9th, once more upheld the tradition of good-fellowship for which these gatherings have long been famous. In the main, the papers centered around the Dominion's fuel problems, and in the technical discussion every phase of this vital question received consideration. After devoting the morning session of the first day to reports and general business of the Institute, the sessions for the balance of the three days were taken up with presentation of the following technical papers and illustrated descriptions of various works:

The Lignites of Saskatchewan, by R. J. Lee.

Wood Fuel, by Rolland D. Craig.

Mining and Smelting of Sullivan Ore, (Moving pictures of the operations of the Consolidated Mining and Smelting Co. of Canada, Limited.) — introduced by W. S. Rugh.

The Story of Compressed Air, (Moving pictures), introduced by E. S. Winslow, A.M.E.I.C.

The Fuel Situation in Canada, by B. F. Haanel, M.E.I.C., (Member, Dominion Fuel Board.)

Peat Resources of the Central Provinces and their Utilization for Fuel Purposes, (Lantern slides). by B. F. Haanel, M.E.I.C.

Fuel Oil as an Aid to Civilization, by Clayton D. Dean, A.M.E.I.C.

The Problem of Replacing Foreign Coals on the Manitoba Market, by G. B. Saunders.

Relationship of the Anthracite Field to Canada, by J. F. K. Brown.

United States Bituminous Coals Available for Canada, by Geo. H. Cushing.

British Fuel for the Canadian Market, by The Monmouthshire and South Wales Coal Owners Association.

Economic Study of Coal Mining in Alberta and Southeastern British Columbia, by W. J. Dick, M.E.I.C.

Notes on the Welding of Iron and Steel with the Electric Arc, by F. H. Williams, A.M.E.I.C.

The Evolution of Rock Drilling, by H. A. Burbank.

A Preliminary Prospecting Trip in Northern Quebec, (Lantern slides), by J. W. Evans, A.M.E.I.C.

Investigation of the Economic Value of a Fossil Resin from British Columbia, by R. T. Elworthy and R. K. Carnochan.

Topographical Mapping and its Relation to the Mining Industry, by A. C. T. Sheppard.

Kick versus Rittenger, by H. E. T. Haultain, M.E.I.C.

More Ball Paths, by H. E. T. Haultain, M.E.I.C., and F. C. Dyer, M.E.I.C. Illustrated by moving pictures.

An exceptionally fine programme of entertainment was provided in the form of a smoker and concert during the evening of the second day of the meeting, and following the established custom the convention was concluded with the annual dinner.

Publications received during the month.

General Publications

Presented by Librairie Scientifique Albert Blanchard.

"Traité de Stéréotomie" (charpente et coupe des pierres) Texte et dessin par Jules Pillet, 1923.

Transactions Proceedings, etc.

Presented by the Societies.

"Transactions of the Institution of Mining and Metallurgy" Thirtieth Session 1920 and 1921, Volume 30.

"Minutes of proceedings of the Institution of Civil Engineers". Volume CCXIII.

Presented by British Engineering Standards Association.

"British Standard Specification for copper-alloy pipe fittings. screwed for low and medium pressure, British standard copper tubes". No. 99-1922.

"List of British Standard Specifications and Reports" C. A. 4120-November 1922.

Reports

Presented by Department of Mines, Canada.

"Geological Survey". "Geology of the Moncton Map Area", by W. J. Wright. Memoir No. 129.

"Geology and Ore Deposits of Salmon River District, British Columbia", by S. J. Schofield and G. Hanson. Memoir No. 132.

"Report for the fiscal year, ending March 31, 1922".

"Geological Survey" Summary Report, 1921, Part B. Geological Survey, Bulletin No. 35, "Relationship of the precambrian (Beltian) Terrain to the lower cambrian strata of south-eastern British Columbia" by S. J. Schofield.

Presented by Dominion Bureau of Statistics, Canada.

"Census of Industry, 1920-Central Electric Stations in Canada".

"The Canada Year Book, 1921".

Presented by Hon. W. H. Sutherland.

Report of the Minister of Public Works of the Province of British Columbia-fiscal year 1921-1922".

Presented by Department of the Interior, Bureau of Mines, Washington, D.C.

"Electric Brass Furnace Practice", by H. W. Gillett and E. L. Mack-1922. Bulletin No. 202.

"Preparation of Light Aluminum-Copper Casting Alloys", by R. J. Anderson-1922. Technical Paper No. 287.

"Natural-Gas Manual for the Home", by R. A. Cattell-1922. Technical Paper No. 325.

"Economic Combustion of Waste Fuels", by David Moffat Myers. Technical Paper No. 279.

"Prospecting and Testing for Oil and Gas", by R. E. Collom. Bulletin No. 201.

"Oil-Shale, an historical, technical and economic study" by Martin J. Gavin. (State of Colorado Co-operative Oil-Shale Investigations). Bulletin No. 210.

"The Technology of Slate", by Oliver Bowles. Bulletin No. 218.

Presented by Department of the Interior, United States Geological Survey.

"Bulletin 731, "Bibliography of North American Geology for 1919-20", by John M. Nickles.

"Professional paper 129, "Shorter Contributions to General Geology, 1921" by David White, Chief Geologist.

"Copper deposits of the Tyrone District, New Mexico" by Sidney Paige. Professional Paper No. 122.

"Potash in the Greensands of New Jersey", by George Rogers Mansfield. Bulletin No. 727.

"Gold and Silver in 1921" (General Report) by J. P. Dunlop. No. I: 26.

"Stone in 1921", by G. F. Loughlin and A. T. Coons. No. 11:27.

"Cement in 1921", by Belle W. Bagley. No. 11:28.

"Natural-Gas Gasoline in 1921", by E. G. Sievers. No. 11:30.

Preliminary Notice

of Applications for Admission and for Transfer

19th March, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in April, 1923.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV. and VI.), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BARRINGTON—YORKE C., of Sydney Mines, N.S. Born at Sydney Mines, July 25th, 1880. Educ., evening classes, engr'g sch., Boston, Mass., 1898-02; on shipbldg. and repair plant, and dftng. office, Atlantic Works, East Boston, 1902-05, engr. on British ships in foreign trade; 1905-09, constrn., and repair work, Nova Scotia Steel and Coal Co.; 1907-09, colliery engr., Eastern Coal Co., Maccan, N.S.; 1912-14, in chg. constrn. and repairs, N.S. Steel and Coal Co.; 1914 to date, town engr., Town of Sydney Mines, N.S.

References: T. J. Brown, J. Purves, R. M. McKinnon, J. Stephenson, K. H. Marsh, C. M. Odell.

BARWICK—OLIVER ARCHIBALD, of Westmount, Que. Born at Montreal, Que., Jan. 3rd, 1889. Educ., B. Arch., McGill Univ., '14; 5 yrs., drftng. appr'tceship prior to Univ. course; 1911, dftsman., Brown & Vallance, Montreal; 1914 (Apr.-Sept.), dftsman., Mond Nickel Co., Coniston, Ont., under Wm. L. Dethloff, M.E.I.C., ch. engr.; 1915 (8 mos.), inspectr. shell parts, Canadian Inspectn. and Testing Laboratories; 1916 and 17, in chg. at night, of chemical, physical, thermal and microscopic experiments, etc., Montreal Ammunition Co., Longue Point, Montreal, and later with Dominion Bridge Co., and Dominion Copper Products Co., Lachine, Que.; 1918, in chg. experiments, tests and calibrations, three plants, and in chg. heat treatments forgings, etc., Western Ave. plant, for P. Lyall & Sons, Montreal, also pvte. consltg. work; 1919-20, dftsman., same firm on shop work New Parliament Bldgs., Ottawa; 1920, (Feb.-Dec.), dftsman., Toronto office, T. W. Lamb, archt., New York; 1921-22, structrl. dftsman., Bannigan, Armstrong and Thompson, also Wm. F. Sparling, archt. and engr., and in chg. of design of bldgs. (only) for James, Proctor & Redfern, consltg. engrs., Toronto; in chg. drftng., Canadian Hydrostone, Ltd., Montreal; 5 mos., in chg. office, Chas. J. Saxe, archt., 7 wks., dftsman., E. Cormier, archt. and engr., Montreal, and 6 wks., A. Surveyer & Co., Montreal; at present, dftsman., on Insurance Exchange Bldg., etc., D. J. Spence, archt., Montreal, Que.

References: F. P. Shearwood, H. M. MacKay, J. P. Anglin, D. C. Tennant, H. H. Vaughan and D. W. Ross.

DINGWALL—ROBERT MACFARLANE, of Calgary, Alta. Born at Glasgow, Scotland, March 16th, 1890. Educ., Associate, Royal Tech. Coll., Scotland, '14; Registrd. Professional Engineer (Mech.), Alberta, and 1st class engr. cert., Alberta; 1906-11, appr'tceship in mech. engr'g.; 1913 (6 mos.), junr. engr., SS. "Vivid"; 1914, designer, Robertson and Adams, consltg. mech. and elecl. engrs., Glasgow; 1915-17, commn. in infantry, Imperial Army; 1917-19, tech. officer, British Forestry Corps., R.E., in chg. machinery, Eawy district, France; 1919, master mech., North American Collieries, Alberta; 1920, ch. engr., Mountain Park Coal Co., Alberta; 1921 to date, supervisr. of industrial mech. engr'g. and corresp'dce. dept., in power plant engr'g., Provincial Institute of Technology and Art, Calgary, Alta.

References: C. C. Richards, J. H. Ross, L. F. Fyles, B. L. Thorne, P. J. Jennings.

DOWNING-COOK—WALTER SCOTT, of 475 Argyle Ave., Westmount, Que. Born at St. Louis, Mo., July 9th, 1873. Educ., archt. engr'g., special course, Univ. of Illinois, 1894. 1885 and 87, (summers), carpenters boy; 1886 (summer), stock boy, Simmons Hardware Co.; 1888 and 89, (summers), material clerk and sub layerout, 1890, layerout; 1891 and 92 (summers), sub-foreman and layerout; 1893 (summer), foreman, carpentry and masonry; 1894-98, foreman, supt., and contractor, General Building Construction; 1899-01, partner to A. E. Cook and Son, builders; 1902-03, supt., asst. mgr., and sub local mgr., Geo. A. Fuller & Co., Boston, Mass.; 1904, genrl. supt: Remington Cons. Co., New Orleans; 1905-06, senr. supt., Geo. A. Fuller & Co., Baltimore; 1907, mgr., Wells Bros. Co., of New York, Pittsburg; 1908, genrl. mgr., Gilbert Co., Philadelphia; 1909-10, ch. of constrn., Hoggson Bros., New York; 1911-14, supt., Ottawa, and genrl. supt. and asst. to Pres., Montreal, P. Lyall & Sons; 1915-17, contractor as Downing-Cook Co., Montreal; 1918-19, mgr., Wm. Lyall Shipbuilding Co., Vancouver, B.C.; 1920-22, contractor as W. S. D. Cook, Montreal; 1923, ch. engr., Downing-Cook & Co., Montreal.

References: J. M. R. Fairbairn, P. B. Motley, C. T. Delamere, G. R. Heckel, W. J. Francis.

EDWARDS—SAMUEL MICHAEL, of Montreal, Que. Born at Montreal, Aug. 14th, 1890. Educ., American Correspondence Sch., Chicago, uncompleted course; 1907-10, in chg. trigonometrical, contour and detailed surveys etc., with late Jos. Rielle, C.E., Q.L.S.; 1910, foundation work, C.P.R., Windsor Stn., Montreal; 1910-11, in chg. location survey, part transmission line, Montreal to Shawinigan Falls; 1915-18, chg. topogr. survey, parts St. Francis River, and 1914-18, chg. topogr. survey, Yamaska and Richelieu Rivers, both for Southern Canada Power Co., Ltd.; 1917-18, chg. topogr. survey, sections and soundings part Gatineau River, Walter J. Francis & Co.; 12½ yrs., asst. to Malcolm D. Barclay, C.L., Q.L.S., in chg. trigonometrl., topogr'l., hydrogr'l, Stadia and city detailed surveys, sub-divns., road grading, layouts and constrns., calculation of quantities for excavation, design'g. small water supplies etc.; at present, with Technical Service Dept., on genr'l. engr'g. work City of Montreal, Que.

References: M. D. Barclay, L. J. Seldenne, F. B. Brown, N. J. A. Vermette, J. B. Woodyatt, G. R. MacLeod, F. C. Laberge.

EDWARDS—THOMAS APPLEBY, of Niagara Falls, Ont. Born at Aberdare, S. Wales, England, Jan. 18th, 1879. Educ., Brigend Grammar Sch., and Llandovery Coll., S. Wales, 1896-99, articled pupil to late Mr. T. Lloyd Edwards, county surveyor, Glamorgan, Wales, 1900-01, inspectr., sewer constrn., under the Margam Urban District Council, Wales, 1901-10, asst. to county surveyor, road and bridge constrn., and mtce., estimates, plans, etc., 1910-11, contrn. engr., roads, light rlys., and quarry work, Robert Rankin, contr., Porthcawe, Wales; 1911-13, constrn. engr., Highway Commn. Co. of York, Ont., 1913-14, instr'man and inspectr. sewer dept. City of Toronto, 1914-15, constrn. engr. with late Mr. Frank Law contr., Toronto; 1915, steel testing for munitions, steel and radiation plant, Toronto; 1915-19, R.G.A., Lieut., 1919-20, inspectr., York township, road constrn., to date, dftsman., Hydro-Electric Power Commn. of Ontario, Chippawa, Ont.

References: R. O. Wynne-Roberts, F. A. James, W. A. McLean, G. Phelps, A. C. D. Blanchard, H. L. Bucke, F. W. Clark, G. H. Lowry.

GARTER—ERNEST LINWOOD, of Sydney, N.S. Born at St. John, N.B., Jan. 22nd, 1891. Educ., E. E. Polytech. Inst., Brooklyn, N.Y., '12; 1912-13, meter test dept., New York Edison Co.; 1913-14, C.P.R. Angus Shops; 1914-17, constrn. foreman, L. K. Comstock, Montreal; 1918-19, inspectr. Gas and electricity for Province of New Brunswick, at St. John, N.B.; 1920 to date, manager, Canadian General Electric Co., Sydney, N.S., in chg. all work for Cape Breton.

References: A. P. Theuerkauf, K. H. Marsh, C. C. Curtis, K. G. Cameron, C. H. Wright.

McCALLUM—GEORGE HUGH, of Ottawa, Ont. Born at Smiths Falls, Ont., April 8th, 1882. Educ., B.Sc., McGill Univ., '07; D.L.S., B.C.L.S.; 1906 (summer), drafting office, and instr'man. on location, C.N.R., Winnipeg, Man.; 1907 (summer), asst. to J. E. Ross, D.L.S., Kamloops; 1908, staff, Geodetic survey, and for 3 yrs. in chg. reconnaissance or observing parties in Ontario, Quebec, and Maritime Provinces; 1911 and 12, in chg. reconnaissance and observing in B.C.; 1915-19, overseas, Can. Engrs., Major and M.C. and bar; 1913 and 14, and 1920 to date, in full chg. operations of survey on Pacific coast, Geodetic Survey of Canada, Ottawa, Ont.

References: N. J. Ogilvie, D. W. McLachlan, R. L. Dobbin, F. S. Keith, J. R. Grant, J. D. Craig.

HARVIE—THOMAS WHITE, of Montreal, Que. Born at Coatbridge, Scotland, Aug. 5th, 1877. Educ., Glasgow and West of Scotland Tech. Coll., 1894-1900. 1894-99, pupilage, sewage and waterworks, road constrn., town planning and surveying, and 1899-00, asst. engr., Kyle Dennison & Frew, C.E., and L.S., Scotland; 1900-02, asst. res. engr., on rly. constrn., Caledonian Rly. Co., Scotland; 1902-04, asst. engr., design and constrn., harbour works, etc., Clyde Navigation Trust, Glasgow, and 1904-07, res. engr., on constrn., Merklands Quay, Shield Hall wharf etc., and 1907-10, agent and ch. engr. on constrn. Yorkhill basins and quays, etc., carried out by Sir Robert McAlpine & Sons for Navigation Trust; 1910-13, res. engr., on constrn., New Victoria Pier, shore wharves etc., Montreal Harbour Commnrs.; 1913-22, asst. ch. engr., in genrl. chg., under ch. engr., on scheme for harbour improvements inaugurated in 1910, mtce. of harbour works etc., and 1922 to date, ch. engr., of the Port of Montreal.

References: G. H. Duggan, J. M. R. Fairbairn, R. S. Lea, R. M. Wilson, F. W. Cowie, R. M. Hannaford, H. Rolph, F. P. Shearwood, A. D. Swan, G. R. MacLeod, J. H. Hunter.

SCHLEMM—LEONARD E., of Montreal, Que. Born at Brooklyn, N.Y., Sept. 16th, 1878. Educ., Mass. Inst. of Tech., 1900-03; 1903-05, topogr. and instr'man., location surveys, Gulf Colorado and Santa Fe Rly.; 1905-08, Chicago Nor. Western Rly. reconnaissance, location, surveys, etc.; 1908-10, responsible chg. all constrn., Brett & Hall, landscape archts., Boston, Mass.; 1910 to date, in pvte. practice, landscape archt're., 1912 to date, consltg. engr., Town of Hampstead, P.Q., and 1917 to date, for Towns of Mt. Royal and Beaconsfield, 1918 to date, town planning consultant for town of Iroquois Falls, Ont., in chg. all development work; at present, private practice, 43 St. François Xavier Str., Montreal, Que.

References: F. S. Keith, W. J. Francis, F. B. Brown, G. R. MacLeod, G. M. McKergow, A. H. Ross, A. Surveyer.

SEYMOUR—HORACE LLEWELLYN, of Weston, Ont. Born at Burford, Ont., June 11th, 1882. Educ., B.A.Sc., Univ. of Toronto, '13, (grad. S.P.S. '03), C.E. '21; D.L.S., O.L.S., S.L.S., N.S.L.S.; 1902 (summer), rodman, Niagara Falls, Canadian Niagara Power Co., 1903-07, dftsman., and first asst., 15th base line west 5th meridian, surveys branch, Dept. of Interior; 1907-08, asst., B. J. Saunder, M.E.I.C., Edmonton; 1908-10, Saunders & Seymour, civil Engrs., genrl. practice; 1910-12, pvte. prtce., includ'g. surveys for Alberta Central Rly.; 1912-14, senr. partner, Seymour & Dawe, Ltd., engrs. for City of Red Deer; 1915-20, Dominion Govt., town planing engr'g., Banff, Halifax (devasted area), St. John, Niagara Regional area, etc.; 1920-23, Barber, Wynne-Roberts & Seymour, director, Frank Barber and Associates, Ltd., consltg. engrs., munic. and town planning engr'g., consultant, City of Niagara Falls, 1921, Haileybury, 1922; at present, consltg., munic. and town planning engr., associated in city planning surveys for City of Kitchener, special lecturer, Easter term, Univ. of Toronto, in town planning, Toronto, Ont.

References: R. O. Wynne-Roberts, C. H. Mitchell, W. H. Breithaupt, C. R. Young, N. J. Ogilvie, D. H. Nelles, J. C. Keith, P. Gillespie, F. S. Keith.

TAIT—ISAAC JOSEPH, of Montreal, Que. Born at Aberdeen, Scotland, June 9th, 1876. Educ., Stewart's Coll., and Heriot Watt Engr.g. Coll., Edinburgh, Scotland appr'tceship., mech. engr'g.; 1898, steam, hyraulic and genrl. engr'g., Brown Bros., Ltd., Edinburgh; six mos. elec'l. engr'g., Cribbes & Ross, Edinburgh; 1899-06, marine engr'g., on various ships, 18 mos. ch. engr.; 1907 (9 mos.), special training, marine turbine constrn., Fairfield Shipbuiling Co., Ltd., Glasgow; 1907-11, 2nd. and ch. engr., T.T.S.S., "Eskside" and "Royal George"; 1921 (6 mos.), asst. mgr., Jeffries & Son, Avonmouth and Bristol; 1913, testing engr., Calorolac Ltd., Liverpool; 1914-16, ch. engr., chg. mech. equip'mt., Windsor Str. Stn. bldg., C.P.R.; 1917-19, associated with J. T. Farmer, Montreal; 1919 to date, supt. engr., C.G.M.M. Ltd., Montreal, Que.

References: J. T. Farmer, E. A. Ryan, F. A. Combe, F. B. Browne, K. B. Thornton.

YOUNG—RODERICK BEARCE, of 168, Quebec Ave., Toronto, Ont. Born at Minneapolis, Minn., April 24th, 1891. Educ., B.A.Sc., Univ. of Toronto, '13, C.E., '19; 1907-10, (summers), rly. constrn., C.P.R.; 1911-13, (summers), engr'g. appr'tce., Canadian Westinghouse Co.; 1913-16, asst. laboratory engr., H.E.P.C., of Ont., engag'd. on genrl. testing; 1916 to date, senr. asst. laboratory engr. in chg. engr'g. materials and chemical sections of the laboratories, 1918-21, directed extensive researches in properties of concrete and methods of concreting, Hydro-Electric Power Commission of Ontario, Toronto, Ont.

References: H. G. Acres, A. C. D. Blanchard, P. Gillespie, F. A. Gaby, W. P. Dobson, W. J. Francis.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

BARNES—CHARLES THOMAS, of 93 Dubuc Str., Norwood, Man. Born at Leyburn, England, May 8th, 1890. Educ., diploma, reinf. concrete engr'g., I.C.S., '19; 1912-13, structrl. steel detailer, Manitoba Bridge and Iron Works, Winnipeg, under H. A. MacKay, ch. engr.; 1913-14, reinf. concrete designr., Standard Concrete Steel Co.; 1914, in full chg. constrn., Adams bldg., Edmonton, also steel frame, Chisholm bldg.; 1915-18, travell'g. examiner of shells for Imperial Ministry of Munitions; 1918-19, quantity surveyor on appraisal Winnipeg Elec. Rly. properties, under W. M. Scott, M.E.I.C.; 1919 to date, structrl. designr., bldgs., transmission lines, towers, etc., City of Winnipeg Hydro-Electric System, Winnipeg, Man.

References: E. V. Caton, C. A. Clendenning, H. A. MacKay, J. A. MacGillivray, J. W. Sanger, J. G. Glassco.

BOOKER—HARVEY D., of Fort William, Ont. Born at Hamilton, Ont. Nov. 3rd, 1886. Educ., 3 yrs., appli. sci., (elec.), McGill Univ., 1910-13; 1907-10, construction work and operating munic. power plant, Kenora, Ont.; 1910-13, student's course, Canadian Westinghouse Co.; 1913-16, operating and mtce., Northern Ont. Light and Power Co.; 1916 to date, service dept. engr., Canadian Westinghouse Co., Ltd., Fort William, Ont.

References: F. H. Farmer, D. G. Calvert, C. D. Howe, A. J. Lawrence, G. Blanchard, M. W. Turner, R. B. Chandler.

BOWMAN—FREDERICK, of Lachine, Que. Born at Kitchener, Ont., Oct. 24th, 1889. Educ., grad. Univ. of Toronto, '11; 1911-17, geological survey triangulation, city subdivision and mapping, struct'l. dftsman., and checker; 1917-19, military service; to date, checker and squad leader in struct'l. drawing office and engr. on erection of steel bridges, Dominion Bridge Company, Limited, Lachine, Que.

References: F. P. Shearwood, D. C. Tennant, A. S. Wall, Alex. Peden, LeR. Wilson.

KANE—CHARLES STANISLAUS, of Outremont, Que. Born at Kingston, Ont., May 7th, 1892. Educ., I.C.S.; 1908-09, dftsman., Hart-Otis Car Co., Ltd.; 1909 to date, with the Dominion, Bridge Co., as follows:— 1909-12, dftsman., 1912-17, in chg. design'g. and estimat'g. dept., local contract'g. office; 1917-19, responsible for designs and estimates, also sales engr., local contract'g. office; during 1919 and 20, supervisn. and design, Sommer Bldg., Mayor Street, reinf. concrete, and checking of detail drawings of bridge and bldg. of Marine Tower for Dominion Flour Mills, for Structural Engineering Co.; design of foundations in Rendering Bldg., Montreal Abattoirs, Ltd., for res. engr., American By-Product and Machinery Co., of New York, also other concrete bldgs., steel structure and foundations in spare time; 1920-21, sales engr.; since 1921, engr. in chg., local contracting office, Dominion Bridge Co., Ltd., Montreal.

References: A. F. Byers, D. L. Tennant, M. J. Rutledge, G. H. Osborne, J. P. Anglin, F. T. Peacock, C. G. Porter, H. W. Racey.

PLAMONDON—J. ADRIEN, of Montreal, Que. Born at St. Cesaire, Que., Dec. 7th, 1884. Educ., Ecole Polytech., Montreal, '09; 1910, asst. engr., Tech. Sch., Sherbrooke, for Peter Lyall & Sons; 1911, transitman for J. G. White & Co., N.Y., at Valleyfield; 1911, inspectr. on reinf. concrete bldg. at Caron Bros.; 1912, Contractors Waterworks, Lachute; 1913, to date with Arsenault & Plamondon, Ltd., engrs. and contrs., 70 St. James Str., Montreal, reports on sewers Nicolette, expert on valuation of Water Works, St. John, Que., and of damages on dams etc.; at present consltg. engr., reports on waterworks, Shawinigan Falls, St. Vincent de Paul Penitentiary, repres., Roberts Filter Mfg. Co., Darby, Pa.

References: T. J. Lafreniere, A. Surveyer, O. Lefebvre, F. C. Laberge, H. G. Hunter, J. O. Meadows.

ROBINSON—WILLIAM CECIL ELWOOD, of Coldwater, Ont. Born at Coldwater, Nov. 12th, 1891. 1910-13, chainman and rodman, C.P.R., constrn. dept., G. B. and S. Rly., Port McNicol-Bethany Jct.; 1913-14, instr'man., constrn. dept.; C.P.R., Islington to Guelph Jct., double track and finishing up C.L.O., and W. Rly., under distr. engr., at Cobourg and Belleville; 1914-18, overseas, Lieut., R.F.A.; 1919-21, relieving engr. and asst. engr., Lake Erie and Nor. Rly., and Grand River Rly., Galt, Ont.; 1922 (Mar.-Aug.), instr'man., constrn. dept., C.P.R., res. no. 3, T. and J.B. Rly., and to date, res. engr. on same Fabre, Que.

References—H. Wellwood, D. Hillman, F. H. Midgley, H. M. Dibblee, C. D. Norton, C. G. J. Luck, G. Rayner, L. F. Grant.

WALCOT—JOHN BEVAN, of 4077, Tupper Str., Westmount, P.Q. Born at Edinburgh, Scotland, June 25th, 1890. Educ., Heriot-Watt Coll., Edinburgh, mech. and elec'l. engr'g., 1908-09; D.L.S.; 1911-12, C.P.R., on mtce. of way, field and office work; 1912-14, C.N.R., constrn. of Mt. Royal tunnel, field and office work; 1914-15, C.N.R., surveying Town of Mt. Royal; 1915, D.L.S.; 1916 and 17, asst. on D.L.S.; 1918, C.E.F., Can. Engrs.; 1919 to date, field and office work, chg. survey parties, res. engr. one year, on constrn. hydro-elec. power house, etc., Walter J. Francis and Company, Montreal, Que.

References: W. J. Francis, F. B. Brown, R. L. Dobbin, J. L. Busfield, L. B. Kingston, G. Kydd, W. D. Adams.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

CLARKE—TERENCE, of Windsor, Ont. Born at London, England, July 15th, 1899. Educ., B.A.Sc., Univ. of Toronto, '22. 1919 (May-Oct.), chainman, rodman and levelman, C.N.R. western lines; 1920 (May-Sept.), instr'man., and (in absence of res. engr.), asst. in chg. constrn., also estimates, reports etc., Ontario Prov. Highways; 1921 (May-Oct.), chief of party, Colonization Roads Branch, Dept. of Public Works, Ont.; since graduation to date, structrl. dftsman., Canadian Bridge Co., Walkerville, Ont.

References: H. A. Dixon, G. Hogarth, C. H. Fullerton, A. E. West, C. R. Young, P. Gillespie, J. H. Bradley.

DEPOCAS—JEAN CHARLES, of Montreal, Que. Born at Montreal, Que., May 5th, 1898. Educ., B.A., Laval Univ., '18, B.A.Sc. Ecole Polytech., '22; 1919-20-21, (summers), inspecting engr., Road Dept., City of Montreal; 1922-23, highway engr., Quebec Road Dept.; at present with the Quebec Development Co., Ltd., St. Joseph d'Alma, Que.

References: J. E. Blanchard, J. A. Lalonde, O. Desjardins, C. Milot, P. L. P. Lecointe.

FORD—ROBERT, of Temiskaming, Que. Born at Chatham, N.B., Dec. 16th, 1895. Educ., B.Sc. (mech.), McGill Univ., '22. 1916-19, overseas, C.F.A.; 1919 (summer), instr'man. and dftsman., geological survey, Dominion Govt.; 1920-21 (summers) actuarial clerk, Dominion Govt.; 1922 (summer), Paige Motor Car Co., Detroit, Mich.; 1922 to date, constrn. engr., under W. L. Ketchen, M.E.I.C., Riordon Company, Limited, Temiskaming, Que.

References: W. L. Ketchen, A. K. Grimmer, C. M. McKergow, D. G. Anglin, A. R. Roberts.

GRAY—DONALD, ERCELDOUNE, of Montreal, Que. Born at Amoy, China, Dec. 29th, 1900. Educ., 2nd. yr., applied sci., McGill Univ.; 1917-19, compilation of gun range reports, Vickers Limited, London, England; 1919-21, foreman of works and asst. engr., Public Works Dept., Govt. of Palestine; 1922 (4 mos.), genrl. asst. to supt. engr., on bldg. constrn., Lockwood Greene & Company of Canada, Limited, Montreal, Que.

References: G. J. Dodd, H. W. B. Swabey, H. M. Lamb, E. G. Horne, C. Batho, C. M. McKergow.

PRENDERGAST—RALPH MACAULAY, of 462 Sherbrooke Str., Peterborough Ont. Born at Toronto, Ont., Jan. 18th, 1889. Educ., B.A.Sc., Univ. of Toronto, '21. 1918 (June-Oct.), hydro-elec. station operator, Orillia Water Light and Power Commn., Ont.; 1919 (June-Oct.), lathe hand, Chapman Ball Bearings Co.; Toronto; 1920 (June-Oct.), and 1921-22, meter inspectr., H.E.P.C., of Ont.; 1922 to date, testman, Canadian General Electric Co., Peterborough, Ont.

References: L. D. W. Magie, C. E. Sisson, P. L. Allison, B. L. Barns, G. R. Langley, V. S. Foster.

JAMES—HAROLD H., of 191 Vermont Str., Montreal, Que. Born at Toronto, Ont., Aug. 3rd, 1889. 1906-09, engr'g. appr'tce., Canada Foundry Co., Toronto; 1909-12, mech. drftng., General Electric Co., Schnectady; 1912-14, structrl. detailing, National Bridge Co., and Structural Steel Co., Montreal; 1915-16, genrl. plant engr'g., N.S. Steel and Coal Co., New Glasgow, N.S.; 1916 to date, engr'g. dftsman., office of maintenance engr., Montreal Locomotive Works, Montreal, Que.

References: C. A. Mullen, F. J. Di Benga, A. F. Hanly, J. M. Robertson, S. D. MacNab.

KNAPP—EDWARD WINSLOW, of 107, Hutchison Str., Montreal, Que. Born at Sackville, N.B., Oct. 31st, 1894. Educ., McGill Univ. (graduating this year); 1920, surveying during summer.

References: L. A. Herdt, C. V. Christie, C. M. McKergow, A. R. Roberts, E. Brown.

McDIARMID—FERGUS ARCHIE, of Ottawa, Ont. Born at Fingal, Ont., Mar. 29th, 1880. Educ., B.A., Univ. of Toronto, '02; 1902, astronomical computer, staff chief astronomer, Dept. of Interior; 1905, promoted to observer, and 1908 to asst. astronomer; 1905-13, chg. field observations, Dominion Observatory; 1906-07, chg. of party observing at 141st meridian Yukon-Alaska Boundary; 1914-16, gravity campaign establishing 42 stations across Canada; 1917 to date, supervisor of Standards, standardization invar base line tapes, measurement of base lines and geodetic astronomy, Geodetic Survey of Canada, Dept. of the Interior, Ottawa, Ont.

References: J. J. McArthur, N. J. Ogilvie, J. L. Rannie, J. D. Craig, J. B. Challies, H. L. Seymour.

MERTON—HAROLD A., of London, Ont. Born at London, Ont., Mar. 27th, 1900. Educ., evening classes, London Tech. Sch.; 1916-19, dftsman. appr'tce., Yeates Machinery Coy.; 1920, dftsman., Whitehead & Kales Iron Works, Detroit; 1921, dftsman., and to date, instr'man. and asst. to engr., London and Port Stanley Rly., London, Ont.

References: H. B. R. Craig, H. L. Bucke, E. V. Buchanan, F. W. Farncomb, H. A. Brazier.

MORRISON—DAVID MONTROSE, of London, Ont. Born at Owen Sound, Ont., Sept. 5th, 1885. 1903-04, chainman and topogr., land survey; 1905-07, chainman and rodman, rly. survey and constrn.; 1908-11, dftsman. and instr'man., rly. construction, dist. "F", div. 3 and 4, 1912, res. engr., div. 3, and 1913, in chg. final track work on same, Nat. Transc. Rly.; 1914-15, in chg. re-constrn., and electrification, and 1916 to date, engr. in chg. design and constrn., terminals, grading, tracklaying etc., London and Port Stanley Rly., London, Ont.

References: H. B. R. Craig, H. L. Bucke, E. V. Buchanan, J. A. Bell, F. A. Bell, W. P. Wilgar, H. A. Brazier, F. W. Farncomb.

MUMMERY—CHARLES RUTHERFORD, of 413 Langside Str., Winnipeg, Man. Born at Hamilton, Ont., Jan. 14th, 1901. Educ., B.A.Sc., Univ. of Toronto, '22. 1920 and 1921, (vacations), employed as millwright; at present, demonstrator in elec'l. and mech'l., laboratories, Univ. of Manitoba, Winnipeg, Man.

References: J. N. Finlayson, R. W. Angus, C. R. Young, E. P. Fetherstonhaugh, N. M. Hall, R. W. Moffatt.

POUNDER—JOHN ALLAN, of Ottawa, Ont. Born at Co. of Renfrew, Ont., May 13th, 1892. Educ., B.A., Univ. of Toronto, '12. D.L.S.; 1909-12, articled pupil to D.L.S., on surveys of Internat. Boundary Commn.; 1912-15 (Winter seasons), engag'd, on computations of triangulation and precise traverses, etc.; 1913-15, (field seasons), in chg. parties, triangulation and base line work, etc., also 1919, Internat. Boundary Commn.; 1920, Canadian attaché with U.S. Boundary survey party on Unuk River, Alaska, and 1921, in similar capacity on St. Croix River; 1921, ch. of party, making topog'l. map of position of Campbell's Island; 1922 (summer), ch. of party on survey of S.W. branch of St. John River; 1922 (Fall), ch. of party, making topogr. map of St. Andrews, N.B., and vicinity; 1919-22 incl. (winters), adjustment of precise and other traverses to fit control geodetic positions; at present, engr. on staff, Internat. Boundary Commn., Ottawa, Ont.

References: J. J. McArthur, J. D. Craig, N. J. Ogilvie, W. M. Tobey, J. L. Rannie.

ROBB—ROLAND WENTWORTH TUPPER, of Montreal, Que. Born at Amherst, N.S., May 29th, 1883. Educ., McGill Univ., 1905-06; appr'tce., machine shop and testing dept., Robb Engineering Works, Ltd., Amherst; 2 yrs. constrn. work, erecting steam power plant and testing, design'g. power plants; 15 yrs. in chg. various branches, Robb Engineering Works, Ltd., design'g., supervising, testing steam power plants and heating installns., Toronto Elec. Co., Ltd., Canadian Copper Co., Copper Cliff, Ont., T. Eaton Co., Winnipeg, C.P.R. Co., Fort William, Ont., Calgary Water Power Co., Alta., Town of Moose Jaw, Sask., Town of Cardston, Alta.; at present, district mgr., for Prov. of Quebec, Robb Engineering Works, Ltd., Montreal, Que.

References: E. B. Browne, G. E. Newill, D. W. Robb, H. H. Vaughan, E. A. Ryan, F. A. Combe, G. H. Duggan.

ROBERTSON—RANDAL KILLALY, of Cooksville, Ont. Born at Dickinson's Landing, Ont., July 16th, 1892. Educ., B.Sc., McGill Univ., '14. R.M.C., Kingston, 1909-12. 1910, instr'man., and chainman, O.L.S. work with Tyrell & McKay, Hamilton, Ont.; 1913 (4 mos.), levelman, City of Toronto, Sewer Dept., 1914, (8 mos.), asst. engr., Chipman and Power of Toronto, stationed at London, Ont., on sewer constrn.; 1915-18, with infantry, and 1919 transferred to Engrs., in France, rank of Capt.; 1919-21, in chg. engr.'g dept., and 1921 to date, works manager, Cooksville Shale Brick Company of Canada, Ltd., Cooksville, Ont.

References: W. Chipman, R. D. Sutherland, H. Dwight, E. S. Malloch, C. J. Swift, A. B. McEwen, E. Brown.

ROBINSON—CHRISTOPHER M., of 533, Aylmer Str., Peterborough, Ont. Born at Kingston, Ont., Dec. 1st, 1882. Educ., Queen's Univ., 1st and 2nd yr., sci., in one year, 1909-10; 1908-09, rodman, and 1909-11, transitman and inspectr., C.P.R.; 1911-12 (9 mos.), asst. bridge engr., C.N.R., Sudbury; 1912-13, asst. bridge engr., Ontario Divn., C.P.R.; 1913-15, asst. res. engr., C.P.R., Lake Superior Divn.; Can. Engrs., France; 1921 (9 mos.), res. engr., Dominion Park's Branch, Dept. of Interior, Banff, Windermere Highway; to date, in chg. constrn., Port Hope — Peterborough Provincial Highway, Provincial Highways Dept., Peterborough, Ont.

References: J. M. Wardle, D. W. Bews, D. S. Ellis, A. A. Richardson, R. B. Rogers, R. L. Dobbin.

TAYLOR—ALFRED JAMES TOWLE, of Toronto, Ont. Born at Victoria, B.C. Aug. 4th, 1887. Educ., 4 yrs. pvte. tuition; 1906-07, inspectr., mech. dept., Canadian General Electric Co.; 1907-08, asst. supt., Hamilton Powder Works; 1908-09, works engr., Canadian Explosives, Ltd.; 1909-10, asst. to consltg. engr., industrial power plant design; 1910-11, asst. mgr., Shaake Machine Works; 1911-12, asst. mgr., H. W. Petrie & Co., engrs., and machinery dealers; 1912-14, Pres. and Mng. Dir., Taylor & Young Ltd., consltg. and contr. engrs.; 1914-22, Pres. and Mng. Dir., Taylor Engr'g. Co., B.C.; Member — A.S.M.E., A.I.E.E., A.I.M.M., C.I.M.M.; to date, Pres. and Managing Director, Combustion Engineering Corporation, Ltd., Toronto, Ont.

References: J. T. Farmer, A. G. Dalzell, W. Young, A. E. Foreman, E. A. Cleveland, A. K. Robertson, A. C. R. Yuill.

TREMPE—J. C. LUCIEN, of Quebec, P.Q. Born at Montreal, Que., April 27th, 1900. Educ., B.A.Sc., and C.E., Ecole Polytech., '22; 1918 (June-Sept.), elecl. repair work, Henry Morgan Co.; 1919, (June-Sept.), survey work in connection with location of dam site, Quebec Streams Commn.; 1920 and 21, (June-Sept.), design'g., genrl. drftng., and estimating, ch. engrs. office, Public Works and Labour Dept.; 1922 (May-Nov.), design'g., dftng., and estimating, and inspectn. of bridges, and to date, asst. mtce. engr., of highway bridges, Public Works and Labour Dept. Quebec, P.Q.

References: I. E. Vallee, J. G. O'Donnell, M. L. Guimont, T. J. Lafrenière, E. T. Lavigne, C. C. Leluau.

VINEBERG—SAMUEL SULIM, of Winnipeg, Man. Born at Winnipeg, Jan. 12th, 1898. Educ., B.Sc., McGill Univ., '21. 5 mos., clerk, Greater Winnipeg Water District constrn.; 4 mos., rodman, railway mtce., G.T.P. Rly.; 4 mos., topogr., C.P.R., prelim. survey; 5 mos., C.N.R., prelim. and location survey; 12 mos. dftsman., Winnipeg Hydro-Electric System, and operator at Point du Bois; 1917(summer), leveller, D.L.S.; 1919-20, instr'man., on rly. mtce., and transitman in chg. of track centring party, G.T.P. Rly.; 1921 to date, industrial heating engr., and staff engr., Winnipeg Hydro-Electric System, at present on design or stand-by plant on City of Winnipeg Hydro-Electric System, Winnipeg, Man.

References: J. G. Glassco, J. A. MacGillivray, E. V. Caton, L. A. Herdt, N. M. Hall.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

DENNIS—WILLIAM MELBERN, of Ottawa, Ont. Born at Tyne Valley, P.E.I., July 7th, 1885. Educ., B.Sc., McGill Univ., '09, D.L.S., '11; 1909, asst. on Internat. Boundary survey on St. John River; 1910, similar position, Alaska Boundary; 1911-14, in chg. parties surveying and marking sections of boundary between B.C. and Alaska; 1915, chg. reconnaissance party, B.C. coast; 1916-17, in chg. operations, Bay of Fundy and New Brunswick triangulation nets; 1918-19, in chg. triangulation, Geodetic Survey of Canada, along B.C. coast; 1920 to date, in chg. triangulation for Geodetic Survey of Canada in Manitoba, Saskatchewan and Alberta; geodetic engr., Geodetic Survey of Canada, Dept. of the Interior, Ottawa, Ont.

References: N. J. Ogilvie, W. H. Powell, H. H. Shaw, T. E. Price, J. L. Rannie, T. Shanks.

FORBES-MITCHELL—WILLIAM JOSEPH, of London, Ont. Born in India, Nov. 8th, 1884. Educ., Civil and Mech. Engr'g. Cert., Scottish Education Dept.; 1903-07, pupilage, James Barron, M. Inst. C.E., during which completed civil and mech. engr'g. course, Gordon's Tech. Coll., and King's Coll., Aberdeen, Scotland; 1903-07, surveying, planning and estimating on the following:— concrete and rock excavation, extens. work, Wick Harbour and Macduff Harbour, works, cement and timber, Cullen Harbour, and water and drainage works in various parts of Scotland; 1907-14, asst. engr., supervising and design'g., Harbour Works, Public Works, Canada; 1914-19, overseas, Major, D.S.O.; 1919 to date, senior asst. engr., Public Works, Canada, London.

References: A. J. Stevens, K. M. Cameron, H. J. Lamb, H. B. R. Craig, H. A. Brazier.

GRANT—ALEXANDER MACDONALD, of Ottawa, Ont. Born at Egerton, N.S., Dec. 10th, 1882. Educ., B.Sc., Queen's Univ., '08. D.L.S.; two years constrn. Work, Canadian General Electric Co.; one year, Aluminum Coy. of America, 1908-11, examiner of survey returns, Topographical Surveys Branch; 1911, in chg. observing party, Geodetic Survey; 1916-18, gauge examiner, Imperial Ministry of Munitions; 1912-16, and 1919 to date, in chg. laying out triangulation organization and direction of parties engag'd, on reconnaissance, tower bldg., and direction measurement of primary and secondary triangulation in Ontario; geodetic engr., Geodetic Survey of Canada, Ottawa, Ont.

References: N. J. Ogilvie, W. M. Tobey, J. L. Rannie, A. K. Hay, N. B. MacRostie, G. H. Herriot.

GRIEVE—JOHN, of Montreal, Que. Born at Edinburgh, Scotland, Nov. 23rd, 1880. Educ., Heriot Watt Coll., 1896-98. 1898-03, appr'tce., Garrick & Ritchie, crane and hydraulic engrs., Edinburgh; 1903-05, dftsman., Geo. Russell & Co., Ltd., crane wks. engrs., Motherwell, Scotland; 1905-06, ch. dftsman., Steel Coy. of Scotland, Newton; 1906-09, dftsman and res. engr., in chg. mill equipt., Lanarkshire Steel Coy., Ltd., Motherwell; 1911-14, design'g. and estimat'g., Dominion Bridge Co., Montreal; 1914 to date, with Dominion Paint Works, Montreal, at present director and manager of sales.

References: G. R. MacLeod, J. A. Duchastel, F. B. Brown, F. P. Shearwood, C. M. McKergow, F. S. Keith.

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A

ABRASIVE WHEELS

POLISHING DEPARTMENTS. Polishing Room Arrangement, Bradford H. Divine. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 457-460, 4 figs. Arrangement of glue room, wheel-drying room and wheel preheater; general methods of setting up polishing wheels.

ACCIDENT PREVENTION

ELECTRICAL. Electrical Hazards in Industry, J. S. Pillans. Elec. Rev., vol. 92, no. 2356, Jan. 19, 1923, pp. 86-88. Causes of electrical accidents and rules for their prevention; deals with shock, burns, flash to eyes, and mechanical dangers.

ACETYLENE

GENERATORS. Safe Prnctice in Handling Acetylene Generators. Power House, vol. 16, no. 1, Jan. 5, 1923, pp. 29-30, 1 fig. Recharging; search for leaks; testing working pressure; proportions of hose; safety fusible plugs.

ACIDS

DEVELOPMENTS IN HEAVY. Developments in Heavy Acids and Alkalis, P. Pârrish. Chem. Age (Lond.), vol. 7, no. 185, Dec. 30, 1922, pp. 921-923. Deals with sulphuric, hydrochloric, nitric and phosphoric acids, and superphosphates; synthesis of ammonia; ammonia and ammonia compounds; chlorine, hypochlorites and bleaching powder; soda and potash salts.

AERONAUTICAL INSTRUMENTS

ACCELEROMETER. The N. A. C. A. Three Component Accelerometer. Aerial Age, vol. 16, no. 2, Feb. 1923, pp. 74-75, 7 figs. Describes new instrument designed by experts of Nat. Advisory Committee for Aeronautics for use in experimental research on aircraft in free flight.

SPEED INDICATORS. The Altitude Effect on Air Speed Indicators — II, H. N. Eaton and W. A. MacNair. Nat. Advisory Committee for Aeronautics, Report no. 156, 1922, 46 pp., 19 figs. Investigation, in which datn obtained are sufficiently accurate and complete to enable viscosity correction to be deduced quantitatively for number of air-speed pressure nozzles in common use. Bibliography.

AERONAUTICS

FUEL, LUBRICATING AND COOLING SYSTEMS. Aeronautical Fuel, Lubricating, and Cooling Systems, John F. Hardecker. Aerial Age, vol. 16, no. 2, Feb. 1923, pp. 60-62 and 90, 4 figs. Study of materials used, practical range of sizes of these materials, methods of construction and action of service conditions upon materials.

AIR COMPRESSORS

HIGH-PRESSURE. Production of High-Pressure Air in Connection With Low-Pressure Lines (Erzeugung von hochgespannter Druckluft im Anschluss an Niederdruckleitungen), Giller. Dinglers polytechnisches Journal, vol 337, nos 23-24, Dec 2, 1922, pp 228-229, 2 figs. Application of compressed air in mines, especially for locomotives; describes three-stage air compressors built by Duisburg.

ROTARY CELLULAR. The Rotary Cellular Compressor. Iron & Coal Trades Rev., vol 105, no. 2861, Dec. 29, 1922, p 973, 5 figs. Machines developed by Bernard Holland & Co., deal with smaller quantities of air at higher pressure than is usually obtained with turbo-compressor.

AIR CONDITIONING

HUMIDIFIER. Air Fountain Humidifiers. Engineering, vol., 115, no. 2979, Feb. 2, 1923, pp. 141-142, 14 figs. on p. 144. Air-compressing, cleaning and humidifying apparatus designed for production of degree of humidity in atmosphere required in textile mills, but which can be used for other purposes.

MIST-REMOVAL PLANT. Industrial Mist Clearing Plants, P. Martell. Eng. Progress, vol. 4, no. 1, Jan. 1923, pp. 9-20, 3 figs. Removal of mist and vapor in industrial plants; scientific principle and methods of cleaning mist; removing mist from individual vessels.

AIR LIFTS

PRINCIPLE OF OPERATION. Does the "Air Lift" Push or Pull the Water, Frank Richards. Power, vol. 57, no. 5, Jan. 30, 1923, pp. 177-178, 1 fig. Explanation of principle upon which air lift operates.

AIR PUMPS

RATE OF EXHAUSTION BY. Rate of Exhaustion of a Closed Tank by a Reciprocating Air Pump, Edgar Buckingham. U.S. Bur. of Standards, Technologic Papers, vol. 17, no. 224, Jan. 4, 1923, pp. 109-116. Equation is deduced for finding number of strokes of reciprocating air pump required to exhaust tank of large volume down tu any given fraction of atmospheric pressure, assuming that piston and valves are tight. Resulting formula shows how clearance and valve loading affect speed of exhaustion and finai minimum attainable pressure.

AIRPLANE ENGINES

AIR-COOLED STAR TYPE. Air-Cooled Star-Type Aircraft Engines (Luftgekühlte Sternflugmotoren), Otto Günther. Motorwagen, vol. 25, no. 32, Nov. 20, 1922, pp. 608-611, 3 figs. The Bristol-Jupiter and Armstrong-Siddeley-Jaguar engines are described as examples of this type.

FUEL, HIGH-ALTITUDE EFFECT ON. Results of Experimental Flights at High Altitudes with Daimter, Benz, and Maybach Engines to Determine Mixture Formation and Heat Utilization of Fuel, K. Kutzbach. Nat. Advisory Committee for Aeronautics, Tech. Notes, no. 125, Jan. 1923, 11 pp., 12 figs. Translated from Technische Berichte, vol. 3, part 1.

AIRPLANE PROPELLERS

SHAPE. The Air Propeller, Its Strength and Correct Shape, H. Dietsius. Nat. Advisory Committee for Aeronautics, Tech. Notes, no. 127, Feb. 1923, 12 pp., Investigation of stresses. Author states that it is possible to give propeller such a shape that, under given conditions, viz., a definite speed of recolution and flying speed, bending stresses in blades assume quite an insignificant magnitude. Translated from Technische Berichte, vol. 3, part 2.

AIRPLANES

ALBATROS. The New Albatros Commercial Airplane "L 58" (Das neue Albatros-Verkehrsflugzeug "L 58"), G. Meyer. Motorwagen, vol. 25, no. 34, Dec. 10, 1922, pp. 648-650, 3 figs. Built for passenger and freight transportation, with seating capacity for six passengers in a closed cabin and two pilots. Characteristics: Engine, 220-hp. Rolls-Royce; weight empty, 1250 kg., loaded, 2130 kg.; speed, 165 km. per hr.; span, 15.94 m.; length, 10.874 m.; height, 3,826 m.

BIPLANE THEORY. General Biplane Theory, Max M. Munk. Nat. Advisory Committee for Aeronautics, Report no. 151, 1922, 47 pp., 9 figs. Deals with air forces on biplane cellule. 1st part deals with two-dimensional problem neglecting viscosity; 2nd part, with influence of lateral dimensions; 3rd part is intended for practical use and can be read without knowledge of 1st and 2nd parts. Tables and diagrams. Bibliography.

CURTISS ORIOLE. The Curtiss Oriole for Aerial Photography. Aviation, vol. 14, no. 6, Feb. 5, 1923, pp. 154-155, 1 fig. Details of sepcial airplane equipped for photography work used by Fairchild Aerial Camera Corp. for pictorial and mapping purposes.

SOARING PRINCIPLES APPLIED TO. Application of Soaring Machine Practice to Airplane Design, Benno R. Dierfeld. Automotive Industries, vol. 48, no. 7, Feb. 15, 1923, pp. 332-336, 7 figs. Study of gliders in recent trials indicates that builders of propelled aircraft may adapt some construction ideas; light sport plane likely development; engine would carry plane to height at which soaring would be possible.

AIRSHIPS

HULL DESIGN. Characteristics of Streamline Forms and Design Data for Airship Hulls, Thos. L. Blakemore and Ollie L. Lewis. Air Service Information Circular, vol. 1, no. 39, Nov. 1, 1922, 17 pp., 4 figs. Determination of most efficient streamline form for airship hulls from comparative study of characteristics; and investigation of relative efficiencies of all such forms on which data were available, based upon specifications and reports of wind tunnel tests on models of same.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

BRONZE. *See Bronze.*

CALITE. Calite An Ideal Alloy for Structural Parts That must Withstand High Heat. Raw Material, vol. 6, no. 1, Jan. 1923, pp. 6-9, 2 figs. Advantages in industry and wide range of usefulness.

ZINC-BASED DIE-CASTING. A New Zinc Based Die Casting Alloy, Charles Pack. Metal Industry (N.Y.), vol. 21, no. 2, Feb. 1923, pp. 53-54, 3 figs. Alloy, known as ni-chro-zink, which is non-corrosive and does not swell up or warp.

ALUMINUM ALLOYS

ALUMINUM SILICON. Thermal Properties of Aluminum-Silicon Alloys, Junius D. Edwards. Chem. & Met. Eng., vol. 28, no. 4, Jan. 24, 1923, pp. 165-169, 5 figs. Accurate determination of densities of aluminum alloys containing variable amounts of silicon; data at various temperatures up to 1000 deg. cent., and on crystallization shrinkage and tendency to form pipe.

CASTINGS, USE IN. Aluminum Alloys and Their Use in Castings. Raw Material, vol. 6, no. 1, Jan. 1923, pp. 24-34, 1 fig. Survey of various aluminum alloys with exception of silicon alloys which have become commercially important; suggestions for turning out meritorious aluminum-alloy castings.

ASBESTOS

AUSTRALIA. Asbestos Mining in N.S.W., C. Lonsdale Smith. Chem. Eng. & Min. Rev., vol. 15, no. 171, Dec. 5, 1922, pp. 101-102, 3 figs. Quarries, treatment plant and methods of Asbestos Min. Co. of Australia Ltd.

ASH HANDLING

METHODS. Methods of Ash Handling, John Hunter and Alfred Cotton. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 83-91 and (discussion) 91-92, 24 figs. Describes various methods, dealing specially with stationary practice. Methods of removing ashes from boiler rooms; design, construction and capacity of hopper ashpits, including doors and water seals; systems of mechanical conveyance and elevation, comprising ash cars, skip hoists and bucket conveyors; fluid conveyance, as represented by water sluicing and steam-jet conveyors; particulars of ash bunkers and settling basins. (Abridged.)

AUTOGENOUS WELDING

RAILWAY SHOPS. Autogenous Welding at Sacramento General Shops of the Southern Pacific Company, H. J. McCracken and F. J. Hickey. Am. Welding Soc. Jl., vol. 2, no. 1, Jan. 1923, pp. 10-20, 16 figs. Notes on repairing boiler tubes boilers, varied articles in machine shops, and castings in steel foundry.

AUTOMOBILE ENGINES

AIR COOLING. The Progress of Air-Cooling, Autocar, vol. 50, no. 1422, Jan. 19, 1923, pp. 94-96, 4 figs. Success of two-cylinder-engined cars, and possibility of adoption of air cooling on four-cylindered power units; criticisms of air cooling; comparison of air-cooled twin with water-cooled four.

BI-FUEL USE IN. Alcohol as a Fuel. Autocar, vol. 49, no. 1419, Dec. 29, 1922, pp. 1310-1311, 2 figs. Process of utilization of bi-fuels scheme, which makes possible use of two different types of fuel, petrol and alcohol, in same engine.

TWO-CYCLE. New Two-Cycle Engine for Vehicles, H. Heller. Eng. Process, vol. 4, no. 2, Feb. 1923, pp. 33-34, 5 figs. Difficulties of two-cycle design; new engine invented by J. Lorbach works without valves, only with slots.

VALVE GUIDES. Improvements in Valve Gear. Autocar, vol. 50, no. 1422, Jan. 19, 1923, p. 84, 2 figs. Describes Smith floating valve guide, which ensures accurate seating of poppet valve, and Akehurst valve mechanism.

WAUKESHA. Unusual Fuel Economy a Feature of New Waukesha Engine. Commercial Vehicle, vol. 27, no. 11, Jan. 1, 1923, pp. 21-23, 5 figs. Describes new commercial vehicle engine, 4 by 5¾ in.; efficiency of more than 110 ton-miles to gallon; increased compression ratio factor in operating efficiency of new model.

See also Ignition.

AUTOMOBILE FUELS

CARBURATION. A New System of Carburation, G. Keith and W. A. Whatmough. Automobile Engr., vol. 13, no. 173, Feb. 1923, pp. 55-59, 14 figs. System described is development of system of quality control of combustible mixtures of gas and air which has been successfully applied in gas-furnace practice since 1915; application of principles to fuel supply of internal-combustion engines. Paper read before Instn. Automobile Engrs.

CHARCOAL PRODUCER GAS. Hungary Uses Charcoal Producer Gas as Truck Fuel, J. E. Kirchner. Automotive Industries, vol. 48, no. 6, Feb. 8, 1923, pp. 283-284, 4 figs. Fiat trucks in service by Hungarian state railroads equipped with gas producers, located at side of driver's seat; cost of operation with charcoal is 16 per cent of that with gasoline.

See also Gasoline.

BRAKES. Automobile Braking (Le freinage des automobiles), E. Weiss. Nature, no. 2540, Dec. 9, 1922, pp. 369-372, 8 figs. Discusses differential, servo, hydraulic, pneumatic, etc., brakes, placed on rear or front axles, and their control.

BRAKING. Distances Required for Stopping, P. M. Heldt. Automotive Industries, vol. 48, no. 6, Feb. 8, 1923, pp. 280-281, 1 fig. Application of brakes produces effect of transferring weight from rear to front wheels; stopping time less with four-wheel type; effect of air resistance.

CITROËN CATERPILLAR. The Sahara Conquered by Car. Autocar, vol. 50, no. 1421, Jan. 12, 1923, pp. 58-60, 8 figs. Describes Citroën cars, equipped with Kegresse-Hinstin systems of flexible rubber and canvas creeper track, which have crossed the Sahara, from Touggourt to Timbuctoo, in twenty-two days; special cooling arrangements; six-speed arrangement. See also articles in Autocar, vol. 50, no. 1422, Jan. 19, 1922, pp. 102-103, 3 figs., describing performance.

DESIGN. Relative Movements Between Axle and Frame, F. A. Stepney. Automobile Engr., vol. 18, no. 172, Jan. 1923, pp. 9-10, 4 figs. Location of brake, steering, and similar connections. Discusses design of axle and chassis so as to have least possible endwise movement.

DEVELOPMENTS. Passenger-Car Developments and Prophecies, F. E. Watts. Soc. Automotive Engrs.— Jl., vol. 12, no. 2, Feb. 1923, pp. 177-178. Review of important developments, most important of which is said to be adaptation of closed body to cheap quantity production.

DIFFERENTIAL CASINGS. Machining Differential Housings on a Production Bai., H. A. Loudon and H. S. Beal. Automotive Industries vol., 48, no. 5, Feb 1, 1923, pp. 234-237, 10 figs. Outlines practical methods.

FUEL-CONSUMPTION INDICATORS. Fuel Consumption Indicators. Autocar, vol. 50, no. 1420, Jan. 15, 1923, pp. 21-23, 5 figs. Instruments which show at glance fuel consumption in miles per gallon at any instant; various methods suggested for attaining desired result.

HEADLIGHTS. British Encourage Development of Non-Glare Headlamps, M. W. Bourdon. Automotive Industries, vol. 48, no. 7, Feb. 15, 1923, pp. 329-330, 2 figs. "Moonbeam" lamp with ellipsoidal reflector, narrow opaque shield in focal plane and lens with vertical corrugations on its rearward surface wins medal of Roy. Automobile Club of Great Britain.

Moonbeam Non-Dazzle Headlamps, Auto-Motor Jl., vol. 28, no. 2, Jan. 11, 1923, pp. 33, 2 figs. Optical principle used to control objectionable glare; system comprises reflector of special shape, projecting lens and cross-bar or diaphragm.

LAVOIE. New Canadian Chassis Is Replete with Engineering Interest. Herbert Chase. Automotive Industries, vol. 48, no. 4, Jan. 25, 1923, pp. 177-184, 11 figs. Lavoie closed cars fitted with 4-wheel interchangeable brakes, live front axle spindles and novel design of steering gear; 4-cylinder engine has unjacketed detachable head.

SERVICE SYSTEM. The Development of a Modern Service-System, Don T. Hastings. Soc. Automotive Engrs.— Jl., vol. 12, no. 2, Feb. 1923, pp. 193-204, 16 figs. Enumerates causes of poor service, describes new attitude toward service and progress of building up of combined flat-rate and piece work system.

AVIATION

AERIAL LIGHTHOUSES. Improved Equipment for Night Flying. Aviation, vol. 14, no. 5, Jan. 29, 1923, pp. 130-131, 1 fig. Describes field limitation beacon and ground wind indicator developed by Am. Gas. Assumulator Co., showing limits of field and direction of wind.

Landing Lights for Aircraft. Times Trade & Eng. Supp., vol. 11, no. 231, Dec. 9, 1922, p. 305, 1 fig. New combined lighthouse and airdrome landing light of French design.

AIRPORTS. Airports in the United States and Possessions. Aviation, vol. 14, nos. 3 and 4, Jan. 15 and 22, 1923, pp. 68-72 and 98-103, 5 figs. How airport should be built; size and shape; character of ground. List of permanent and temporary American airports.

GLIDING. Engineless Airplanes (L'avion sans moteur), Suffrin-Hebert. Technique Moderne, vol. 15, no. 1, 1923, pp. 11-16, 7 figs. General review of developments; study of air currents and how to make use of them.

B

BALANCING MACHINES

ROTATING PARTS. Balancing Rotating Parts While Running at Regular Speed. Dispositif permettant l'équilibrage des pièces tournantes "en cours de rotation à leur vitesse de régime"), Jacques Roquet. Revue Générale de l'Electricité, vol. 12, no. 26, Dec. 30, 1922, pp. 1013-1016, 8 figs. Deals especially with balancing of rotors of turbo-generators, and describes apparatus consisting of two balancing disks placed at each end.

STATIC-DYNAMIC. The Olsen-Carven Static-Dynamic Balancing Machine, C. Norman Fletcher. Machy. (Lond.), vol. 21, no. 539, Jan. 25, 1923, pp. 513-516, 9 figs. Designed so that by simple manipulation, static unbalance of a body can be ascertained.

TECHNOLOGY. The Present Status of Balancing Technology (Der heutige Stand der Auswuchttechnik), Ernst Lehr. Maschinenbau, vol. 2, nos. 5-6, Dec. 16, 1922, pp. G62-G69, 15 figs. Presentation of methods on an exact scientific basis. The Lawaczeck-Heymann system of balancing machines.

BEARINGS

LUBRICATION. Reducing Lubrication Costs, H. M. Robinson. Elec. Ry., Jl., vol. 61, no. 3, Jan. 20, 1923, pp. 119-122, 8 figs. Methods of lubrication and amount of lubricant used on various types of motor and journal bearings on rolling stock of Northern Texas Traction Co. and Tarrant County Traction Co., Fort Worth, Tex.

BEARINGS, BALL

ECONOMY OF. Ball Bearing Installation Nets 50% on Investment, Chester A. Gauss. Belting, vol. 22, no. 1, Jan. 1923, pp. 26, 28, 30 and 32, 9 figs. Economics which can be effected through change over to ball-bearing line shaft equipment. Describes equipment of Hubbard Milling Co., Mankato, Minn., and savings effected.

ROLLER AND. Experience With Ball and Roller Bearings in Railway Rolling Stock (Erfårenheter rörande kul-och rullaper i järnvägsmatriel), Arvid Palmgren. Tecknish Tidskrift, vol. 53, no. 3, Jan. 20, 1923. pp. (Mekanik Section) 1-6, 10 figs. Behavior of ball and roller bearings and results of comparative tests.

The Elimination of Power Losses and Other Sources of Waste in Mines by the Use of Ball- and Roller-Bearings, Kenelm C. Appleyard and A. W. MaCaulay. Instn. Min. Engrs.—Trans., vol. 64, part 4, Jan. 1923, pp. 154-170 and (discussiun) 170-172, 8 figs. Account of tests showing power saving.

BEARINGS, ROLLER

RAILWAY VEHICLES. Roller Bearings for Railway Vehicles. Ry. Engr., vol. 44, no. 516, yan. 1923, pp. 10-11, 4 figs. Recent developments on New York Central lines.

STREET CARS. Tests of London Country Council Car Fitted With Roller Bearings. Tramway & Ry. World, vol. 53, no. 3, Jan. 18, 1923, pp. 25-27, 6 figs. Describes comparative tests carried out by Nat. Physical Laboratory with car before and after replacement of plain bearings of motors and axles by Hoffmann roller bearings, and results obtained.

BELT DRIVE

CALCULATIONS. Transmission Belt Operation (Le fonctionnement des transmissions par courroies), Métallurgie, vol. 54, no. 51, Dec. 21, 1922 and vol. 55, no. 2, Jan. 11, 1923, pp. 1907-1908 and 53-54. Belt calculations; measuring coefficient of friction and belt efficiency; theory of functioning of belts, based on formula by Rankine.

STANDARDIZATION. DuPont Method of Analysing and Standardizing Belt Drives, William Stamar. Belting, vol. 21, no. 6, Dec. 1922, pp. 25-28, 2 figs. How this organization determined by actual tests proper belts to use and what it saved by doing so.

BELTING

LEATHER. Relatiun of Leather Belting to Economical Power Transmissiun, Claude O. Streeter. Agricultural Eng., vol. 3, no. 12, Dec. 1922, pp. 199-200. Results of tests show superiority of leather belting.

BLAST-FURNACE GAS

CLEANING. The Trend in Blast Furnace Gas Cleaning, Fred E. Kling. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 44-46, 2 figs. Controversy between "wet cold" and "dry cold" still waging; comparison between American and foreign equipment and costs.

BLAST FURNACES

DESIGN. New Blast Furnace at Clarence Ironworks, Iron and Coal Trades Rev., vol. 106, no. 2865, Jan. 26, 1923, pp. 111-114, 8 figs. Details of furnace built by head, Wrightson & Co., Ltd.; height is 85 ft.; hearth, 12 ft. 6 in. in diam.

BLASTING

COAL MINES. Recent Advances in Blasting N. S. Greensfelder. Coal Industry, vol. 6, no. 1, Jan. 1923, pp. 52-54. Discusses different types of permissible explosives and their safety features; electric shot firing said to be is preferable in all cases and should be used; systems of shot firing described.

BOILER EXPLOSIONS

MARINE. Vertical Type Boiler Explodes on a British Ship. Boiler Maker, vol. 23, bo. 1, Jan. 1923, pp. 8-9, 1 fig. Details of Board of Trade Investigation with conclusions.

BOILER FEEDWATER

DE-GASSING. Kestner System for the De-gassing of Boiler Feed Water. Iron and Coal Trades Rev., vol. 106, no. 2864, Jan. 19, 1923, pp. 84-85, 3 figs. Describes apparatus and application of system.

HEATING. Feed Heating or High Thermal Efficiency, Linn Helander. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 105-109, 11 figs. Economics of 25-000-kw. power stations using single- and multiple-stape condenser heaters, with and without economizers, determined for purpose of demonstrating effect of varying feedwater temperature. (Abridged.)

Feed-Water Heaters, Water Softeners and Purifying Systems. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 77-86, 18 figs. Advantages of heating water before delivering to furnace; methods of heating boiler feedwater; insulating feedwater heater; economizers; mechanical, thermal, and chemical treatment of feedwater; types of purifiers.

TREATMENT. Determination of Hardness of Water (Die Härtebestimmungen in technischen Wässern), Franz Kanhäuser. Chemiker-Zeitung, vol. 47, no. 8, Jan. 18, 1923, pp. 57-59. Reviews processes for treating boiler feedwater and shows most appropriate method for a given water.

BOILER FURNACES

DRAFT, MECHANICAL. Mechanical Draft. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 72-76, 15 figs. Advantages; discusses induced and forced draft.

BOILER OPERATION

EFFICIENCY CALCULATION. Special Slide Rule Designed to Calculate Boiler Efficiency, C. H. S. Tupholme. Power Plant Eng., vol. 27, no. 3, Feb. 1, 1923, pp. 165-166, 2 figs. Calculator brought out by British firm consists of two slide rules working in usual direction and fitted into one frame.

FACTORS DETERMINING. Determining Boiler Operating Factors, D. C. Hess. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 169-172, 6 figs. Methods used to determine essential factors for economical operation of boiler rooms; results of tests; method of calculating combined efficiency of furnace and grate; operating charts.

FURNACE FIRING. Determining Boiler Operating Factors, D. C. Hess. Am. Gas Jl., vol. 117, no. 29, Dec. 16, 1922, pp. 679-683, 8 figs. Data produced by series of tests. Heat-balance calculations; cost of steam curves; factors for firing furnaces.

BOILER PLANTS

OIL-BURNING. Where Steam Gets 83.1 Per Cent of Heat in Fuel, G. Milton Levy. Power Plant Eng., vol. 27, no. 3, Feb. 1, 1923, pp. 157-161, 7 figs. Plant of Atlantic Refining Co. equipped to burn oil, coal or gas; instruments permit weekly calculation of heat balance.

WOOD-REFUSE-BURNING. Wood Refuse Power Plant. Engineering, vol 115, no. 2977, Jan. 19, 1923, pp. 69-71, 5 figs. New installation built by Horace Boot and Partners, London, for timber mills, uses as its sole fuel sawdust and wood obtained from works.

BOILER PLATE

INVESTIGATIONS. Report on Investigations of Boiler Plate at the Material Testing Institute (Mitteilung aus der Materialprüfungsanstalt an der Technischen Hochschule Stuttgart), H. Baumann. Zeit. des Bayerischen Revisions-Vereins, vol. 26, no. 24, Dec. 31, 1922, pp. 191-1194, 4 figs. Account of work extending over a number of years. Address before Federation German Boiler Inspection Societies at Stuttgart.

BOILER ROOMS

PIPING. Boiler-Room Piping. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 93-99, 10 figs. Details of design, laying, and size; tables giving sizes of standard, extra-strong, and double-strong pipe, respectively.

BOILER TUBES

SOOT BLOWERS. Boiler Efficiency and Spot Removal. Eng. Rev., vol. 36, no. 5, Nov. 1922, pp. 140-142, 4 figs. Description of modern equipment for removal of soot from tubes of marine and land boilers by means of steam jet.

BOILERS

CARE AND MANAGEMENT. Care and Management of Steam Boilers. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 5-11, 16 figs. Selection of boiler room personnel; discusses ascertaining and maintaining water level, starting fires and raising steam, feeding and heating feedwater, pressure indicating and regulating devices, how to proceed in emergencies, soot removal, firing methods, stokers, coal and ash handling, etc.

ICE PLANTS. Steam Boilers and Accessories for Ice Making Plants, W. D. Dunbar. Ice and Refrigeration, vol. 63, no. 6, Dec. 1922, pp. 337-339. Discusses furnaces, stokers, baffling of boilers, draft, etc., from standpoint of economical generation of power. (Abstract). Paper read before Nat. Assn. Practical Refrig. Engrs.

RATING. Capacity, Methods of Rating and Horsepower of Boiler. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 66-71, 1 fig. Details of economical operation Relation of boiler horsepower to engine horsepower; depreciation and obsolescence; evaporation.

SETTING. Boiler Setting. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 33-40, 10 figs. Describes settings required for different-type boilers; construction of boiler settings; tables giving measurements for setting different-type boilers; characteristics of firebrick.

TYPES. Internally and Externally Fired Boilers. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 27-32, 11 figs. Describes the various types of vertical boilers, and the uniflow boiler. Specifications for vertical boilers of 100 and 125 lb. pressure, vertical boiler with submerged tubes, and portable boiler, tables giving dimensions of Manning and firebox heating boilers, horse-power rating of uniflow boilers, and general proportions of continental boiler ranging from 50 to 300 hp.

WATER-TUBE. *See Boilers, Water-Tube.*

BOILERS, WATER-TUBE

LARGE-CAPACITY. Large Capacity Water-Tube Boilers. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 1-4, 11 figs. Describes installation of various plants.

TYPES. Water-Tube Boilers. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 41-59, 41 figs. Describes Babcock & Wilcox, Bieglow-Hornsby, Bonar, Casey-Hedges, Edge Moor, Erie City, Franklin, Heine, Keeler, Ladd, Morrison, O'Brien, Geary, Root, Rust, Stirling, Union, Voght, Walsh & Weidner, Worthington, Page, Murray, Springfield, Bass, Davis, and Wicks water-tube boilers, and Hawkes and Koschell combination fire- and water-tube boilers.

BONUS SYSTEMS

FOREMEN. Some Details in the Application of a Bonus on Operation and Maintenance, A. A. Frank. Indus. Engr., vol. 81, no. 1, Jan. 1923, pp. 4-10 and 67, 12 figs. Plan whereby foremen are rewarded according to economies they can show in maintenance and power costs.

BRAKES

WESTINGHOUSE. The Westinghouse Pressure Brake. Autocar, vol. 49, no. 1418, Dec. 22, 1922, pp. 1281-1282, 4 figs. Device which applies brake shoes by means of gas pressure and ensures perfect compensation; made primarily for lorries and such heavy vehicles, but applicable to touring car and particularly where four-wheel brakes are standard.

BRICK

SYNTHETIC. What About Synthetic Brick and Tile? Brick and Clay Rec., vol. 62, no. 2, Jan. 9, 1922, pp. 118-119 and 151, 8 figs. Ignorance on part of public of vast difference of quality enabled over 800,000,000 cement brick and tile to be produced; some brick sold as high as $35 per M. Says public should be told of dangers in using synthetic brick. How concrete, cement, and face bricks are made.

BRIDGE DESIGN

GIRDER. Girder Bridge Design, T. C. Hood. Engineer, vol. 135, no. 3501, Feb. 2, 1923, pp. 124-125. Calculation of stresses; impact stresses.

BRIDGES

WIND PRESSURE. Wind Pressures and Stresses Caused by the Wind on Bridges, Douglas H. Remfry. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 152. Deals with maximum mean velocities; wind velocities in India; dynamic increment due to dust; size of structure as affecting wind pressure; effect of shape. (Abstract.) Paper read before Instn. Civ. Engrs.

BRIDGES, CONCRETE

ARCH. Design of 400-ft. Concrete Arch of the Cappelen Memorial Bridge. Eng. News-Rec., vol. 90, no. 4, Jan. 25, 1923, pp. 148-152, 6 figs. 400-ft. concrete arch largest ever built; span required to provide navigation water and clear old bridge; thrust partly balanced by 199-ft. side spans.

BRIDGES, HIGHWAY

CONCRETE. Reinforced Concrete Bridge at Brantford, Frank P. Adams. Can. Engr., vol. 44, no. 5, Jan. 30, 1923, pp. 179-180, 4 figs. Arch highway bridge at Ontario, 60 ft. span and 48 ft. wide; details of reinforcement for arch ring; arrangement of form-work for concrete; particular attention paid to construction of parapet wall.

Tests of Knees for Continuous Frame Concrete Bridges, Arthur G. Hayden. Eng. News-Rec., vol. 90, no. 3, Jan. 18, 1923, pp. 108-110, 8 figs. Results of tests conducted in laboratory of Columbia University show efficiency of details of specially designed highway bridges used on Bronx Parkway roads.

STEEL-AND-CONCRETE. 1750 ft. Bridge Across the Ottawa River. Contract Rec. vol. 37, no. 4, Jan. 24, 1923, pp. 68-70, 6 figs. Deck plate girder-type of structure to be erected from Perrot to Dorion, near Montreal; concrete arch bridge was alternative design.

BRIDGE, SUSPENSIONS

DESIGN. Large Modern Suspension Bridges (Note sur les conditions d'établissement des grands ponts suspendus modernes), T. Godard. Annales des Ponts et Chaussées, vol. 2, no. 5, Sept.-Oct. 1922, pp. 101-131, 8 figs. Compares principles and design of American and French bridges; good and bad points of suspension bridges; calculation; recommends Delaware and Detroit bridges as type of future.

BRONZES

CASTING. Casting Bronze in Green-Sand Moulds, M. J. Leonard. Foundry Trade Jl., vol. 27, no. 335, Jan. 18, 1923, p. 47. Technical difficulties of method; bronzes and sands used. Translated from Bul. L'Assn. Technique de Fonderie de Liège.

BUILDING CONSTRUCTION

COST CURVES. How to Develop Cost Curves for Building Estimates, O. Wilbur. Eng. News-Rec., vol. 90, no. 7, Feb. 15, 1923, pp. 293-295, 2 figs. Equation of cost curve for given type of building derived from analysis of estimated costs of three buildings.

TIMBER, ESTIMATING COST. Estimating the Cost of Timber Construction, Chas. F. Dingman. Contract Rec., vol. 37, no. 3, Jan. 17, 1923, pp. 48-52. Practical data to aid the estimator in figuring cost of handling, framing and erecting lumber in mill and house types of construction.

BUILDINGS

RAILWAY MAIL. New Railway Mail Building at Chicago An Unusual Structure. Ry. Eng. and Maintenance, vol. 19, no. 1, Jan. 1923, pp. 4-6, 5 figs. Details postal terminal recently completed which is important feature of new Union station project.

C

CALCIUM CARBIDE

MANUFACTURE AND USES. Calcium Carbide; Its Manufacture and Applications. Elec. Rev., vol. 92, no. 2357, Jan. 26, 1922, pp. 126-128. Electric furnaces used in manufacture; electric furnace electrodes uses.

CANALS

DIMENSIONS, DIAGRAM FOR DETERMINING. Straight Line Diagram for Obtaining Canal Dimensions, John R. Jahn. Eng. World, vol. 22, no. 1, Jan. 1923, p. 35, 1 fig. Nomographic chart which enables to determine easily dimensions of earth channels to carry predetermined quantities of water with assigned surface slopes or at assigned velocities; based on Kutters' formula "n" constant = .025 and bank-slopes 1½ to 1.

CAR WHEELS

WORN, SALVAGE OF. The Salvage of Worn Steel Car Wheels, W. J. Merten. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 84-88, 12 figs. Influence of complex internal wheel stresses and strains on building up worn flanges and treads by arc welding; preheating essential before welding.

CARS, COAL

GONDOLA. A Discussion of the Methods Used in Designing the C. M. & St. P. Gondola, Wendel J. Meyer. Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 109-111, 6 figs. Comments on analyses used in description of method employed in designing cars, published in same journal, Nov. 1922.

CARS, FREIGHT

AUTOMOBILE. Chicago, Milwaukee & St. Paul Automobile Cars. Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 97-105, 14 figs. Calculations from specifications of stresses in truck members, body frame and underframe.

ORE-CARRYING. Large Capacity Ore Car, Ry. Jl., vol. 29, no. 1, Jan. 1923, pp. 18-19, 8 figs. Describes Commonwealth cars at Duluth Missabe and Northern Ry., having special features intended to insure economy in operation as well as affording large tonnage per car.

CASE-HARDENING

BOXES FOR. Efficient Case Hardening Boxes, L. C. Dunn. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 53-54, 4 figs. Considerations in design of efficient boxes with special reference to type of furnace and work to be treated; comparison of plain carbon and alloy boxes.

CAST IRON

SOLIDIFICATION. Volume Changes of Cast Iron on Solidification, Oliver Smalley. Foundry Trade Jl., vol. 27, no. 337, Feb. 1, 1923, pp. 89-99, 60 figs. Series of experiments conducted on volume change of various cast irons on solidification as related to piping or drawing. Casting without risers or feeding.

SPECIAL ELEMENTS, EFFECT OF. The Effect of Special Elements on Cast-Iron—II, Oliver Smalley. Foundry Trade Jl., vol. 27, no. 333, Jan. 4, 1923, pp. 3-6, 7 figs. Effect of molybdenum on cast iron; physical tests; chemical analysis and microscopical examination; effect of chrome.

CEMENT

ALUMINA. Ciment Fondu or Alcement, Rud. Christiani. Concrete, vol. 22, no. 1, Jan. 1923, pp. 25-28. Principal points of interest in make and use of usual binding mortars and production and use of lime and cement mortars; comparison of different cements; alcement proof against sulphurus solutions; description of driving tests. Translated from Ingenioren.

CEMENT MANUFACTURE

PROGRESS IN. Recent Improvements in Manufacture of Artificial Cements, H. Bied. Concrete, vol. 21, no. 6, Dec. 1922, pp. 95-96 (Cement Mill Section), Methods of Analysis; rules for proportioning; elements constituting cement; new cements; burning; grinding of burned or raw materials. Translated from Le Ciment.

CENTRAL STATIONS

BIRMINGHAM, ENGLAND. The Nechells Power Station of the Birmingham Corporation, W. Noble Twelvetrees. Engineering, vol. 115, nos. 2978, Jan. 26. 1923, pp. 99-102. Permanent generating station is designed for ultimate capacity of 100,000 kw.; main power-house buildings comprises boiler and engine house and adjoining building, details of which are given.

LONDON. New Electrical Station of Leicester Corporation. Tramway and Ry. World, vol. 53, no. 3, Jan. 18, 1923, pp. 9-14, 12 figs. Describes station at Aylestone, Leicester, for supplying energy for tramways, lighting and power, and its equipment; 10,000-kw. turbo-generator. See also Elec. Rev., vol. 91, nos 2353, Dec. 29, 1922, pp. 977-978, 6 figs.

CHAINS

CAST. Producing Detachable Cast Chain, Herbert R. Simonds. Iron Trade Rev., vol. 72, no. 6, Feb. 8, 1923, pp. 446-449, 5 figs. Introduction of assembling machine for locking together malleable iron links makes possible output three times greater than with hand method; casting, finishing, annealing and assembly operations.

CHIMNEYS

REINFORCED-CONCRETE. Concrete Chimney in Pre-Cast Segments. Concrete and Constructional Eng., vol. 15, no. 1, Jan. 1923, pp. 31-35, 3 figs. Describes reinforced-concrete chimney, 150 ft., high with internal diameter at top of about 51 ft., constructed in pre-cast segments, on "Monnoyer" system; advantages of "Monnoyer" system of construction over ordinary brick, and monolithic reinforced-concrete chimneys.

CLUTCHES

FRICTION, DESIGN. Improvements in Design of Friction Clutches, V. R. Bruce. Can. Machy., vol. 29, no. 3, Jan. 18, 1923, pp. 18 and 32, 2 figs. Eliminating power loss; characteristic of various types; advantages of plate design; effect of centrifugal action.

COAL

CANADA. Coal in Canada, 1922, S. J. Cook. Can. Min. Jl., vol. 44, no. 1, Jan. 5, 1923, pp. 5-7. Interprovincial shipments, exports, and imports; coal made available for consumption in Canada.

PREPARATION. Selective Preparation of Boiler Fuel, Noel Cunningham. Combustion, vol. 8, no. 2, Feb. 1922, pp. 98-101, 2 figs. Brief description of methods of preparing better coal, with view to aiding consumer to greater economies in its uses.

COAL HANDLING

COAL HANDLING. Coal Handling and Electricity Supply, George F. Zimmer. Elecn. vol. 39, no. 2328, Dec. 29, 1922, pp. 742-747, 9 figs. Describes modern installation at Blackburn electricity station.

COAL MINING

LONGWALL SYSTEM. Longwall System of Mining, R. W. McCausland. Engrs' Soc. West Pa. — Proc., vol. 38, no. 9, Dec. 1922, pp. 421-438 and (discussion) 439-452, 8 figs. Consideration of plan to be used; roof control, author's experiences.

COAL TIPPLES

STEEL. Surface Plant at Crane Creek Mine, R. S. Miller. Coal Industry, vol. 6, no. 1, Jan. 1923, pp. 25-27, 3 figs. Large new tipple contains modern equipment; five sizes can be loaded direct or sent to dry-cleaning plant, method used in handling mine cars and refuse.

COKE MANUFACTURE

CHEMISTRY OF PROCESS. The Chemistry of the coking Process, Fredrich Lierg. Am. Gas. Jl., vol. 118, no. 4, Jan. 27, 1923, pp. 63-66 and 74-77, 1 fig. Observations and conclusions of experiments conducted to secure better results in coking of non-caking coals mixed with coal tar pitch. Preparation of high melting point bitumen. Translated from Zeit. fur angewandte Chemie, 1922, pp. 264-268.

COLUMNS

REINFORCED-CONCRETE. Reinforced Concrete Columns, John Tucker, Jr., Am. Soc. Civ. Engrs., —Proc. vol. 49, no. 2, Feb. 1923, pp. 165-239, 13 figs. Determination of values of safe working stresses for several types of reinforced-concrete columns, and indication of those excessive, and therefore, unsafe stresses permitted by 1917 and 1921 specifications, especially those for spirally reinforced columns.

COMBUSTION

HEAT OF GASES. Internal Combustion and the Specific Heat of Gases. Mar. Engr. and Naval Architect, vol. 46, no. 544, Jan. 1923, pp. 17-18, 1 fig. Lack of theoretical knowledge on subject compared with advance of practice; necessity for further information.

COMPRESSED AIR

COAL MINES. Notes on Compressed Air, D. H. Curren Briggs. Instn. Min. Engrs. Trans., vol. 64, part 3, Dec. 1922, pp. 85-95 and (discussion) 95-111, 6 figs. Results of practical tests and observations with view of drawing attention to and preventing widespread waste and inefficiency in use of compressed air for coal-mining purposes.

CONCRETE

DESIGN AND CONSTRUCTION. Some New Ideas on Concrete Design and Construction. Eng. News-Rec., vol. 90, no. 5, Feb. 1, 1923, pp. 216-218. Abstracts of following papers read before Am. Concrete Inst.; Inundation Methods of Measuring Sand in Making Concrete, G. A. Smith and W. A. Slater; How to Minimize Some Defects in Concrete Buildings, H. D. Loring; A Concrete Tank Reinforced With Outer Tightened Bands, W. S. Hewett; Trend of Concrete Road Design, H. Eltinge Breed.

PAVING, HYDRATED LIME IN. Advantages of Hydrated Lime in Paving Concrete, Duff A. Abrams. Concrete, vol. 21, no. 6, Dec. 1922, pp. 202-203. Discussion of paper by T. B. Shertzer before City Paving Conference, correcting statements made therein which author says are erroneous.

PROPORTIONING AGGREGATES. Design of Concrete Mixtures, F. S. Besson. Concrete, vol. 22, no. 1, Jan. 1923, pp. 10-18, 11 figs. Quality of concrete; fineness modulus, surface area, and void methods of measuring aggregates; water-cement ratio; cement space ratio; aggregate denseness; strength curves; estimating chart; proportioning by use of tables.

CONCRETE, REINFORCED

SLABS. Rectangular Slabs, A. Ingerslev. Concrete and Constructional Eng., vol. 18, no. 1, Jan. 1923, pp. 51-56 and (discussion) 57-59, 4 figs. Solution by elementary calculus, of problem as regards determination of bending moment and stresses at any point of slab. Abstract of paper read before Instn. Structural Engrs.

CONNECTING RODS

MILLING. Milling Automobile Connecting-rods, Charles Littelmann. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 433-434, 4 figs. Handling work on two-story fixture; power requirements; arrangement when both bosses are of equal strength.

CONVERTERS

ROTARY. Converters (Transformatrici polimorfiche), G. M. Pestarini. Elettrotecnica, vol. 9, nos. 34 and 35, Dec. 6 and 15, 1922, pp. 777-782 and 797-803, 29 figs. Discusses rotary transformers for transforming electrical energy supplied by one line into energy of different character of another line; d.c., polyphase, and single-phase locomotives.

CONVEYORS

BELT. Belt Conveyors in Bulk Storage Plant at Portland, Ore., W. A. Scott. Belting, vol. 22, no. 1, Jan. 1923, pp. 15-17, 4 figs. Describes system used in plant on Willamette River for transferring materials from cars to storage and thence to ships as needed; equipped especially for handling in bulk phosphate, rock, coal, ores, sulphur and non-metallic minerals.

COOLING TOWERS

ACTION OF. Analysis of Cooling Tower Performance, J. W. Gavett, Jr. Power Plant Eng., vol. 27, no. 4, Feb. 15, 1923, pp. 217-221, 1 fig. Fundamental principles underlying action of cooling tower; use of psychrometric chart demonstrated.

DESIGN. The Design of Cooling Towers, C. S. Robinson. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 99-102, 1 fig. Author establishes general principle applicable to cooling-tower design and derives equations for use of designer; presents experimental data to substantiate validity of formulas and shows by actual experiment how they are applicable to design of counter-current cooling tower. (Abridged.)

CORROSION

ANTI-FOULING COMPOSITIONS. Anti-Corrosive and Anti-Fouling Compositions, P. E. Bowles, Soc. Chem. Industry—Jl., vol. 41, no. 22, Nov. 30, 1922, pp. 492R-495R, 3 figs. Discusses conditions to be sought in making anticorrosive paint, most satisfactory products being certain pitches and asphalt solutions.

COST ACCOUNTING

By-Product Coke Plant. Accounting and Costing for By-Product Coking Plants, M. Mackenzie. Iron and Coal Trades Rev., vol. 106, nos. 2862, 2863 and 2864, Jan. 5, 12 and 19, 1923, pp. 4-5, 46-47 and 78-79, 11 figs. Author describes system from theoretical aspect; actual method of operation; and preparation of monthly statement and its reconciliation with financial books.

Clay Products Plants. An Uncostly Cost Accounting Stsyem, W. A. Barron. Brick and Clay Rec., vol. 62, no. 1, Jan. 9, 1923, pp. 30-35 and 64-65, 4 figs. System of Barron Brick Co., using only four forms or sheets, which has been proven thoroughly successful in actual operation; uses symbols to designate accounts.

Factory. Factory Cost from Rough Castings to Product, A. Lunenberg. Can. Machy. vol. 29, nos. 1, 2 and 3, Jan. 4, 11 and 18, 1923, pp. 24-25, 19-20 and 32, and 23 and 25, 10 figs. Jan. 4: Indirect expense; overhead or burden; distribution among departments; monthly method of handling; figuring depreciation. Jan. 11: Expense of replacing defective castings; repairs to patterns; handling supplies. Jan. 18: Checking up material in different departments; inventory of completed and semi-finished work.

CRANES

Gasoline-Electric Road. A Petrol-Electric Road Crane. Engineer, vol. 135, no. 3499, Jan. 19, 1923, p. 66, 2 figs. Evolved with idea of rapidly handling loads up to 2 tons in any situation where it may be possible to drive a motor lorry.

Locomotive. The 80-Ton Oerlikon Crane for Locomotive Repair Shops (Le gru da 80 tonn. dell'Officina di riparazione dei locomotori delle Ferrovie Federali in Bellinzona, fornite dalla Maschinenfabrik Oerlikon), Druey. Rivista Tecnica della Svizzera Italiana, vol. 11, no. 12, Dec. 1922, pp. 136-138, 2 figs. Design and operation of Ward-Leonard control cranes.

Traveling. Traveling Crane Has Turnable to Swing Locomotives. Eng. News-Rec., vol. 90, no. 6, Feb. 8, 1923, pp. 250-251, 2 figs. Engines transferred from longitudinal shop track to transverse track by rotating hoist on trolley of crane.

Wrecking. A Powerful Steam Breakdown Crane, Jamaica Government Railways. Ry. Gaz., vol. 38, no. 4, Jan. 26, 1923, pp. 116-117, 3 figs. 40-ton crane built by Cowans Sheldon & Co., Carlisle.

CRANKSHAFTS

Torsion. Torsion of Crankshafts, S. Timoshenko. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 96-98, 4 figs. Considers case of crankshaft with single throw and established mathematical relations for such case; investigates three conditions of such crankshaft: (1) no constraint, corresponding to ample clearance in bearings; (2) complete constraint, corresponding to no clearance; and (3) partial constraint, corresponding to ample clearance in halves of bearings nearest web and no clearance in other halves.

Webs, Machining. The Machining of Crank Webs (Die Bearbeitung der Kurbelwellenarme), Heinrich Steiner. Motorwagen, vol. 25, no. 31, Nov. 10, 1922, pp. 600-603, 6 figs. Describes machining operations and a special machine for (Moll system) machining webs for automobile, airplane and Diesel-engine crankshafts.

CUPOLAS

Problems of. The Foundry Cupola, Robert Buchanan. Foundry Trade Jl., vol. 27, nos. 333, 334 and 335, Jan. 4, 11, and 18, 1923, pp. 9-13, 27-28 and 41-42, 1 fig. Historical review; tuyere considerations; how to deal with poor coke; comparison of types of cupolas; management; cupola linings; charging; melting; cupola slag.

Steel-Melting. Throws Light on Steel Melting, G. Muntz. Foundry, vol. 51, no. 2, Jan. 15, 1922, pp. 77-79, 1 fig. Experiments made under stress of war necessity result in procedure for melting steel in cupola; priming charge of pig iron deemed imperative to maintain fluidity.

Tuyeres. Foundry Cupola Tuyeres, H. H. Shepherd. Metal Industry (Lond.), vol. 22, no. 1, Jan. 5, 1923, pp. 11-12. Considerations concerning tuyeres, that should be taken into account when buying, designing, or "running" melting section of iron foundry; arguments against use of spiral or double-row tuyere arrangement.

CYLINDERS

Molding Castings. Molding Large Card Cylinders, H. R. Simonds. Foundry, vol. 51, no. 3, Feb. 1, 1923, pp. 87-92, 14 figs. Ingenious flask and pattern rigging in connection with jolt machines and sand-handling equipment applied to production of large cylindrical castings used in textile industry.

D

DAMS

Calaveras, Cal. Calaveras Dam Raised With Dry Fill and Puddled Core. Eng. News-Rec., vol. 90, no. 3, Jan. 18, 1923, pp. 117-118, 3 figs. Additional material now being added brings total height to 175 ft.; concrete spillway and new outlet tunnel provided.

DIES

Motor Laminations. Punching Rotor and Stator Laminations, Charles O. Herb. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 436-438, 7 figs. Describes three piercing and blanking dies used in sequence in manufacture of laminations for small electric motors.

Steel for Die Blocks. Composition and Manufacture of Die Block Steel, Chas. McKnight. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 44-46. Discusses merits of various steels used for die blocks; comparison of straight carbon and alloy steels.

DIESEL ENGINES

Clutches. Diesel-Engine Clutch Used in the German Submarine "U-117," W. H. Nicholson. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 113-115, 8 figs. Information obtained at time of dismantling of ex-German submarines in United States. The U-117's clutch is described in detail and other types of German Diesel-engine clutches are covered generally.

Compressorless. New Fuel-valves for Compressorless Diesel Engines (Neue Brennstoff-Ventile für kompressorlose Dieselmaschinen), Rorck. Motor u. Auto, vol. 19, no. 23-24, Dec. 20, 1922, pp. 285-286, 2 figs. Discusses recent German and British patents.

The Deutz Horizontal Compressorless Diesel Engine (Der Deutzer liegende kompressorlose Diesel-motor), Kurt Schmidt. Zeit. des Vereines deutscher Ingenieure, vol. 66, nos. 51-52, Dec. 23, 1922, pp. 1125-1129, 24 figs. Characteristics of best-known processes for mixture formation in Diesel engines; the Deutz extended-piston engine; investigation of effect of piston extension on fuel consumption; behavior with different fuels; structural details.

Manufacture. Operations in the Manufacture of Diesel Engines. Machy. (Lond.), vol. 21, no. 538, Jan. 18, 1923, pp. 481-489, 23 figs. Review of methods employed by Mirrlees, Bickerton & Day, Ltd., Stockport.

Sulzer. The Sulzer two-cycle marine engine, L. J. LeMesurier. Ingenieur, vol. 38, no. 1, Jan. 6, 1923, pp. 1-2 and (discussion) 12-13, 26 figs. Principle of Sulzer two-cycle engine; scavenging pumps; comparison between two-cycle and four-cycle; applications of both stationery and marine Sulzer engines; shop trials of 3,400-b.hp. Sulzer twin-screw two-cycle engines. (In English).

DRILLING MACHINES

Headstock. Headstock Drilling Machines (Spindelstockbohrmaschine), F. Uber. Werkstattstechnik, vol. 16, no. 22, Nov. 15, 1922, pp. 685-688, 22 figs. Special drilling operation for simultaneous production of row of parallel holes in headstocks and gear cases of machine tools.

Types. Two New Drilling Machines. Engineer, vol. 135, no. 3501, Fev. 2, 1923, pp. 128-129, 3 figs. Describes portable horizontal and heavy-duty vertical drilling machines constructed by William Asquith, Halifax.

DRYDOCKS

Concrete Plant for. The Plant Used for the Construction of the St. John, N.B., drydock. Contract Rec., vol. 37, no. 2, Jan. 10, 1923, pp. 24-26, 7 figs. Details of concrete plant which consists of two separate yet practically identical traveling units.

DRY KILNS

Cutler. A New Drykiln Installation, Wood-Worker, vol. 41, no. 11, Jan. 1923, pp. 56-57, 2 figs. Describes three-compartment Cutler dry kiln.

Lumber. Lumber Dry Kilns, Thomas D. Perry. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 110-112 and 120, 5 figs. Describes blower, condenser and ventilated kilns and discusses possibilities of each, with particular reference to ventilated kiln, of which there are several classes. Data showing relation between relative and absolute humidity during drying period.

DYNAMOMETER

Hardness Testing. Elastic Column Dynamometer for Hardness Testing, Herman A. Holz. Chem. and Met. Eng., vol. 28, no. 6, Feb. 7, 1923, pp. 269-270, 3 figs. Dynamometer, designed by A. J. Amsler, imposes load by train of gears and screws.

E

EDUCATION, ENGINEERING

Training of Students. Training of Engineering Students, E. P. Mathewson. Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 9-10. In author's belief too great specialization is a mistake; recent graduates seem to be weak in accounting, command of English, and training in writing of reports; personal contact should be encouraged.

ELECTRIC CIRCUITS A.C.

Power Calculation. Calculation of Power in Three-Phase Circuits, H. C. Roberts. Power Palnt Eng., vol. 27, no. 3, Feb. 1, 1923, pp. 175, 1 fig. Method of obtaining formula used in calculating polyphase circuits.

ELECTRIC CURRENTS, D.C.

Speed Adjustment. Speed Adjustment of Direct-Current Motors, Gordon Fox. Power, vol. 57, no. 8, Feb. 20, 1923, pp. 285-287, 6 figs. Field or armature control.

ELECTRIC DISTRIBUTION

Systems. The Future Distribution System, William C. L. Eglin. Elec. World, vol. 81, no. 7, Feb. 17, 1923, pp. 379-383, 5 figs. Analysis of all types of distribution systems from all standpoints indicates that one type of distribution system is best; comparison of methods in tabular form.

ELECTRIC DRIVE

Handling Materials, Application to. The Driving of Handling Machinery, H. Blyth. Elecn., vol. 89, no. 2328, Dec. 29, 1922, pp. 734-737, 9 figs. Applications of electric drive to mechanical handling of materials.

ELECTRIC FURNACES

Ajax-Wyatt. Ajax-Wyatt Electric Brass Furnace, W. S. Gifford. Metal Industry (Lond.), vol. 22, no. 2, Jan. 12, 1923, pp. 30-31 and 34, 4 figs. Notes on cost of electric power, labour, repairs and relining, metal losses and overhead charges, all of which, with exception of first, are very low.

Combustion vs. Electrically Heated Industrial Furnaces, W. Trinks. Forging and Heat Treating, vol. 8, no. 12, Dec. 1922, pp. 538-542, 14 figs. Efficiency of electrically-heated and combustion-type furnaces compared; design of heating elements and supports; advantages and disadvantages of various types of construction.

Developments. Recent Electric Furnace Developments, Edward T. Moore. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 153-158, 6 figs. Rapid recovery from stagnation experienced during previous year; gray iron foundries slow to realize advantages of electric melting of low-phosphorus irons.

Greavis-Etchell. The Greaves-Etchell Electric Furnace for Steel Making, Alfred Stansfield. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 64-68, 6 figs. Furnace has two electrodes, entering through roof, and specially designed three-phase electrical supply connected to two top electrodes and electrode hearth. Bibliography. From advance sheets of author's new book, The Electric Furnace for Iron and Steel, publishers, McGraw-Hill Book Co.

Krypto. Electric Furnaces for Small Plants and Laboratories (Elektrische Schmelzofen für das Kleingewerbe und für den Versuchsraum), H. Barlow. Gewerbefleiss, vol. 101, no. 12, Dec. 1922, pp. 340-344, 8 figs. Describes construction and operation of electric furnaces of Krypto type, with capacity of about 2 kg.

Metal Melting. Electric Furnace of the Brown Boveri Type (Elektrischer Metallschmelzofen Bauart Brown Boveri). Schweizerische Bauzeitung, vol. 81, no. 3, Jan. 20, 1923, pp. 30-31, 1 fig. Combination of arc and resistance furnaces, using three-phase current, for metallurgical purposes.

PIG IRON. The Production of Foundry Pig Iron in the Electric Furnace (Ueber die Herstellung von Giessereiroheisen im elektrischen Ofen), Leo Lyche. Stahl u Eisen, vol 43, no 4, Jan 25, 1923, pp 110-116, 2 figs. Modern electric pig-iron furnaces of the Arendal Smelteverk A.-G with two shafts; composition of charge, operating difficulties, smelting results compared with those from other furnaces; heat balance of furnace.

STEEL. West Favois Electrical Methods, Larry J. Barton. Iron Trade Rev., vol. 72, no 6, Feb 8, 1923, pp 435-437. List of electric-furnace installations on Pacific coast, costs of labor and materials.

ELECTRIC LAMPS, INCANDESCENT

NEON GLOW DISCHARGE. The Neon Glow Discharge Lamp on A.C. Circuits, R. A. Brockbank and L. E. Ryall. Eyeen., vol 40, no 2329, Jan. 5, 1923, pp. 4-6, 8 figs. Lamps of Beehive type consist of glass bulb enclosing two metal electrodes; oscillograms obtained from lamp; energy and power-factor measurements; further suggested experiments.

ELECTRIC LOCOMOTIVES

OPERATION. Some Records of Electric Locomotives and Motor Cars in American Railway Service, Homer K. Smith. Tramway and Ry. World, vol. 52, no 29, Dec 14, 1922, pp. 302, 10 figs. Operating records of number of railways that have adopted electric traction, including Long Island, N.Y., N.H., and Hartford, Pennsylvania, Norfolk and Western, and others.

SINGLE-PHASE. Single-Phase Electric Locomotive With Individual Axle Drive. Ry. Engr., vol. 44, no. 516, Jan. 1923, pp 18-23, 11 figs. Express passenger locomotive designed and built by Brown, Boveri & Co., Baden Switzerland, for Swiss Federal Rys.; advantages claimed for individual axle drive.

Single phase 4-6-2 express locomotives with independent driving axles of the "Brown Boveri" type. Int. Ry. Congress Assn.—Bul., vol. 4, no. 12, Dec. 1922, pp 1477-1483, 5 figs. Details of design of locomotive in service on Swiss Federal Rys.; results obtained in service. From Schweizerische Bauzeitung.

ELECTRIC MOTORS

INTERPOLE FIELD-COIL CONNECTIONS. About Interpole Field-Coil Connections, E. C. Parham. Elec. Traction, vol. 18, no. 12, Dec. 1922, pp. 1053-1055, 15 figs. Time-saving suggestions for determining proper connection of replaced coils and their correct polarity relationships.

SELECTION. How to Reduce the Cost of Electric Current, Edward H. Tingley. Management Eng., vol. 4, no. 2, Feb. 1923, pp. 107-110, 5 figs. Points out that proper selection of motors will save power up to as much as 35 per cent. Advantages of synchronous motor.

ELECTRIC MOTORS, A.C.

CONTROLLERS. Automatic Controller for Induction Motors. Engineering, vol. 115, no. 2977, Jan. 19, 1923, pp. 71-77, 7 figs. Describes type of control gear for induction motors of wound-rotor type, known as Eddystat rotor controller, from fact that surplus power supplied to stator while motor is accelerating is absorbed in eddy-current losses instead of in ohmic heating.

ELECTRIC MOTORS, D.C.

OPERATION. Operation of Direct Current Motors, E. C. Parham. Nat. Engr., vol. 27, no. 1, Jan. 1923, pp. 20-21. Features of application and operation; characteristics of different types; troubles encountered and their remedies.

ELECTRIC PLANTS

INTERCONNECTION. Interconnection of Industrial and Electric Plants (Kraft- und Wärmekupplung), G. Weber. Zeit. des Bayerischen Revesions-Vereins, vol. 26, no. 24, Dec. 31, 1922, pp. 195-197, 2 figs. Gives example of power and heat connection of a dye factory with an electrical plant.

ELECTRIC RAILWAYS

AUBURN AND SYRACUSE. A High Speed Interurban Line in New York State, Norman G. Meade. Elec. Traction, vol. 18, no. 12, Dec. 1922, pp. 1042-1045, 4 figs. Operating, construction and maintenance features on Auburn and Syracuse electric railway.

ELECTRIC SWITCHES

DISCONNECTING. A Magnetically Self-Locking Disconnecting Switch, V. Karapetoff, Sibley Jl., Eng., vol. 37, no. 1, Jan. 1923, p. 9, 1 fig. Usual mechanically locked switch has been found unsatisfactory in high-current work because of high magnetic stresses set up; author has invented several switches in which magnetic field aids in holding switch in place.

ELECTRIC TRANSMISSION LINES

PROTECTION. Selection (La Sélection) E. Vedovelli. Revue Générale de l'Electricité, vol. 13, nos. 1 and 2, Jan. 6 and 13, 1923, pp. 7-25 and 53-70, 32 figs. Protection of transmission lines against excess voltage; localizing of accidents; allowable excess voltage in power stations, transmission lines and transformers, coefficient of safety; calculation of short circuits.

SAG UNDER ICE LOAD. The Sag and Stress of an Overhead Transmission Line Loaded with Ice. Electricity, vol. 36, no. 1673, Dec. 1, 1922, pp. 645-648, 1 fig. Method of calculation.

SHORT. Practical Design of Short Transmission Lines, E. K. McDowell. Power Plant Eng., vol. 27, no. 4, Feb. 15, 1923, pp. 229-231. Preliminary considerations regarding transmission circuits in general and fundamentals of d.c. lines.

WOODEN-POLE. Design of Wooden Pole Transmission Line, Perry O. Crawford. Elec. World, vol. 81, no. 3, Jan. 20, 1923, pp. 151-155, 9 figs. Tests made to determine most suitable material for stubs prove of much value; general features of design adopted by central-station company in Pacific Northwest.

ELECTRIC WELDING, ARC

DEVELOPMENT. Arc Welding, O. H. Escholz. Am. Welding Soc.—Jl., vol. 2, no. 1, Jan. 1923, pp. 33-40, 6 figs. Discussion of incomplete development activities; 100-per cent fusion welds; mechanical working; are phenomena—penetration; high-speed welding.

ELEVATORS

ELECTRIC, SHEAVE FOR. Hemp-Fiber-Packed Sheave Used on Traction Elevator Machine. Power, vol. 57, no. 6, Feb. 6, 1923, pp. 216-217, 8 figs. New type of single-wrap traction elevator machine on which traction-sheave face is made of short pieces of hemp fiber set radially and known as fiber-packed sheave.

EMPLOYEES' REPRESENTATION

COPPER QUEEN MINES. Employees' Representation at the Copper Queen Mines, Cleveland E. Dodge. Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 17-18. Plan modeled after constitution of United States.

PENNSYLVANIA R. R. Employee Representation on the Pennsylvania, E. T. Whiter. N.Y. Railroad Club—Proc., vol. 33, no. 1, Dec. 1922, pp. 6855-6869. Includes article by Leo I. Kennedy on Pennsylvania's plan from employee's viewpoint.

ENGINEERING LITERATURE

CLASSIFICATION AND INDEXING. Utilization of the Contents of Engineering Journals (Verwertung des Inhalts technischer Zeitschriften), Fritz Helm. Werkstattstechnik, vol. 16, no. 22, Nov. 15, 1922, pp. 688-690, 2 figs. Suggestions for better utilization and indexing of technical-journal literature; assignment and indexing of separate articles; system of classification.

ENGINEHOUSES

DESIGN. An Innovation in Locomotive Terminal Design. Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 113-116, 3 figs. Rectangular or circular enginehouses with inside cinder pits designed for promptly turning power; designed by Nat. Boiler Washing Co., Chicago.

EXPLOSIVES

MANUFACTURE. Some Achievements of Chemical Industry During the War in This Country and in France, William Macnab. Soc. Chem. Industry—Jl., vol. 41, no. 23, Dec. 15, 1922, pp. 353T-361T, 12 figs. Particulars of work accomplished in Great Britain and France, in the production of explosives.

STORAGE. Suitable and Safe Storage of Explosives, E. B. Jones. Cement, Mill and Quarry, vol. 21, no. 11, Dec. 5, 1922, pp. 31-34, 10 figs. Suggestions of users and handlers of explosives; what is recognized as best storage practice.

F

FANS, CENTRIFUGAL

TESTS. Tests of Centrifugal Ventilators, with Special Reference to Initial Water-Gauge, Henry C. Harris, Min. Inst. Scotland—Trans., vol. 43, part 4, Dec. 9, 1922, pp. 70-78, 2 figs. Details of practical test on Capell and Sirocco fans; suggested method for determination of initial water gage of fan.

FIRE PREVENTION

WATER FRONTS. Report of the Committee on Fire Protection, M. H. Brondsdon. World Ports, vol. 11, no. 1, Nov. 1922, pp. 47-56. Discussion of sections of report by G. H. Wooley published by Nat. Fire Protection Assn. Consideration of water-front losses by fire.

FLIGHT

WIND-POWER. Sailing the Air With Wind Power, D. W. Starrett. Aerial Age, vol. 16, no. 2, Feb. 1923, p. 68. Refers to apparatus constructed by writer in 1910 which proved principle of bird wingless flight. Points out that motorless airplane, properly constructed, can carry freight and passengers in any direction, with power equal to that of wind.

FLOORS

CONCRETE AND HOLLOW TILE. Test of a Hollow Tile and Concrete Floor Slab Reinforced in Two Directions, W. A. Slater, Arthur Hagener and G. P. Anthes. U.S. Bur. of Standards, Technologic Papers, vol. 16, no. 220, Nov. 15, 1922, pp. 727-793, 53 figs. Test of large slab built of hollow clay tiles with reinforced-concrete ribs between rows of tiles and parallel to both panel sides; purpose of test was to obtain empirical data to form basis for design of such slabs.

FLAT-SLAB. Experience with Metal Forms for a Flat-Slab Floor, Dan Patch. Eng. News-Rec., vol. 90, no. 7, Feb. 15, 1923, pp. 296-298, 5 figs. System for using old metal forms worked out on job, effecting a saving of money; but wood forms are advocated for most jobs.

REINFORCED-CONCRETE HOLLOW. New Method of Hollow Floor Construction. Concrete and Constructional Eng., vol. 15, no. 1, Jan 1923, pp. 41-43, 4 figs. Describes new type of reinforced-concrete hollow floor which is claimed to possess many advantages over other floors of this type; is very light and is one of the cheapest forms of floor on market.

FLOW OF FLUIDS

DISCONTINUOUS. The Line of Action of the Resultant Pressure in Discontinuous Fluid Motion, S. Brodetsky. Roy. Soc.—Proc., vol. 102, no. A716, Dec. 1, 1922, pp. 361-372, 1 fig. Calculations required to find line of action of pressure.

FLOW OF GASES

ORIFICES. Flow of Gases Through Orifices, George B. Shawn. Am. Gas. Jl., vol. 118, no. 2, Jan. 13, 1923, pp. 23-25, 1 fig. What has been developed by experimental work. Discussion and comparison of hydraulic and adiabatic formulas.

FLOW OF WATER

MEASUREMENT OF VELOCITY. An Electrical Method for Measuring the Velocity of Moving Water, M. A. Hogan. Engineering, vol. 115, no. 2977, Jan. 19, 1923, pp. 66-67, 3 figs. Results of experiments show that although, under particular conditions chosen, change in resistance of cathode immersed in water depends on velocity of motion of water, relation between them is too variable to allow change in resistance being taken as measure of velocity.

VORTEX MOTION. Absolute Dimensions of Karman Vortex Motion, Werner Heisenberg. Nat. Advisory Committee for Aeronautics, Tech. Notes, no. 126, Jan. 1923, 10 pp., 2 figs. Study, based on investigation by Karman of resistance of plate moving perpendicularly to its surface through water. Translated from Physikalische Zeit., Sept. 15, 1923. Includes remarks on article by L. Prandtl.

FLUE-GAS ANALYSIS

APPARATUS. New Method of Determining Heat Losses Due to Incomplete Combustion in Furnaces, O. I. Housey. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 117-122, 3 figs. Results of experiments carried out by K. E. Nielsen in laboratories of Danish Soc. for Control of Fuel and Combustion, show that method described in this and previous article is quick, reliable and exact means of determining heatl osses in flue gases due to incomplete combustion.

HYPERBOLAS OF COMPONENTS. The Hyperbolas of Flue-Gas Components (Zu den Hyperbeln der Rauchgas-Bestandteile), Georg Szende. Feuerungstechnik, vol. 11, no. 7, Jan. 1, 1923, pp. 73-76, 1 fig. Relation between air coefficient on the one hand, and percentage flue-gas components of a fuel of reduced molecular formula CmH1m on other hand, is shown in hyperbola groups; as parameter of every hyperbola group, the CO content is chosen.

TESTING APPARATUS. The Unograph, Karl Müller. Eng. Progress, vol. 4, no. 2, Feb. 1923, pp. 27-28, 1 fig. Method of operation and design of flue-gas tester.

FLUMES

PRECAST CONCRETE. Precast Concrete Flume on Klamath Project, E. C. Koppen. Eng. News-Rec., vol. 90, no. 5, Feb. 1, 1923, pp. 194-199. Of six comparative designs precast type chosen at lowest capitalized cost; short flume sections constructed along old flume with traveling concrete equipment.

FLYWHEELS

EXPLOSIONS. Flywheel Explosions and Their Prevention, E. B. Tolsted. Can. Machy., vol. 29, no. 4, Jan. 25, 1923, pp. 15-16. Safety factor in pulley and flywheel work; point of actual bursting; reason for rupture; recording flywheel accidents; types of failure.

FORGE SHOPS

LAYOUT. Description of a Well Balanced Forge Plant, D. L. Mathias. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 18-25, 15 figs. Outline of Titusville (Pa.) Forge Co.'s plant, equipped to forge and machine great variety of shapes.

FORGING

DEVELOPMENTS 1922. Items from the Literature of Forging and Heat Treating, Stephen L. Goodale, Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 14-16. Review of important developments of 1922, with special emphasis given to cost accounting, fuel economy and co-operative research.

FORGE BLOWER. New Forge Blower, D. M. McLean. Iron and Steel of Canada, vol. 5, no. 12, Dec. 1922, pp. 225-226, 4 figs. New device for blowing forge fires, etc., introduced in Canada by Can. Ingersoll-Rand Co. Gives new meaning to term "free air."

FOUNDRIES

FORD MOTOR CO. Ford Principles and Practice at River Rouge, John H. Van Deventer. Indus. Management (N.Y.), vol. 65, no. 2, Feb. 1923, pp. 67-76, 28 figs. Operation of world's largest foundry.

SCHNEIDER & CO., FRANCE. The "Henri-Paul" Foundry of Messrs. Schneider et Cie. Foundry Trade Jl., vol. 27, no. 335, Jan. 18, 1923, pp. 48-57, 14 figs. Organization and equipment of modern foundry for production of heavy castings. Translated from Science et Industrie.

STEEL. A Western Steel Casting Foundry, C. A. Handschin. West. Machy. World, vol. 14, no. 1, Jan. 1923, pp. 5-7, 9 figs. Equipment and methods used in manufacture of steel casting on Pacific Coast.

Builds New West Coast Foundry, Don Partridge. Iron Trade Rev., vol. 72, no. 4, Jan. 25, 1923, pp. 300-302, 8 figs. Describes foundry of Llewellyn Iron Works in Los Angeles; equipment includes three cupolas.

FURNACES

ARCH DESIGNING. Furnace Arch Designing. Practical Engr., vol. 66, no. 1868, Dec. 14, 1922, pp. 372-373, 4 figs. Comments on engineering practice in finding maximum efficiency.

FURNACES, ANNEALING

FLAMELESS FIRING. Controlled Flameless Firing, Without an Explosive Mixture. Gas Jl., vol. 160, no. 3110, Dec. 20, 1922, pp. 733-734, 1 fig. Results of applying system of firing, known as "captive fire," developed seven years ago to insure constant mixture of air and gaseous fuel.

FURNACES, HOT-AIR

RATING. Significance of Air Temperature at Registers in Rating Warm-Air Furnace, A. C. Willard, Sheet Metal Worker, vol. 13, no. 25, Jan. 5, 1923, pp. 835-836, 3 figs. Results of tests showing effect of changes in air temperature.

RECIRCULATING-DUCT DESIGN. Effect of Recirculating Duct Design on Furnace Capacity, A. C. Willard, A. P. Kratz and V. S. Day. Sheet Metal Worker, vol. 13, no. 26, Jan. 19, 1923, pp. 891-892, 2 figs. Results of tests with gravity circulation only, as conducted in furnace-research work at University of Illinois.

FURNACES, INDUSTRIAL

BRICKWORK. Industrial Furnace Brickwork, M. H. Mawhinney. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 145-147, 6 figs. Mechanical questions involved in use of bricks of various shapes and sizes; materials in manufacture; bonding.

TEMPERATURE CONTROL. The Automatic Control of Temperature in Industrial Furnaces, W. Trinks and S. A. Henderson. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 68-72, 10 figs. Various types of automatic temperature controls as applied to furnaces heated by electricity, gas or oil; location of thermocouple.

FUELS

HEAT TREATING AND FORGING. Economic Factors Affecting Fuel Selection, J. A. Brown. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 73-78, 3 figs. Technology of production and economics of energy utilization as applied to forging and heat-treating furnaces; essential characteristics of fuels.

SLAG AND ASHES. New Patent Process to Recover Fuel from Slag and Ashes with the Aid of Magnets, F. A. Brackmann. Ry. and Locomotive Eng., vol. 36, no. 2, Feb. 1923, pp. 41-42, 2 figs. Describes system of dry magnetic separation and patented plants put on market by German Krupp-Gruson Works, making use of fact that iron pyrites in coal change into ferric oxide during combustion.

WASTE, UTILIZATION OF. Economic Combustion of Waste Fuels, David Moffat Myers U. S. Bur. of Mines, Tech. Paper, no. 279, 1922, 51 pp., 20 figs. Classification of waste fuels; combustion; utilization of semi-combustible substances as fuel; tanbark and wood chips; principles involved in increasing efficiency of combustion; efficient burning of low-grade waste fuels. Bibliography.

G

GAGES

STANDARD SHAFTS AND HOLES. The Gage Requirements of Graded Standard Shafts and Holes (Der Lehrenbedarf bei der abgestuften Einheitswelle und bei der Einheitsbohrung), W. Kühn. Werkstattstechnik, vol. 16, no. 23, Dec. 1, 1922, pp. 713-716, 12 figs. Examples are presented to show that system of standard holes requires fewer gages and is superior to standard shafts in all cases where the really smooth shaft cannot be used to advantage.

GAS PRODUCERS

DESIGN. Gas Producers and Produce Gas, Victor Windett. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 55-60, 2 figs. Specifications covering producer design; comparative gas costs, showing influence of increased rates.

SUCTION-GAS. Suction Gas for Power Purposes, Ralph N. Lewis. Commonwealth Engr., vol. 10, nos. 3 and 4, Oct. 1 and Nov. 1, 1922, pp. 85-88 and 130-134, 2 figs. Some salient points concerning purchase and installation.

GASOLINE

NATURAL GAS. Cost of Producing Natural-Gas Gasoline. Chem. and Met. Eng., vol. 28, no. 7, Feb. 14, 1923, pp. 297-298. Outlines scope of industry and analyzes recovery costs for various types of plants.

The Extraction of Gasoline from Natural Gas, George A. Burrell. Soc. Chem. Industry—Jl., vol., 41, nos. 23 and 24, Dec. 15 and 30, 1922, pp. 524R-527R and 549R—553R, 4 figs. Dec. 15: Extraction by compression and by absorption of oil. Dec. 30; Extraction with charcoal, and plant design.

PRODUCTION, CATALYTIC. Catalytic Gas from Heavy Oil, Joseph F. Snadgen. Gas Age—Rec., vol. 50, no. 27, Dec. 30, 1922, pp. 897-898. Use of catalysis to increase production of gasoline and rich gases from heavy hydrocarbon oils as developed by Sabatier and Mainle. Translated from Journal des Usines à Gaz.

QUALITY REQUIREMENTS. Group Sessions on "What Is Good Gasoline?" Am. Petroleum Inst.—Bul., vol. 3, no. 62, Dec. 30, 1922, pp. 84-128, 22 figs. Chemical Control of Gaseous Detonation with Particular Reference to the Internal Combustion Engine, Thomas Midgley, Jr., and T. A. Boyd. Answer So Far Given by Joint Research Program of U.S. Bureau of Standards and the Oil and Automotive Industries, S. W. Stratton. Results Obtained from Joint Research Tests, R. E. Carlson. Evaporation and Fire Loss Problem—Sealite, J. M. Jennings. Remarks by various authorities.

VOLATILITY. Economic Motor-Fuel Volatility, R. E. Carlson. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, pp. 139-146 and (discussion) 146-150, 14 figs. Report covering investigation made by Bur. of Standards to secure data that can be used as basis for estimating effect of change in gasoline volatility on fuel consumption of cars now in service throughout United States. Describes fuels used, test cars, apparatus, tests and test methods.

GEAR

BEVEL. Standardization of the Calculation of Bevel Gear Bodies (Normung der Berechnungsform von Kegelradkörpern), C. E. Berck. Werkstattstechnik, vol. 16, no. 23, Dec. 1, 1922, pp. 707-711, 19 figs. Calculation of different positions of bevel gears under any given axial angles to one another.

GRINDING. Gear Grinding, R. S. Drummond. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, pp. 173-176, 3 figs. Discusses gear-grinding work on gear teeth subsequent to heat treatment, with particular attention to automobile transmission gears; salvaging of rejected gears; cost of grinding, etc.

HERRINGBONE, STANDARDS FOR. Standards for Herringbone Gears for General Commercial Use. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 145 and 146, 1 fig. Proposed by Am. Eng. Standards Committee sectional committee on standardization of gears.

PUNCH-PRESS MANUFACTURE. Making Gears on the Punch Press, Frank Lux. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 453-456, 4 figs. Discusses three factors governing adaptability of gears to punch-press manufacture, namely, material from which gears are to be produced, size and design of work, and accuracy required.

GRINDING

PRODUCTION ESTIMATION. Estimating Grinding Production, Robert J. Spence. Abrasive Industry, vol. 3, no. 12, Dec. 1922, pp. 369-371 and 378, 3 figs. Discusses kind of material, ratio of diameter to length, tolerance limits, degree of finish, skill required by operator, special conditions; accurate estimation of cylindrical grinding production difficult, as many variables must be considered.

GRINDING MACHINES

CENTERLESS. Finishing Work Without Centers. Abrasive Industry, vol. 3, no. 12, Dec. 1922, pp. 363-366, 4 figs. Describes Heim, Detroit, Sanford, and Reeves centerless grinding machines and their operation; continuous in operation; handle straight and taper pieces.

ERRORS, CORRECTING. Correcting Errors in Grinding Machines, Frederick Grover. Machy. (Lond.), vol. 21, no. 538, Jan. 18, 1923, pp. 491-492, 1 fig. Investigations made with view to compensation of errors due to wear.

INTERNAL. Internal Grinding. Abrasive Industry, vol. 4, no. 1, Jan. 1923. Contains following articles: Grinders Finish Bores Accurately, pp. 1-7, 13 figs.; Design Large Internal Grinders, pp. 9-10, 2 figs.; Portable Grinders for Many Uses, pp. 12-14, 10 figs.; Hints On Grinding Wheel Selection, E. D. Bishop, pp. 14-15; Fixtures Locate Internal Work, pp. 18-20, 8 figs.

H

HANDLING MATERIALS

APPARATUS FOR. What It Pays to Know About Material Handling, W. T. Spivey. Factory, vol. 30, no. 1, Jan. 1923, pp. 27-29, 82, 84, 86, 88, 90 and 92, 12 figs. Use of tiering machines, portable conveyors and monorail carriers.

ROCK-PRODUCTS INDUSTRY. Modern Conveyor Practice in the Rock Products Industries, H. D. Pratt. Rock Products, vol. 25, no. 26, Dec. 30, 1922, pp. 96-100, 15 figs. Importance of uniform feeds, types of mechanical feeders, conveyor practice at crushing plants, sand and gravel plants, and in handling lime and finely ground materials.

STEEL WORKS. Material Handling for Steel Mills, R. W. McNeil. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 161-163, 5 figs. Various types of bridges and drives employed; controls.

HARDNESS

SCLEROSCOPE FOR TESTING. Recording Scleroscope and Pneumatic Release Pedal Engineering, vol. 115, no 2980, Feb 9, 1923, pp 185 186, 5 figs. New design brought out by Shore Instrument and Mfg. Co , Jamaica, N.Y.

HEAT TRANSMISSION

DETERMINATION OF. New Methods and Investigations for Determining Heat Transmission, Oscar Knoblaugh Mech Eng , vol 45, no 2, Feb. 1923, pp 131-132, 1 fig. Discussion of meaning of various coefficients of heat transmission and methods for their determination, including methods of measuring temperature of various elements entering into problem

RATES High Rates of Heat Transmission. Mar. Engr. and Naval Architect, vol. 46, no. 545, Feb. 1923, pp. 48-51, 1 fig. Experimental results of rates in Diesel engines and German submarine engines; tables giving results of trials of Babcock & W lcox boilers at various rates of combustion.

HEATING AND VENTILATION

FORGE SHOPS. Forge Shop Heating and Ventilating, O. H. Bathgate. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 31-37, 8 figs. Problems encountered in heating and ventilating industrial buildings; comparison of natural and artificial ventilation; dust collecting systems.

HELICOPTERS

DE BOTHEZAT. Successful Helicopter Trials at McCook Field. Aviation, vol. 1 , no. 4, Jan. 22, 1923 p. 97, 1 fig. De Bothezat helicopter lifts 3600 lb. with 170-lb. Le Rhone engine.

HIGHWAYS

CONSTRUCTION DEPARTMENT. A Constructional Division of a Highway Department, John H. Mullen. Eng. and Contracting, (Roads and Streets), vol. 59, no. 1, Jan. 3, 1923, pp. 34-38, 1 fig. Its financing, organization and operation. Paper presented before Am. Assn. State Highway Officials.

HOBBING MACHINES

OPERATION. Hobbing-Machine Operation, John Edgar. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, pp. 179-180. Discusses major factors upon which successful operation of hobbing machines depends.

TESTING. Testing Gear-hobbing Machines, D. V. Waters. Machy. (Lond.), vol. 21, no. 539, Jan. 25, 1923, pp. 523-525, 5 figs. Describes two types of testing fixtures for hobbing machines.

HOBS

GEAR-CUTTING. How to Use Gear-Cutting Hobs, S. O. Bjornberg. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, pp. 181-185 and (discussion) 185-187, 14 figs. Geometrical principles involved; testing instruments, and their application, which is termed quality control.

HOISTS

BLAST-FURNACE. Blast Furnace Hoist, Karl Möhringer. Eng. Progress, vol. 4, no. 2, Feb. 1923, pp. 25-27, 3 figs. Describes number of installations supplied by J. Pohlig A.-G. Cologne.

SKIP. Automatic Skip Hoists for the Handling of Coal and Ashes, H. W. Stevens. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 173-177, 3 figs. Types of skip hoists; motors and controllers for operating them.

HYDRAULIC TURBINES

FRANCIS. Evaluation of the Characteristic Curves of Francis Turbines (Auswertung der Kennlinien von Francisturbinen), R. Müller. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 3, Jan. 20, 1923, pp. 57-58, 1 fig. Diagrammatic presentation of test results; calculation of loss of energy; determination of admission and discharge of water at rotor; calculation of effective admission and discharge radius of rotor.

IMPULSE VS. REACTION. Impulse Turbine versus Reaction Turbine for High Heads. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 129-130. Discusses factors entering into consideration of choice between two types.

REGULATORS. Turbine Regulators (Neuere Turbinenregler), Donath. Elektrotechnischer Anzeiger, vol. 39, nos. 195, 196 and 197, Dec. 7, 9 and 12, 1922, pp. 1521-1522, 1529-1530 and 1541-1542, 10 figs. Describes Schichau regulator for equalizing all changes in power consumption by opening or closing regulator so as only to use quantity of water corresponding to power required.

SMALL PLANTS. Typical Water Turbines for Small Plants, S. C. O'Grady. Beama, vol. 12, no. 57, Jan. 1923, pp. 12-18, 5 figs. Deals with open-fume turbines. Examples of low head plants; regulation; governors; prices and specifications.

HYDRO-ELECTRIC DEVELOPMENTS

FRANCE. Utilization of Water Power of the Bonne and the Drae (L'Aménagement des Forces hydrauliques de la Bonne et du Drac), M. E. Dusaugey. Houille Blanche, vol. 21, no. 71-72, Nov.-Dec. 1922, pp. 207-213, 7 figs. Existing and proposed hydro-electric construction; barrage work; power cost data.

HYDRO-ELECTRIC PLANTS

CALIFORNIA. The Pit River Power and 220,000-Volt Transmission Problem, Frank G. Baum. Elec. World, vol. 81, nos. 4 and 5, Jan. 27 and Feb. 3, pp. 205-212 and 262-267, 19 figs. Analysis of California power problem which involved transmission and economic question of unprecedented magnitude. Jan. 27: Line regulation and insulation; Vaca substation. Feb. 3: Power possibilities of system; Hat Creek and Pit River plants.

KEARNEY, NEB. Design Reduces Cost of Small Hydro Plant. Elec. World, vol. 81, no. 3, Jan. 20, 1923, pp. 141-146, 4 figs. Unusual ground conditions make conventional designs difficult of application to Kearney (Neb.) plant, hence unique plan is adopted. Canal conveys water 16 mi. for irrigation and power purposes; power plant develops 1500 kw. with 54-ft. head.

REMOTE CONTROL. Remote Control Made Possible Economical Development of a Small Water Power, R. Philip Hart. Power vol. 57, no. 5, Jan. 30, 1923, pp. 162-165, 10 figs. Water-power site used by old mill and abandoned was redeveloped with remotely controlled station and operated in parallel with another plant 3000 ft. away.

SAFEGUARDING WORKMEN. Safeguarding Workmen in Hydro-Electric Stations, Ralph Brown. Power, vol. 57, no. 8, Feb. 20, 1923, pp. 280-284, 9 figs. Describes method closely patterned after that at Holtwood Station of Pa. Water and Power Co.

SMALL. The Electric System for Small Water-Powers, William T. Taylor. Elec. Rev., vol 92, no 2354, Jan 5, 1923, pp 5 8, 3 figs Discusses mill-site type, type equipped with regular hydro-electric machinery, and type where hydro-electric plant is controlled from distant points.

I

ICE PLANTS

RAW-WATER, AIR-AGITATING SYSTEMS. Air Agitating Systems for Raw Water Ice Manufacture, H. R. Haltermann. Ice and Refrigeration, vol. 63, no. 6, Dec 1922, pp 341-343 Discusses various types of low-pressure and high-pressure systems. Paper read before Nat. Assn. Practical Refrig. Engrs.

ICE MOULDS, CARE OF. Care of Ice Moulds, M. A. R. Brunner Ice and Cold Storage, vol. 26, no. 298, Jan. 1923, p. 6. Various faults and how they can be avoided. Recent German practices.

IGNITION

BATTERY. Battery Ignition, A. Mortimer Codd. Automobile Engr., vol. 13, no. 173, Feb. 1923, pp. 42-44, 9 figs. Points out that if battery ignition be made with same scrupulous care as magneto and design not sacrificed to cheapness, it will give superior results. Points to be considered.

INDICATORS

INTERNAL-COMBUSTION-ENGINE. Indicators, Engineer, vol. 135, no. 3500, Jan. 26, 1923, pp. 100-102, 7 figs. Two papers read before Instn. Mech. Engrs., as follows: Micro-Indicator for High-Speed Engines, W. G. Collins; R. A. E. Electrical Indicator for High-Speed Internal Combustion Engines, and Gauge for Maximum Pressures.

INDUSTRIAL MANAGEMENT

AUTOMOBILE SERVICE STATION. Modern Methods in "Service" Industries, Louis G. Rowe. Indus. Management(N.Y.),vol. 65, no. 2, Feb. 1923, pp. 77-83, 4 figs. Outlines method for applying proved principles of management in field of automobile service and repair station.

EQUIPMENT RECORDS. Why Not an Equipment Register? Morgan C. Farrell and Johnson Heywood. Factory, vol. 29, no. 6, Dec. 1922, pp. 662-664 and 700, 1 fig. Describes appearance and operation of equipment record, and savings to be effected, preventing over payment of taxes, showing up excesive repair bills, etc.

MACHINE SHOPS. Mechanical and Electrical Work shops at Tarbes (Ateliers de constructions mécaniques et électriques de Tarbes). Ouvrier Moderne, vol. 5, no. 10, Jan. 1923, pp. 389-394, 5 figs. Shop management methods at new works of Constructions Electriques de France, manufacturing electric locomotives and railway motor cars, electric generating machinery, and hydrau lic turbines; very modern establishment.

POWER PLANTS. Modern Management Methods in the Power Plant, Browning Robinson. Indus. Management (N.Y.), vol. 65, no. 2, Feb. 1923, pp. 121-125, 1 fig. Getting co-operation from fireroom gang.

POWER-SERVICE MAINTENANCE. Report on Practice in Maintenance Work, E. H. Hubert. Indus. Engr., vol. 81, no. 1, Jan. 1923, pp. 27-31 and 36, 1 fig. How 74 companies handle inspections, repairs and maintenance supplies.

QUALITY CONTROL. Quality Products, G. S. Radford. Management Eng., vol. 4, no. 2, Feb. 1923, -p. 111-116, 3 figs. Control methods of leading manufacturers used to maintain standards.

REPAIR DEPARTMENT, SYSTEMATIZING. Systematizing the Repair Department, L. F. Libgotte. Indus. Management (N.Y.), vol. 65, no. 2, Feb. 1923, pp. 101-109, 5 figs. How repair department was reorganized in large factory in France.

TOOLROOM ORGANIZATION. The Function of the Tool-room from Constructive and Administrative Viewpoint (Die Aufgabe des Werkzeugbüros in konstruktiver und verwaltungstechnischer Hinsicht), Wilhelm Kropff. Werkstattstechnik, vol. 16, no. 22, Nov. 15, 1922, pp. 673-680, 24 figs. Proper selection of workshop devices with special regard to standardization of gages. Control of tools and arrangement of toolroom.

See also Cost Accounting; Time Study.

INSULATION

SOUND. Sound Insulation (Lydisolering), E. Suenson. Teknisk Tidsskrift (Den Tekniske Forenings Tidsskrift), vol. 46, no. 23, Nov. 6, 1922, pp. 167-178, 12 figs. Vibration of particles propagation of sound waves and its velocity in various materials; damping and absorption of waves; cork and other insulators; insulation of machinery.

INTERNAL-COMBUSTION ENGINES

FOUR-CYLINDER, CLASSIFICATION OF. Classification and Designation of Multi-Cylinder Light Engines (Einteilung und Benennung der vielzylindrigen Leichtmotoren), H. Schrön. Motorwagen, vol. 25, no. 3, Nov. 10, 1922, pp. 589-595, 22 figs. Usual classification; classification according to crank and cylinder diagram; and according to motion-geometrical aspects; thrust direction of connecting rod and dead-center line as designations of classification.

GOVERNORS. The Ramsay Marine Governor. Mar. Engr. and Naval Architect, vol. 46, no. 544, Jan. 1923, pp. 15-16, 3 figs. Description and method of operation of apparatus applicable to internal-combustion engines.

HEAVY FUELS. Group Session on "The Present Status and Probable Development of Internal Combustion Engines to Consume Heavy Fuels." Am. Petroleum Inst.—Bul., vol. 3, no. 62, Dec. 30, 1922, pp. 129-150, 3 figs. Remarks by Henry L. Doherty, Harte Cooke, F. W. Gay, W. G. Gernandt, C. E. Lucke, Carl A. Norman, Max Rotter, Arthur West, W. P. Dempsey and A. C. Goldingham.

LINESHAFTS AND AIR CONTAINERS. Revision of Rules for Internal Combustion Engines, Joseph Hecking. Motorship, vol. 8, no. 1, Jan. 1923, pp. 51- and 52. Modifications in rules for lineshafts and air containers for internal-combustion engines

MARINE. Review of Different Types of Marine Internal-Combustion Engines. North-East Coast Instn. Engrs. and Shipbldrs., advance paper, no. 13108Q, for meeting Jan. 12, 1923, 20 pp., 7 figs. on supp. plates. Descriptions of following engines: Armstrong-Sulzer Diesel engine; Camellaird-Fullagar, Doxford opposed-piston; Neptune and Scott-Still marine oil engines; and Vickers internal-combustion engine.

STILL. The Still Engine (Der Still-Motor), Wars. Motor u. Auto, vol. 19, no. 23-24, Dec. 20, 1922, pp. 287-288, 1 fig. An oil engine with combustion cylinder and steam cylinder; design and operation.

See also Airplane Engines; Automobile Engines; Diesel Engines; Oil Engines; Semi-Diesel Engines.

IRON INDUSTRY

ONTARIO. An Iron Ore Indstry for Ontario, A. Hasselbring and Geo. W. McLeod. Can. Min. Jl., vol. 2, no. 3, Jan. 19, 1923, pp. 52-54. Practical proposal from two mining engineers with purpose of aiding Ontario Iron Ore Committee, regarding establishment of iron ore industry in Ontario. Also in Iron and Steel of Canada, vol. 6, no. 1, Jan. 1923, pp. 4-6.

IRON AND STEEL

BIBLIOGRAPHY 1922. Review of Iron and Steel Literature for 1922, E. H. McClelland. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 6-10. Also Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 7-11. Classified list of more important books, serials and trade publications during 1922, with few of earlier date, not previously announced.

DIRECT PROCESS. Production of Iron and Steel Direct from the Ore, Ralph Whitfield. Iron and Coal Trades Rev., vol. 106, no. 2862, Jan. 5, 1923, pp. 6-7, 6 figs. Study of proposals of Courcoud, in view of apparent failure of Basset proposals.

METALLURGY 1922. Developments in Metallurgy of Iron and Steel, S. L. Goodale and Kenneth D. Dodd. Blast Furnace and Steel Plant, vol. no. 1, Jan. 1923, pp. 4-6. Report of important achievements recorded in current periodicals and presented as papers before national societies during 1922.

SULPHUR DETERMINATION. The Determination of Sulphur by Combustion in a Stream of Oxygen, A. Vita. Forging and Heat Treating, vol. 8, no. 12, Dec. 1922, pp. 557-559. Analytical determination of suiphur in pig iron, steels, ores, slags and fuels by combustion in a stream of oxygen; discusses special cases and limitations. Translated from Stanl u. Eisen, July 15, 1922.

IRON CASTINGS

HIGH-SILICON. Acid Resisting Metal Unique, H. E. Diller. Foundry, vol. 51, no. 2, Jan. 15, 1923, pp. 47-52, 10 figs. Castings made of high-silicon iron melted and remelted in air furnace with addition of 50 per cent ferrosilicon; metal hard and brittle, easily welded, but not machineable.

INTERNAL CHILL. Internal Chill in Castings, J. E. Hurst. Foundry Trade Jl., vol. 27, no. 337, Feb. 1, 1923, pp. 85-87, 1 fig. It is believed that phenomena of internal chill can be attributed to lag or period of time which elapses in cooling down of cast iron before maximum rate of cooling is attained.

IRON, PIG

GRADING. The Grading of Pig-Iron, H. H. Shepherd. Foundry Trade Jl., vol. 27, no. 334, Jan. 11, 1923, pp. 25-26, 3 figs. System of grading by means of combination of analytical and fracture system.

IRRIGATION

WATER MEASUREMENT. Discharge Through Adjustable Submerged Orifices, H. A. Wadsworth. Eng. News-Rec., vol. 90, no. 7, Feb. 15, 1923, pp. 308-309, 6 figs. Experiments made at Sacramento and Fort Collins lead to increased accuracy of measuring irrigation water.

L

LABORATORIES

HYDRAULIC. Inauguration of the Hydraulic Laboratory at Beauvert (Near Grenoble (Inauguration du Laboratoire d'Hydraulique de Beauvert à Grenoble). Houille Blanche, vol. 21, nos. 71-72, Nov-Dec. 1922, pp. 214-219, 15 figs. For studying utilization of waterfalls; technical equipment and testing apparatus.

LABOR

PROBLEMS ON RAILROADS. The Labor Problem on the Railroads, Charles H. Stein. N.Y. Railroad Club—Proc., vol. 33, no. 1, Dec. 1922, pp. 6846-6855. In author's belief, interests of public in respect to labour problem on American railroads will require existence of U.S. Railroad Board, provided that by congressional action necessary teeth are incorporated in act.

LABOR TURNOVER

CAUSES AND COST. Labor Turnover Causes Economic Waste, W. C. West. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 11-13. Cost and cause of excessive labor turnover; suggestions for reducing turnover.

LATHES

RAILWAY-WHEEL. Modern Wheel Production (Neuzeitliche Bearbeitung von Radsätzen), O. Krupski. Organ für die Fortschritte des Eisenbahnwesens, vol. 77, no. 20, Oct. 15, 1922, pp. 303-307, 6 figs. Lathes for turning wheels and tires, and description of operations.

TURRET. Using the Turret Lathe for Small Lots, Albert A. Dowd. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 424-429, 12 figs. Examples showing how small quantities of castings and forgings can be machined economically on turret lathe.

LIGHTING

STREET. New Practice in Street Lighting, A. E. Bettis. Elec. World, vol. 81, no. 6, Feb. 10, 1923, pp. 321-326, 18 figs. Pole-type transformers used in Kansas City to reduce substation equipment to minimum; installation conditions required underground cable of special type. features of lamps.

LIGNITE

GRUDEHOCKS. Grudehocks, O. P. Hood. Coal Age, vol. 23, no. 4, Jan. 25, 1923, pp. 175-176, 1 fig. New material made from brown coal put on market in Germany, known as grudecocks, which means embers coke and may be best described as lignite char; its uses for domestic heating and cooking.

WORLD INDUSTRIES. Brown Coals and Lignites, William A. Bone. Roy. Soc. Arts —Jl., vol. 71, no. 3662, Jan. 26, 1923, pp. 172-184, 3 figs. Origin and classification; characteristic properties; brown coal industries of Central Europe; lignite in United States, British Empire, Australia, Burma and Malay Peninsula.

LOCOMOTIVES

BALANCED COMPOUND. Economy of Four Cylinder Balanced Compound Locomotive, W. E. Symons. Ry. and Locomotive Eng., vol. 36, no. 2, Feb. 1923, pp. 53-54, Features of refinement in design; objection to additional parts; improvements.

BALDWIN. Powerful Baldwin Locomotives for Western Maryland Railway. Ry. Gaz., vol. 38, no. 3, Jan. 19, 1923, pp. 88-90 and 100, 5 figs. Designs establishing new weight and tractive-effort records developed in connection with locomotives supplied to West. Maryland Ry.; designed to operate on 90-lb. rails, traverse curves of 22 deg., and negotiate grades of 3½ per cent.

COMPRESSED-AIR. Compressed Air Locomotives, H. Schulte. Eng. Progress, vol. 4, no. 1, Jan. 1923, pp. 1-5, 9 figs. Development; types; working process; working pressure; air consumption; tunnel locomotives.

Compressed-Air Locomotives of Old and Recent Types (Druckluft-Lokomotiven älterer und neuerer Bauart). Gewerbefliess, vol. 101, no. 12, Dec. 1922. pp. 344-348, 8 figs. Review of development of modern types, and examples of their application, especially in mining; production of compressed air up to 200-atmos. pressure by special 5-stage compressors.

DESIGN AND CONSTRUCTION. Some Features of Boiler Design and Construction in Relation to Upkeep, A. E. Keyffin. Ry. Engr., vol. 44, no. 516, Jan. 1923, pp. 28-29. Tube arrangements; water-space stays; firebox crown stays; firehole and foundation ring; flanged plates; tubes; washout arrangements; steam domes. (Abstract.) Paper read before Instn. Locomotives Engrs.

DIESEL-ELECTRIC. Diesel-Electric Locomotives and Railway Motor Cars (Locomotive ed automotrici benzo-elettriche), D. F. Spani. Elettrotecnica, vol. 9, no. 35, Dec. 15, 1922, pp. 804-805, 4 figs. Construction and operation of some American and Swedish types; advantages.

Is the Steam Locomotive Out of Date, L. G. Coleman. N.E.R.R. Club, Jan. 9, 1923, pp. 190-199 and (discussion) 199-239, 3 figs. Points out that weakness of steam locomotives is its boiler, and discusses possibilities for use of Diesel or gas engine as power plant. See (Abstract) in Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 92-94.

DRAWBARS. The Design of Engine and Tender Draw bars, H. J. Coventry. Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 87-89, 2 figs. Comments on existing practice with suggestions for more logical basis of design.

FIRELESS. Heavy Plates Used in Fireless Locomotive, C. E. Lester. Boiler Maker, vol. 23, no. 1, Jan. 1923, pp. 1-3, 2 figs. Details of construction of tank of largest fireless steam locomotive ever built.

PACIFIC. G. N. R. Three-Cylinder Pacific Locomotive, Engineer, vol. 135, no. 3500, Jan. 26, 1923, pp. 90, 92 and supp. plate. Presents drawings of locomotive which was described in same Journal, Apr. 14, 1922.

New Locomotives for the Alabama & Vicksburg. Ry. and Locomotive Eng., vol. 36, no. 2, Feb. 1923, pp. 33-34, 6 figs. Pacific and Mikado types, feature of which is interchangeability of parts.

RODS, MILLING. Milling Locomotive Rods. Machy. (Lond.), vol. 21, no. 539, Jan. 25, 1923, pp. 531-534, 8 figs. Results of tests conducted in United States to determine possibilities of reducing costs in locomotive shops by milling.

TANK. Heavy Tank Locomotives for Service in Germany. Ry. Gaz., vol. 38, no. 2, Jan. 12, 1923, p. 49, 1 fig. 2-10-2-type tank locomotive, built by A. Borsig, Berlin, for Halberstadt-Blankenburg Ry.

LUBRICANTS

MANUFACTURE. Manufacture of Lubricants. Oil News, vol. 10, no. 23, Dec. 5, 1922, pp. 19-20. How neutral oils, cylinder stocks, petrolatums, and wax are made; importance of still and "cut"; uses of petrolatum. Reprinted from Atlantic Lubricator.

LUBRICATING OILS

SPECIFICATIONS. Lubricating Oil Specifications, Harold Moore. Instn. Min. Engrs. —Trans., vol. 64, part 3, Dec. 1922, pp. 74-78. Notes on drafting of specifications for supply of lubricants.

LUBRICATION

CYLINDRICAL-JOURNAL. On the Characteristics of Cylindrical Journal Lubrication at High Values of the Eccentricity. T. E. Stanton. Roy. Soc.—Proc., vol. 102, no. A716, Dec. 1, 1922, pp. 241-255, 6 figs. Investigation to obtain more definite information on nature of action between two lubricated surfaces when value of intensity of pressure as defined by load (area of lubricated surface) is considerably higher than that normally attained in current practice with cylindrical journals.

GREASE GUN FOR BEARINGS. The "Enots" Machinery Grease Gun. Machy. (Lond.), vol. 21, no. 538. Jan. 18, 1923, pp. 494-495, 2 figs. New type used for greasing bearings in all kinds of machinery and factory equipment generally

JOURNAL BOXES. Successful Lubrication of Journal Boxes, W. J. O'Connor. Ry. Mech. Engr., vol. 97, no. 2, Feb. 1923, pp. 106-108. Paper read before Chief Interchange Car Inspector's and Car Foremen's Assn. of Am., and discussion.

M

MACHINE TOOLS

HANDLES, PRESSED-STEEL. Pressed-Steel Machine Handles, Fred R. Daniels. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 466-468, 6 figs. Process for manufacturing hollow seamless machine handles.

Making Handles from Strip Steel, Herbert R. Simonds. Iron Trade Rev., vol. 72, no. 7, Feb. 15, 1923, pp. 505-507 and 510, 8 figs. Machine-tool handles formerly made from castings now produced on forming presses utilizing special dies; 12 operations required to turn raw material into finished produce; details of process.

PULL OR PUSH CUTTING STROKE. Pull or Push Cutting Strokes. Mech. World, vol. 73, no. 1879, Jan. 5, 1923, pp. 2-3, 3 figs. Discusses problem as to whether cut shall be taken on pulling or pushing stroke on certain types of machine tools, possessing holders or rams carrying tool out from end.

TRIPLEX UNIVERSAL. The Triplex Universal Machine Tool. Engineering, vol. 115, no. 2978, Jan. 26, 1923, p. 118, 6 figs. partly on p. 110. Describes machine which may be used for many purposes, such as turning, milling and drilling, either vertical or angular.

MACHINERY

DEPRECIATION. Some Economic Phases of Engineering, George F. Morsteller. Elec. World, vol. 81, no. 4, Jan. 27, 1923, pp. 217-219, 1 fig. Methods of evaluating increase of equipment efficiency in studies of plant design; mathematical formulas developed for such studies.

FOUNDATION VIBRATIONS. Investigations of the Oscillations of Foundations (Untersuchungen über Fundamentschwingungen). Ernst Schmidt. Zeit. des Vereines deutscher Ingenieure, supp. sheets, vol. 67, no. 2, Jan. 13, 1922, pp. 33-35, 11 figs. Oscillations caused by periodical forces of machines are investigated by means of graphic representation of oscillating magnitudes through vectors, investigation of behavior of elastic machine foundations of cork and rubber. Experimental results.

MAGNETOS

American Bosch. New American Bosch Magneto Model Has Novel Frame Construction. F. M. Heldt. Automotive Industries, vol. 48, no. 6, Feb. 8, 1923, pp. 278-280, 3 figs. New design embodies one-piece die-cast frame and is lighter and more compact than previous types.

Parts, Manufacture of. The Manufacture of Magneto Parts, W. Richards. Machy. (Lond.), vol. 21, no. 539, Jan. 1923, pp. 520-522, 4 figs. Describes production of magneto contact breaker lever and collector ring.

MAGNETS

Alloy Steels for. Alloy Steel for Permanent Magnets. F. O. Barralet, and W. G. Radley. Post Office Elec. Engrs. Jl., vol. 15, part 4, Jan. 1923, pp. 344-354, 3 figs. Account of tests carried out on some of special steels in which magnetic properties are developed to highest degree so far attained.

MALLEABLE IRON

European Production Processes. European View of Malleable, T. Levoz. Foundry, vol. 51, no. 2, Jan. 15, 1923, pp. 58-60. Iron oxide principal factor in producing poor malleable; thoroughly deoxidized metal will run well; French triplexing process and results of tests. Paper presented before Am. Foundrymen's Assn. through courtesy of Assn. Technic de Fonderie de France.

Motor Castings. Permeability of Malleable High. Iron Trade Rev., vol. 72, no. 3, Jan. 18, 1923, pp. 231-232, 3 figs. Magnetic properties make it suitable for frames of small motors and generators used on automobiles.

MANOMETERS

Ventilation Measurements. A Precise Manometer for Ventilation Measurements, Walter S. Weeks. Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 19-22, 8 figs. Details and operation of manometer developed by author.

MEASURING INSTRUMENTS

Test Code. Test Code on Instruments and Apparatus. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 116-120, 5 figs. Preliminary draft of chapters 1 and 2, dealing respectively with general considerations and with accuracy of measuring instruments, being first installment of this A.S.M.E. power test code to be published.

Torsiograph and Vibrograph. The Torsiograph and Vibrograph and Measuring Results Obtained Therewith (Torsiograph und Vibrograph und neuere uit denselben gewonnene Messergebnisse), Jos. Geiger. Maschinenbau, vol. 2, nos. 5-6, Dec. 16, 1922, pp. G69-G75, 41 figs. Describes torsiograph for investigations of torsional oscillations and vibrograph for registration of straight movements, and their general usefulness of technical purposes. A number of diagrams are presented showing varied uses of apparatus.

METALS

Diseases. Diseases and Special Properties of Metals (Metallkrankheiten und besondere Metalleigenschaften), Heinz Lange. Zeit. für die Gesamte Giesserei-praxis, vol. 43, nos. 50-51, Dec. 30, 1922, pp. 181-182. (Das Metall Section). Discusses diseases of tin, zinc and iron; disintegration of tin into powder, a contagious disease; corrosion of iron; etc.

METALLURGY

Chemistry. Recent Advances in Metallurgical Chemistry, Elaine Eustice. Chem. Age (Lond.), vol. 8, no. 187, Jan. 13, 1923, pp. 26-28, 2 figs. Discusses allotropy, and refers to light which has been shed on number of metallurgical problems by Rontgen ray analysis. Allotropic transformation; crystal structure influence of carbon atoms; hard and soft steel;

METALS

Recrystallization. Recrystallization, E. O. Courtman. Brit. Non-Ferrous Metals Research Assn.—Bul. no. 8, Jan. 1923, pp. 6-15. Cold working and annealing; relation between grain size and hardness; practical application. Bibliography.

METRIC SYSTEM

Features and Advantages Claimed. The International Metric System of Weights and Measures. U.S. Bur. of Standards, Miscellaneous Publications, no. 2, Sept. 21, 1922, 16 pp., 6 figs. Report prepared to answer questions addressed to Bur. of Standards.

MILLING MACHINES

Tool Fastening. The Standardization of Tool Fastening to Milling Machines (Die Normung der Werkzeugbefestigung an Fräsmaschinen), K. Hegner, Werkstattstechnik, vol. 17, no. 1, Jan. 1, 1923, pp. 1-6, 46 figs. Recommendations of Standard Committee of Assn. German Machine-Tool Mfrs. for standardization of tool fastenings.

MINERALS

Production, Canada. Mineral Production of Canada in 1922, S. J. Cook. Can. Min. Jl., vol. 44, no. 1, Jan. 5, 1923, pp. 3-5. Notes on output of coal, gold, silver, lead, natural gas, copper, asbestos, zinc, feldspar and gypsum.

MINING

Canada. Mining in Canada, J. B. Tyrrell. Science, vol. 57, no. 1463, Jan. 12, 1923, pp. 31-38. History of development. Address before Am. Assn. for Advancement of Science.

Underhand Square Setting. Mining by Ratterree Modification of Underhand Square Setting, Robert H. Dickson. Eng. and Min. Jl.-Press, vol. 115, no. 4, Jan. 27, 1923, pp. 191-192, 3 figs. Method used by Calumet and Ariz. Min. Co., for removing heavy ground near old caved cut-and-fill or square set stopes.

NITROGEN

Bibliography. The Nitrogen Industry in 1922, E. B. Maxted. Chem. Age (Lond.), vol. 7, no. 185, Dec. 30, 1922, pp. 917-919. Discussion giving Bibliography including papers and patent specifications published during 1922, on synthesis of ammonia, nitrogen fixation, ammonium salts, nitric acid and nitrates.

MOLDING METHODS

Flanged Bushings. Molding Flanged Bushings, Charles Vickers. Foundry, vol. 51, no. 3, Feb. 1, 1923, pp. 97-100, 4 figs. Advantages and disadvantages of molding with flange up or down; different kinds of gates are illustrated.

MOTOR BUSES

One-Man-Operated. A Cheap-Operation Single-Decker. Motor Transport, vol. 36, no. 932, Jan. 8, 1922, pp. 34-35, 4 figs. Bus designed for poorer-paying routes of Manchester Corp. Tramways, to be worked without conductor.

Reconditioning. Re-conditioning Motor Buses. Machy. (Lond.), vol. 21, nos. 536 and 537, Jan. 4 and 11, 1923, pp. 417-425 and 449-455, 15 figs. Details of system adopted by Lond. Gen. Omnibus Co., Ltd., Chiswick Works, Gunnersbury.

Six-Wheels. The Six-Wheel Autobuses of Paris (Les omnibus automobiles à six roues, de Paris). Génie Civil, vol. 81, no. 27, Dec. 30, 1922, pp. 605-607, 11 figs. Design, construction, and operation, power of suspensions; control of wheels; 34-hp. motors.

MOTOR TRUCKS

Electric, Possibilities and Future. Electric Trucks. Elec. Jl., vol. 20, no. 1, Jan. 1923. Contains following articles: The Possibilities of the Electric Motor Truck, Charles R. Skinner, Jr., pp. 7-9, 2 figs.; Future of the Electric Commercial Truck, A. E. Friedgen, pp. 10-12, 5 figs.; The Field for Electric Trucks, G. A. Freeman, pp. 12-15, 4 figs.; Features of Design of Electric Trucks, J. C. Carroll, pp. 16-20, 4 figs.; Storage Batteries and Charging for Electric Vehicles, J. H. Tracey, pp. 20-22, 3 figs.; The Electric Vehicle Motor, A. L. Broomall, pp. 23-27, 11 figs.; Charging Vehicle Batteries, Otto Sarvas, pp. 27-30, 9 figs.; Control Equipment for Electric Vehicles, A. Robinson, pp. 34-36, 7 figs.; etc.

Overloading. Over-Loading of Motor Trucks, David C. Fenner. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, p. 210. Presented at joint session of Nat. Highway Traffic Assn. and Mich. State Good Roads Assn.

O

OFFICE MANAGEMENT

Paper for Forms. Standard Sheets of Paper for Forms, C. L. Barnum. Management Eng., vol. 4, no. 2, Feb. 1923, pp. 117-119. Gives examples of standard sizes that cut and print without waste from flat papers.

OIL

Prospecting for Gas and. Prospecting and Testing for Oil and Gas, R. E. Collom. U.S. Bur. of Mines, Bul. no. 201, 1922, 170 pp. 19 figs., 27 tables. Discusses features of oil and gas accumulation and describes oil-field rocks and minerals; kinds of tools that should be used and information necessary for selecting proper tools; discusses accurate testing of strata for oil or gas and states principles based on conditions that have frequently existed in well drilling.

OIL FUELS

Burning System. A New System of Burning Gas or Fuel Oil for Industrial Purposes. Oil Eng. and Finance, vol. 3, no. 53, Jan. 13, 1923, pp. 53-56, 3 figs. System is based on subdividing of gaseous flow and mixture of gas and air in burner itself.

OIL SHALES

Moncton Area Canada. Geology of the Moncton Map-area, W. J. Wright. Can. Dept. of Mines, Geol. Survey, Memoir no. 129, geol. series no. 110, 1922, 69 pp., 18 figs. partly on supp. plates in pocket. Geology of area is primarily that of carboniferous rocks, which are of special importance because they contain economic deposits of oil and gas, oil-shale, salt and coal. Oil shale in New Brunswick and Nova Scotia.

OIL ENGINES

Battery-Charging Sets. Small Oil Engine Battery-Charging Sets, W. Wilson. Beama, vol. 11, nos. 5 and 6, Nov. and Dec. 1922, pp. 723-730, 801-810 and vol. 12, no. 57, Jan. 1923, pp. 39-43, 15 figs. Nov.: Characteristics of lead accumulator; standard non-automatic house-lighting equipment; defects of old and improvements in more recent plants; components involved in lighting sets. Dec.: Regulation of current during charge; automatic cessation of charge; automatic starting; engines, dynamos and types of loads. Jan.: Examples of complete apparatus.

Cold-Starting. Vertical Cold-Starting Solid-Injection Oil Engines. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 153-155, 5 figs. partly on p. 152. Ruston heavy-oil engine designed for continuous working load of 380 b.hp. at 250 r.p.m.

Compressorless. Compressorless Oil Engines (Kompressorlose Oelmaschinen), F. P. Grützner. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 3, Jan. 20, 1923, pp. 53-56, 11 figs. Describes 4-cycle engine with pump injection; details of fuel valve and pump and regulation; experimental results and practical experiences.

Exhaust-Gas Utilization. Utilization of Oil-Engine Exhaust Gases, J. L. Chaloner. Motorship, vol. 8, no. 1, Jan. 1923, pp. 16-18 and 24, 3 figs. Heat balance sheet of an oil engine; exhaust gases and their heat value, temperatures, specific heat, heat available; available heat in jacket-cooling water.

Hot-Bulb. A Belgian Hot Bulb Engine with the R.E.M. Type Fuel Pump. Engineer, vol. 135, no. 3501, Feb. 2, 1923, p. 120, 2 figs. Deals with third and fourth series of engines built by Anglo-Belgian Co., Ghent, comprising engines of 25, 50 and 75 hp. designed for speed of 380 r.p.m., and engines of 100, 150 and 200 b.hp. running at 280 r.p.m.

OIL FUELS

Burning, Efficient. The Practical Use of Oil Fuels, Allen F. Brewer. Combustion, vol. 8, no. 2, Feb. 1922, pp. 94-97 and 104. Characteristics of oil fuel.

Combustion. Judging the Combustion of Liquid Fuels, A. G. Witting. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 125-127. Formula for calculating results of combustion from waste-gas analysis applied to liquid fuels; by-product tar used as typical example; moisture calculation not essential.

OPEN-HEARTH FURNACES

Loftus System. Improvements in Open Hearth Furnace, E. C. Cook. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 61-64, 3 figs. Describes Loftus variable-pressure method of firing and briefly explains Naismith mechanical neutral point.

SULPHUR CONTROL IN BASIC. Control of Sulphur in the Basic Open Hearth Process, Sylvester V. Williams. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 51-54. Excessively high temperatures necessary to remove all sulphur; reduction at blast furnace advantageous; selection of low-sulphur fuels should be carefully watched.

OIL TANKS

STORAGE, OIL GAGING. Accurately Gauging Tanks, B. C. Rinehart. Oil News, vol. 11, no. 2, Jan. 20, 1923, pp. 21-22, 1 fig. Describes accurate method of gaging oil in storage tanks for petroleum industry; factors that influence results; how to correctly strap a tank.

ORE DEPOSITS

CLIMATIC CHANGE, EFFECT OF. An Effect of Climatic Change on the Superficial Alteration of Ore Deposits, Henry H. Knox. Economic geology, vol. 17, no. 8, Dec. 1922, pp. 655-661. Discusses causes involved in segregation at one horizon of oxidized zone and impoverishment at another horizon.

OXY-ACETYLENE CUTTING

CAST IRON. Applications of the Cutting of Cast Iron with the Oxy-Acetylene Torch, A. S. Kinsey. Am. Welding Soc.—Jl., vol. 2, no. 1, Jan. 1923, pp. 21-33, 8 figs. Typical examples of cutting cast iron; economy and method of cutting; effects on cast iron; theory of cutting metals with gas.

OXY-ACETYLENE WELDING

PIPE LINES AND PUMPING STATIONS. Oxy-Acetylene Welding as Applied to Oil-Carrying Pipe Lines and Pumping Stations, N. E. Wagner. Acetylene Jl., vol. 24, no. 6, Dec. 1922, pp. 271-277 and (discussion) 277 and 310, 6 figs. Describes experiences of Prairie Pipe Line Co. in laying various lines, including problems encountered. Address before Convention of Int. Acetylene Assn.

SHEET METAL. Production Welding in the Sheet Metal Shop, J. W. Owens. Am. Welding Soc.—Jl., vol. 2, no. 1, Jan. 1923, pp. 41-44, 4 figs. Welding with gas flames in manufacture of metal furniture.

P

PAPER MILLS

TRANSMISSION MACHINERY. Paper Mill Transmission Machinery, G. N. Vanderhoff. Paper, vol. 31, nos. 1, 2 and 3, Sept. 6, 13 and Nov. 8, 1922, pp. 7-12, 12-14 and 33. Discusses shaftings and bearings; maximum stress and elastic limit for shaftings, life of shaft, importance of flexibility and where it is necessary, use of compression couplings, how lubrication is affected, feeding oil by capillary attraction; considers different kings of pulleys.

PEAT

CANADA. Canada Hopes Peat Will Displace Much Anthracite, E. L. Chicanot. Coal Age, vol. 23, no. 5, Feb. 1, 1923, pp. 215-218, 6 figs., 190,000,000 tons of peat fuel mapped out in Dominion; one machine will produce 100 tons per day.

PHOTOELECTRICITY

SENSITIVITY, INVESTIGATIONS. Various Photo-Electrical Investigations, W. W. Coblentz. U.S. Bur. of Standards—Sci. Papers, vol. 18, no. 462, Dec. 20, 1922. pp. 585-607, 9 figs. Miscellaneous data obtained in connection with general investigation of photoelectrical sensitivity.

PIPING

POWER PLANTS. Power Plant Piping, G. W. Smith. Nat. Engr., vol. 27, no. 1, Jan. 1923, pp. 4-7. Pipe sizes, valves, fittings, gaskets, bolts, hangers, drainage and expansion. Paper read before N.A.S.E. convention.

PISTONS

ALUMINUM. Aluminum Alloy Pistons. Metal Industry (Lond.), vol. 22, no. 3, Jan. 19, 1923, p. 3. Discusses difficulties in their use; thermal conditions under which casting is required to work; heat treatment.

TEMPERATURE FLUCTUATIONS. Temperature Fluctuations and Heat Absorption of Internal-Combustion-Engine Pistons (Temperaturschwankungen und Wärmeaufnahme der Kolben von Verbrennungsmaschinen), Max Jakob. Zeit. des Vereines deutscher Ingenieure, vol. 66, no. 51-52, Dec. 23, 1922, pp. 1138-1140, 1 fig. Points out that piston is almost entirely unaffected by change of temperature in combustion chamber of a gas engine; differences in heat absorption of pistons of different metals due to their varying reation against radiating heat. Recommendations for further investigation of exchange of heat in cylinder.

PLANERS

HYDRAULIC DRIVE. Hydraulic Planer Drive, M. H. Sabine. Machy. (Lond.), vol. 21, no. 537, Jan. 11, 1923, pp. 460-463, 3 figs. Experimental hydraulic drive applied to large planer by Variable Speed Gears, Ltd., employing transmission of gear of their separated unit type.

PORTS

SEATTLE, WASH. Benefits Received by Seattle and the Northwest by Reason of the Formation of the Port of Seattle District and the Construction of Its Magnificent Harbor Terminals, W. S. Lincoln. World Ports, vol. 11, no. 3, Jan. 1923, pp. 60-71, 7 figs. Describes how port district is operated.

PRESSES

KNUCKLE-JOINT EMBOSSING. Knuckle-Joint Embossing Presses, N. T. Thurston. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 451-452, 2 figs. Used extensively for embossing coins, medallions, etc. Describes 2500-ton double-geared press in operation on frame connection of automobile.

PRODUCER GAS

LOW-TEMPERATURE. Low-Temperature Bye-Products Producer Gas. Gas Jl., vol. 161, no. 3114, Jan. 17, 1923, pp. 141-142. Distributive features; semi-low and true low-temperature producers, comparison of producers.

PULLEYS

CALCULATION. Calculation of Pulleys for Fiber and Wire Rope (Berechnung von Hanfseil- und Drahtseilscheiben). Zeit. für die gesamte Giessereipraxis, Vol. 43, no. 50-51, Dec. 30, 1922, pp. 640-641, 9 figs. Number and diameter of ropes, horsepower to be transmitted, number of revolutions, diameter of pulleys.

PULVERIZED COAL

BOILER FIRING. Firing Boilers with Powdered Fuel at Bruay Colliery, M. Sohm. Colliery Guardian, vol. 124, no. 3235, Dec. 29, 1922, pp. 1583-1585, 4 figs. Experiences with pulverized-coal plant for battery of 16 boilers installed at Labuissière central station. (Abstract.) Translated from Revue de l'Industrie Minérale.

FEEDING, PRINCIPLES OF. Principles of Feeding Pulverized Fuel, M. W. Arrowood. Combustion, vol. 8, no. 2, Feb. 1923, pp. 117-122. Continuation of author's reply to those who commented on his articles in July, Aug. and Sept. 1922 issues.

PULVERIZERS AND DRIERS. Pulverized Coal—Its Utilization in the Industries, Cecil F. Herington. Combustion, vol. 7, no. 6, Dec. 1922 and vol. 8, no. 1, Jan. 1923, pp. 345-350 and 362 and 42-48, 16 figs. History of pulverized coal; describes various types of driers and pulverizers.

Powdered Coal for Reverberatory Furnaces, J. B. Johnson. Combustion, vol. 8, no. 2, Feb. 1923, pp. 90-93, 6 figs. Describes powdered coal plant of United Verde Copper Co., Clarkdale, Ariz., built for maximum capacity of 700 tons per 24-hr. day, designed to provide powdered coal fuel for six open-hearth reverberatory furnaces, including storage plant, conveyor system, dryers, etc.

PUMPS, CENTRIFUGAL

SAND AND DREDGING. Pumps Used in Dredging and for Pumping Sand, E. T. Keenan. Eng. World, vol. 22, no. 1, Jan. 1923, pp. 27-29, 3 figs. Details of design.

PUMPING PLANTS

WATER WHEELS, 250-YEAR OLD. 250-Year Old Marly Waterwheels for Versailles Fountains. Eng. News.-Rec., vol. 90, no. 3, Jan. 18, 1923, p. 107, 2 figs. Water pumped to aqueduct 4000 ft. away, 500 ft. higher; gravity fall to fountains; 200 pumps, 15 mi. of cast-iron pipe.

PUMPING STATIONS

DESIGN. An Economical Water Supply Plant, William C. Rudd. Ry. Maintenance Engr., vol. 19, no. 1, Jan. 1923, pp. 17-18, 6 figs. Wide range of water levels in river introduces interesting problem in pumping-station design.

ONTARIO, CANADA. Strange Street Pumping Station, Kitchener, Ont., Marcel Pequegnat. Can. Engr., vol. 44, no. 4, Jan. 23, 1923, pp. 159-162, 7 figs. Air-lift system employed to pump water from wells; describes million-gallon emergency reservoir, motor-driven air compressors and centrifugal pumps, stand-by gasoline engines, and distribution system.

PUMPS

AIR-LIFT. Air Lift for De-Watering Mines, Herbert Axford. Compressed Air Mag., vol. 27, no. 11, Nov. 1922, pp. 312-314, 5 figs. Use of large capacity air compressors, up to 2000 and 3000 ft. displacement, for pumping water in anthracite coal mines.

BOILER-FEED. Boiler-Feed Pumps. Southern Engr., vol. 38, no. 5, Jan. 1923, pp 100-112, 27 figs. Inspecting water valves; setting of Duplex pump valves; size of pump and injector; horsepower and pressures obtained in pumps.

VACUUM. Size Selection of Dry-Vacuum Pumps, Edward W. Noves and Harold V. Sturtevant. Mech. Eng., vol. 45, no. 2, Feb. 1923, pp. 103-104, 3 figs. Methods of determining volumetric efficiency were tried out, and working with actual test data, values were obtained from which a "constant" curve was plotted, giving closely accurate results from 80-per cent perfect vacuum up; with aid of this curve two charts have been plotted, by means of which it is possible to determine rapidly (1) size of pump required to exhaust given volume to specified degree of vacuum in predetermined time; or (2) where vacuum pump is already installed, time required to exhaust given volume to specified degree of vacuum. (Abridged.)

R

RADIOTELEPHONY

BROADCASTING STATIONS. The British Radio Broadcasting Stations. Elec. Rev., vol. 91, no. 2353, Dec. 29, 1922, pp. 964-966, 3 figs. Describes transmitting apparatus of Manchester, London, and Birmingham, stations.

RADIOTELEGRAPHY

RECEIVING. Super-regeneration (Au sujet de la super-régénération), Michel Adam. Radio-électricité, vol. 3, no. 12, Dec. 1922, pp. 508-513, 8 figs. New method for radio receiving, which allows triodes to reach maximum amplifying power.

TRANSATLANTIC STATIONS. The Marconi Transatlantic Wireless Stations at Carnarvon and Towyn. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 131-136, 8 figs. Historical survey of developments which have taken place in transmission and reception.

WAVEMETERS. Standardization of Wavemeters, Akira Tsubouchi. Electrotechnical Laboratory, no. 115, Sept. 1922, 67 pp., 30 figs. Method of wavemeter calibration; elements of inductance coils for standard wavemeters.

RAILS

LAYING. Methods and Costs of Laying Rail, George W. Morrow. Eng. and Contracting (Railways), vol. 59, no. 1, Jan. 17, 1923, pp. 133-134. Comparative figures for work with and without labor-saving equipment. Paper presented before Metro. Track Supervisors Club, New York.

RAILWAY CONSTRUCTION

BOLIVIA. Atocha-Villazon Railway Under Construction in Bolivia, Paul C. Campbell. Ry. Rev., vol. 72, no. 6, Feb. 10, 1923, pp. 243-244, 9 figs. Details of construction and engineering characteristics of trans Andean line, which will complete link connecting interior South American country with east coast seaports; line will span gap of 198 km.

RAILWAY ELECTRIFICATION

ADVANTAGES. Advantages of Railroad Electrification, R. J. O'Brien. Universal Engr., vol. 36, no. 6, Dec. 1922, pp. 17-24, 8 figs. Comparative methods of operation with steam and electric traction; trunk-line and terminal tunnel electrifications.

DEVELOPMENTS. Notes on Railroad Electrification, E. A. Palmer. Jl., Pac. Ry. Club—Proc., vol. 6, no. 8, Nov. 1922, pp. 4-10. Developments in United States electric-locomotive features based on types and operations on existing electrifications.

FRANCE. Electrification of the Midi Railway (L'Electrification des chemins de fer du Midi), M. Bachellery. Houille Blanche, vol. 21, nos. 71-72, Nov.-Dec. 1922, pp. 192-198. Developments since 1902; choice of current; power-house data; transformers and substations; line protection; etc.

RAILWAY MOTOR CARS

GASOLINE. A French Petrol Rail Car. Engineer, vol. 135, no. 3498, Jan. 12, 1923, pp. 47-48, 4 figs. Details of 62-72-hp. rail car constructed by Schneider & Cie., Creusot; trial and working results.

Gasoline Rail Car Shows Good Fuel Economy. Ry. Age, vol. 74, no. 4, Jan. 27, 1923, pp. 273-274, 3 figs. Passenger rail car, built around Gramm-Bernstein 3-ton truck chassis, averages 12 mi. per gal.

GASOLINE-ELECTRIC. Gasoline-Electric Railway Motor Cars (Note sur l'automotrice pétroléo-électrique du tramway départemental de Pithiviers à Toury), M. Watier. Annales des Ponts et Chaussées, vol. 2, no. 5, Sept.-Oct. 1922, pp. 160-174, 8 figs. Application of Crochat system, consisting of 4-cycle Aster explosion engine, a generating dynamo of 1000 to 1800 r.p.m., and electric motor, to Pithiviers-Toury line, France; for local traffic. Rolling stock; comparison with steam operation.

RAILWAY SHOPS

MACHINERY DEFICIENT. Lack of Modern Machinery Handicaps Railroads, E. L. Woodward. Ry. Age, vol. 74, no. 3, Jan. 20, 1923, pp. 219-223, 8 figs. Net earnings reduced by need of machinery to repair equipment with desired speed and economy; remedial suggestions.

RAILWAY OPERATION

CANADA. Some Fundamental Needs in the Canadian Railway Industry, Edwin Winfield. Can. Ry. and Mar. World, no. 299, Jan. 1923, pp. 1-4, 8 figs. Inquiries and corresponding conclusions drawn, regarding some things influencing quality and cost of railway transportation in future, including railway mileage and facilities, passenger and freight traffic, transportation costs to public, railway operating efficiency, and railway earnings.

RAILWAY SIGNALLING

A.C., DYNAMIC INDICATION FOR. Dynamic Indication for Alternating Current Induction Motor Signals, P. X. Rice. Ry. Signal Engr., vol. 15, no. 1, Jan. 1923, pp. 9-12, 6 figs. Describes system of dynamic indication suitable for a.c. Describes induction motor apparatus, including standard signals and train stops, and adaptable to switch machine motors if induction switch machines come into use; may be applied to a.c. series commutator motors.

AUTOMATIC. New Automatics on the Grand Trunk, T. A. Allen. Ry. Signal Engr., vol. 16, no. 1, Jan. 1923, pp. 5-8, 11 figs. Details of installations made between Danville Junction Me., and Yarmouth, on line to Portland; storage battery of a.c. floating system is housed in cellar built in signal foundation; switch lamps electrically lighted.

ELECTRIC. Electric Control of Railway Signals and Switches (Commande électrique des signaux et aiguilles de chemins de fer), P. Maurer. Electricien, vol. 54, no. 1316, Jan. 15, 1923, pp. 34-37, 8 figs. Discusses apparatus for controlling electric circuits, for displacement of switches and signals, and for effecting these displacements.

RAILWAY TIES

PRESERVATIVE TREATMENT. The Preservative Treatment of Cross Ties and Timber, F. C. Shepherd. N.E. R.R. Club, Dec. 12, 1922, pp. 156-173 and (discussion 174-184, 3 figs. Discusses merits in use of zinc chloride or creosote.

RAILWAYS

VALUATION IN CANADA. A Review of the Grand Trunk Railway Arbitration, J. P. Newell Eng. News-Rec., vol. 90, no. 5, Feb. 1, 1923, pp. 211-215, 3 figs. Post-war difficulties of Canadian railways and methods used in valuation of Grand Trunk System for purchase by Government.

RECLAMATION

IRRIGATION AND DRAINAGE. Irrigation and Drainage in the Prairies, E. F. Drake. Contract Rec., vol. 37, nos. 21 and 2, Jan. 3 and 10, 1923, pp. ..... and 27-28, 1 fig. Deals with irrigation in southern and drainage in swamps of northern parts of Alberta and Saskatchewan, Canada.

REFRACTORIES

AIR FURNACES. Refractories for Air Furnaces, C. E. Bales. Foundry, vol. 51, no. 3, Feb. 1, 1923, pp. 112-116, 2 figs. Manufacturing of molded and dry pressed brick is described with details of different kinds of clays used; composition and sizes of brick for various parts of furnace. Paper prepared for Am. Foundrymen's Assn.

DEFECTS IN. Defective Refractory Materials, Alfred B. Searle. Gas Engr., vol. 38, no. 360, Dec. 15, 1922, pp. 330-335. Discusses after-expansion, blisters, blotches or color, blowholes, cores, cracks, discoloration, expansion, frozen refractories, fusibility, irregularity in size and shape, over-firing, permeability, porosity, refractoriness, scum, and other defects, and their causes.

DEVELOPMENTS. Recent Developments in Refractories, Robert F. Ferguson. Forging and Heat Treatment, vol. 9, no. 1, Jan. 1923, pp. 79-80. Review of progress made.

Refractories. Am. Ceramic Soc.—Jl., vol. 6, no. 1, Jan. 1923, pp. 275-306. Contains articles by different authors on fireclay, chrome, dolomite, magnesite, silica, high-alumina, fused-alumina, zirconia, zinc and silicon-carbide refractories; testing refractories.

FIRECLAY. Fireclay Refractories for the Steel industry, Chas. L. T. Edwards. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 100-102. Value of scientific methods and relation of impurities to melting points. high heat-resisting clays said to be very scarce.

HEAT, EFFECT OF. Effect of Heat on Kaolins, Clays, Etc. (Action de la chaleur sur les kaolins, les argiles, etc.), A. Bigot. Academie des Sciences—Comptes Rendus des Séances, vol. 176, no. 2, Jan. 8, 1923, pp. 91-93. Results of experiments with compressed and uncompressed samples to study effect of temperature.

MANUFACTURE, DRY-PRESS METHOD. Dry Pressing Refractory Shapes, L. W. Flood. Brick and Clay Rec., vol. 61, no. 12, Dec. 12, 1922, pp. 865-866 and 897. Problems met with in manufacture of refractory ware by dry-press process, and advantages of method.

REFRIGERANTS

SULPHUR DIOXIDE. On the Structure of the Sulphur Dioxide Molecule, AO Rankine. Physical Soc. of Lond.—Proc., vol. 35, Part 1, Dec. 15, 1922, pp. 33-38, 2 figs. Arrangement of atoms in molecule of gaseous sulphur dioxide and manner in which they are linked together.

REFRIGERATING PLANTS

ELECTRIC DRIVE. Electricity in Refrigerating Plants, H. L. Semans. Ice and Refrigeration, vol. 63, no. 6, Dec. 1922, pp. 329-331. Discusses contracts, costs, and relation that contract terms and conditions bear to operation and cost. Paper read before Nat. Assn. Practical Refrig. Engrs.

MEASURING INSTRUMENTS. Measuring Devices for Refrigerating Plants, John E. Starr. Ice and Refrigeration, vol. 63, no. 6, Dec. 1922, pp. 331-333. Discusses instruments used in analyzing operation of refrigerating machine. Paper read before Nat. Assn. Practical Refrig. Engrs.

REFRIGERATION

FOUNTAIN AND ABSORBER SYSTEM. The Fountain and Absorber System, John E. Starr. Ice and Refrigeration, vol. 64, no. 2, Feb. 1923, pp. 128-130. Operation of system; heat quantities involved; cost of recovery of ammonia; distilling apparatus; operating conditions.

REFUSE DISPOSAL

INCINERATORS. Some Refuse Incinerators. Pub. Works, vol. 53, no. 10, Dec. 1922, pp. 285-286. Operating details of 20 incinerators as reported from investigation by city manager of Alameda, Cal.

REGULATORS

ARCA. The Arca Regulators. Engineering, vol. 115, no. 2980, Feb. 9, 1923, pp. 167-170, 17 figs. Describes purely mechanical appliance, which among other uses, has been applied for controlling steam, air and water pressures, temperature, humidity, voltage, speed, density of liquids, adjustment of electrodes of electric furnaces and regulation of flow of pulp in paper manufacture.

RIVERS

BANK PROTECTION. Wire and Willow Mat Revetment on the Missouri River. Eng. News-Rec., vol. 90, no. 6, Feb. 8, 1923, pp. 258-259, 4 figs. Wabash Ry. protects its river line against erosion; wire mesh encloses brush and rock; force and equipment.

ROAD CONSTRUCTION

ECONOMY IN. Studied Economy Is Trend in Modern Road Work. Eng. News-Rec., vol. 90, no. 4, Jan. 25, 1923, pp. 153-157. Abstracts of papers read before Road Bldrs.' Assn. as follows: Keep the Public Sold on Highways, H. E. Hilts; Designed Subgrade, C. M. Upham; Immediate Tasks of Highway Research, W. K. Hatt; Hot-Mix Asphalt Sand Roads, Vernon M. Pierce; Progressive Construction — Iowa Practice, C. C. Coykendall; Progressive Construction — North Carolina, C. M. Upham; Restoring Macadam Roads, W. A. Can Duzer; Salvaging and Maintaining Macadam, Alex W. Muir; Blade Grader Road Maintenance, W. H. Root; Metering Road Service to Users, J. N. Mackall.

ROADS

GRADING OF EARTH. The Grading of Earth Roads, Wilbur M. Wilson. University of Ill., Bul., vol. 20, no. 19, circular no. 10, Jan. 8, 1923, 27 pp., 21 figs. Results of experiment on earth road, 12 mi. long, subject to normal traffic.

ROADS, CONCRETE

CONTRACTION AND EXPANSION. Contraction and Expansion of Concrete Roads, D. L. Jantz. Agricultural Eng., vol. 3, no. 12, Dec. 1922, pp. 201 and 204. Investigation to determine actual expansion and contraction of concrete and concrete roads, and to obtain data for spacing of expansion or contraction joints.

DESIGN AND CONSTRUCTION. How Shall We Build Better Concrete Roads? Concrete, vol. 22, no. 1, Jan. 1923, pp. 3-9. Articles by different authors on progress in design and construction of concrete roads.

ROLLING MILLS

ADJUSTABLE-SPEED MOTORS. Adjustable Speed Motors for Rolling Mills, J. D. Wright. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 89-91, 4 figs. D.c. motors still predominate regardless of higher cost and lower efficiency than a.c. systems.

CHARCOAL IRON. Charcoal Iron Sheets Once More. Sheet Metal Worker, vol. 13, no. 25, Jan. 5, 1923, pp. 845-848 and 879. How they are being made in rebuilt Griffith mill at Washington, Pa.

CHILLED ROLLS. Chilled Roll Making for Sheet Mills, W. H. Melaney. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 86-87, 3 figs. Proposed explanation of breakage of rolls.

COLD ROLLING. Improving the Surface of Steel by Cold Rolling, J. H. McElhinney. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 91-92. Demand for cold-rolled steels increasing rapidly; describes process.

ELECTRICALLY DRIVEN. New Motor-Driven Rolling Mill in the Chicago District, H. E. Davis. Blast Furnace and Steel Plant. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 164-165, 3 figs. Current purchased from superpower system; producer gas used in heating furnaces.

PRODUCTION CONTROL. Production Control in Non-ferrous Rolling-Mills, William R. Grunow. Management Eng., vol. 4, no. 2, Feb. 1923, pp. 125-130, 3 figs. Method of routing orders and keeping in close touch with progress of work.

S

SCREW THREADS

CUTTING TOOLS. Profile and Working Process of Inclined Screw-Cutting Tools (Profil und Wirkungsweise des schräggestellten Gewindeschneidstahls), J. Fritzen. Werkstattstechnik, vol. 16, no. 23, Dec. 1, 1922, pp. 701-706, 29 figs. Numerical and graphical determination of widths of inclined screw-cutting tool for square and trapezoidal threads; advantages and disadvantages of inclined position.

SEMI-DIESEL ENGINES

EXHAUST PIPING. Exhaust Piping for Semi-Diesel Engines, H. F. Shepherd. Power, vol. 57, no. 4, Jan. 23, 1923, pp. 134-136, 12 figs. Effect of exhaust pressure on cylinder scavenging; advantages of regulated pressures; influences of pipe length on fuel consumption.

WYGODSKY CRUDE-OIL. How the Wygodsky Oil Engine Operates. Power Plant, Eng., vol. 27, no. 3, Feb. 1, 1923, pp. 169-171, 6 figs. Airless atomizer ignition element, fuel-oil torch, air-foot pump and flywheel locking used for starting.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Microbiology and Theory of Activated Sludge, A. M. Buswell and H. L. Long. Eng. News-Rec., vol. 90, no. 3, Jan. 18, 1923, pp. 119-121. Discussion of colloidal vs. biological explanation of phenomenon; counts of micro-organisms made to determine effective surface.

TREATMENT FOR. Treatment of Sewage Water (Le traitement de l'eau d'égout), Léonce Fabre. Chimie et Industrie, vol. 8, no. 6, Dec. 1922, pp. 1180-1200, 27 figs. Reviews present methods and their insufficiencies; construction and operation of Imhoff, Dortmund, and other tanks; Dorr clarifier; screens; etc.

SEWERS

CONCRETE. Concrete Pipe Used for Toledo Outfall Sewer, E. L. Peterson. Eng. World, vol. 22, no. 1, Jan. 1923, pp. 13-17, 11 figs. Details of pipe line, pipe manufacture, delivery of pipe from manufacturing yard to laying site, dredging and backfilling.

DESIGN. Some Features of Sewer Design, John W. Raymond, Jr. Boston Soc. Civ. Engrs.—Jl., vol. 10, no. 1, Jan. 1923, pp. 9-29, 2 figs. Describes methods used by comparatively limited number. Definitions of more common terms used in practice.

SANITARY AND STORM. Sanitary and Storm Sewer System for the City of London, Ont., H. A. Brazier. Contract Rec., vol. 37, no. 3, Jan. 17, 1923, pp. 45-47, 6 figs. System of separate sewers serving area of 445 acres designed to care for future development; McCracken and reinforced concrete storm sewers, vitrified-clay sanitary sewers and cast-iron inverted siphons.

SHERARDIZING

EXTENT OF COATING. Sherardized Coatings—Where They Serve Best, F. L. Wolf. Raw Material, vol. 6, no. 1, Jan. 1923, pp. 12-14, 9 figs. Deals with results of series of practical experiments made with view to determining amount of coating deposited by sherardizing.

SPRINGS

HELICAL. Conical and Parabolic Helical Springs (Ressorts en hélice conique et parabolique), C. Reynal. Arts et Métiers, vol. 75, no. 26, Nov. 1922, pp. 343-352, 10 figs. Design and construction os some special springs, strength, flexibility, deformation under load, etc.

Notes on Helical Springs, Thomas Edward Green, Beama, vol. 12, no. 57, Jan. 1923, pp. 37-38, 3 figs. Formulas for torsional stress in springs.

STANDARDIZATION

INDUSTRIAL. Industrial Standardization (Industriell Standardisering), Amos Kruse. Teknisk Tidskrift, vol. 53, no. 4, Jan. 27, 1922, pp. 25-28. Development of idea of standardization due to industrial progress; organization work for standards in individual states; universal standardization.

STANDARDS

GERMAN N. D. I. REPORT. Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie) Maschinenbau, vol. 6, nos. 5-6, Dec. 16, 1922, pp. N27-N33, 14 figs. List of newly published standard sheets. Proposals of the Board of Directors for spiral, metal, and swivel drills, hand wheels, file handles, and edge screws.

STEAM ACCUMULATORS

TYPES. Heat Accumulation (Die Wärmespeicherung in der Dampfwirtschaft), Clemens Kiesselbach. Zeit. des Internationalen Vereines der Bohringenieure u. Bohrtechniker, vol. 31, no. 1, Jan. 1, 1923, pp. 1-4 (Chemiker-u. Techniker-Zeitung). Discusses steam accumulators and their use in equalizing pressure and supply, especially in mining and metallurgical works.

STEAM ENGINES

SLIDE VALVE. The Action of the D Slide Valve. Power, vol. 57, no. 8, Feb. 20, 1923, pp. 296-298, 5 figs. Explanation of effect of lap, lead and angle of advance; simple diagrams showing how valve action may be studied graphically.

UNIFLOW. Principle of the Una-Flow Steam Engine L. T. Rutleged. Power House, vol. 16, no. 1, Jan. 5, 1923, pp. 21-23, 2 figs. Theoretical advantage of uniflow compared with counter flow engine; features in design upon which economy depends; its increasing popularity in pumping and rolling mill engines.

STEAM POWER PLANTS

GORGAS, ALA. Salvaging a War Contract, R. D. Coombs. Elec. World, vol. 81, no. 6, Feb 10, 1923, pp 327-329, 3 figs How Gorgas steam station, erected by government on Warrior River in Alabama, has continued to function and serve interconnected network and industries of Southeast with power

HOTEL. Power Equipment of the Empire's Largest Hotel, J G Soucy Power House, vol. 16, no. 2, Jan. 20, 1922, pp. 21-32, 33 figs. Describes power plant and equipment, coal-handling and boiler-room equipment, forced-draft system, steam and hot-water distribution, electrical equipment, heating and ventilation, ice making and refrigeration, of Mount Royal Hotel, Montreal.

STEAM TURBINES

ELECTRIC DRIVE FOR AUXILIARIES. Electric Drive for Turbine Auxiliaries, John M. Drabelle. Gen. Elec. Rev., vol. 26, no. 1, Jan. 1923, pp. 52-54, 4 figs. Rating of electrically-driven turbine auxiliaries in Iowa Ry. and Light Co., their automatic operating features.

THYSSEN-RÖDER. Acceptance Tests on a 5000-Kw. Thyssen-Röder Turbine (Abnahmeversuch an einer 5000-Kw. Turbine, Bauart Thyssen-Röder), M. Schimpf. Glückauf, vol. 58, no. 49, Dec. 9, 1922, pp. 1449-1451, 3 figs. Details of design of turbine and results of tests, which are presented in tabular form and compared with results from other turbines, previously tested.

WHEELS. Construction of a Steam Turbine Wheel, John K. Cochran. Steam, vol. 31, no. 1, Jan. 1923, pp. 11-12 figs. Consideration should be given to wheel with reference to effect upon it of speed and condensed steam which may enter wheel for one of several reasons, together with its rust-proof or non-corrosive qualities.

STEEL

INGOTS, HEATING CURVES OF. Heating and Cooling Curves of Large Ingots, F. E. Bash. Am. Inst. Min. and Met. Engrs.—Trans., no. 1201-S. Jan. 1923, 7 pp., 3 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, p. 30, 1 fig. Results of test on ingot 45 in. in diam. to determine rate at which heat penetrated and length of time necessary to bring whole mass to forging heat; test showed difference in temperature between portions of interior as compared with temperature of furnace gases.

PHYSICS OF. Continued Discussion on the Physics of Steel, William R. Webster. Am. Inst. Min. and Met. Engrs.—Trans., no. 1205-S, Jan. 1923, 6 pp., 4 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 30-31. Discusses estimated ultimate strength of pure iron, and increase in its strength by carbon, phosphorus and manganese. Contains plots of curves co-ordinating effect of increments in carbon and manganese on tensile strength of basic open-hearth and acid bessemer steels.

STAINLESS, BIBLIOGRAPHY. Bibliography of Stainless Steel and Iron, Victor S. Polansky. Forging and Heat Treating, vol. 8, no. 12, Dec. 1922, pp. 560-565. List of references to material in Carnegie Library of Pittsburgh.

STEEL CASTINGS

CARBON DETERMINATIONS IN. Prompt and Accurate Carbon Determination, Thomas Hill. West. Machy. World, vol. 14, no. 1, Jan. 1923, pp. 1-2, 1 fig. Methods and apparatus found satisfactory under difficult steel foundry conditions.

HEAT TREATMENT. Successful Heat Treatment of Steel Castings, Walter H. White. Can. Machy., vol. 29, no. 4, Jan. 25, 1923, pp. 18-19. Relieving strains set up by solidification; placing castings in furnace to avoid distortion. eliminating injurious gases.

X-RAY EXAMINATION. X-Ray Examination of Steel Castings, H. H. Lester. Chem. and Met. Eng., vol. 28, no. 6, Feb. 7, 1923, pp. 261-267, 12 figs. It is possible to locate 1/16-in. flaws in steel 3 in. thick with 30-min. exposure from commercial X-ray tubes; corespondingly smaller defects can be likewise revealed in thinner sections.

STEEL, HEAT TREATMENT OF

DRILL STEEL. Drill Steel—Its Forging and Heat Treatment, H. S. Brainerd. Compressed Air Mag., vol. 27, no. 11, Nov. 1922, pp. 303-311, 28 figs. Distinctive characteristics and composition of drill steel, and how it should be handled in blacksmith shop when being forged, sharpened, etc.

Hardness and Heat Treatment of Mining Drill Steel Shanks, Charles Y. Clayton. Am. Inst. Min. and Met. Engrs.—Trans., no. 1208-M, Jan. 1923, 12 pp., 1 fig.; also (abstract) in Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 33-34. Hardness varies between 196 and 782 Brinell; methods of heat treating vary not only between different mines, but also between different blacksmiths at same property; length of shank treated varies between ½ and 8 in. Results of investigation show that standard method of heat treating must be adopted by each shop if drill shanks are to give satisfactory service.

Review of Present Status of Drill Steel Breakage and Heat Treatment, Francis B. Foley, Charles Y. Clayton and Henry S. Burnholz. Am. Inst. Min. and Met. Engrs.—Trans., no. 1206-M. Jan. 1923, 18 pp., 1 fig.; also (abstract) in Min. and Metallurgy, vol. 4, no. 193, Jan. 1923, pp. 28-29. Investigations are suggested, based on general survey of 60 mines west of Mississippi River.

FATIGUE STRENGTH, EFFECT ON. Heat Treatment and the Strength of Steel Under Repeated Stresses, J. W. Harsch. Forging and Heat Treating, vol. 9, no. 1, Jan. 1923, pp. 57-62, 4 figs. Discusses effect of heat treatment on fatigue strength of steel; machines and methods; influence of structure on fatigue-resisting properties. Results of investigations at University of Ill.

SUPERHEATING. Heat Treating and Superheating (Les traitements thermiques et la surchauffe), J. Hebert. Technique Moderne, vol. 14, nos. 12 and 14, Nov. 15 and Dec 15, 1922, pp 481-485 and 600-607, 19 figs. Control of effects of heat treatment and utilization of diagrams; superheating from physical, mechanical and metallographic standpoints; changes produced in superheated steels by heat treatment. Bibliography.

STEEL MANUFACTURE

NEUTRAL PROCESS. The "Neutral" Steel Process in Rail Manufacture, Cecil J. Allen. Ry. Engr., vol. 44, no. 516, Jan. 1923, pp. 7-9, 1 fig. New process of steel manufacture in which "neutral" open-hearth furnace lining allows of production of steel of closely approaching acid quality from combination of hematite and low phosphoric iron.

STEEL WORKS

ELECTRIC DRIVE. Electric Power Application in the Steel Mills, G. E. Stolts. Blast Furnace and Steel Plant, vol. 11, no. 2, Feb. 1923, pp. 159-160, 2 figs. Motor-driven rolling mills have proven more economical than steam-driven during recent depression; turbo-generators of 10,000 kw. find general acceptance in larger plants.

ELECTRICITY IN. Considerations in the use of Electricity i Steel Works, Wm. M Farlane West of Scotland Iron and Steel Inst —Jl., vol 30, part 3, Dec 1922-23, pp. 34-39 and (discussion) 40-45, 6 figs. Discusses problem of production of electrical energy

FUEL GAS IN. Fuel Gas Question in Steel Industry, F J Denk Iron Age, vol. 111, no. 6, Feb. 7, 1923, pp. 301-405, 6 figs. Dependence cannot be placed on b t u values in comparing fuels, pyrometric efficiencies and flame temperatures important

HOT-METAL CARS Mixer Type Hot Metal Cars. Iron Age, vol 111, no 5, Feb 1, 1923, p 353, 2 figs Absence of skulls, low cost of maintenance and preliminary mixing are catures of cars developed under Pugh patents by M H Treadwell Co.

STOKERS

MECHANICAL. Mechanical Stokers. Southern Engr., vol. 38, no. 5, Jan. 1923, pp. 86-92, 13 figs. Details of design, and operation of chain-grate, overfeed, and underfeed stokers.

Mechanical Stoking on Merchant Ships. Mar. Engr. and Naval Architect, vol. 46, no. 544, Jan. 1923, pp. 8-11, 7 figs. Description and application of underfeed "type E" mechanical stoker, which has been adopted with great success by Dutch Koninklijke Paketvaart Maatschappy, of Amsterdam, on two of their vessels, SS. Bintochany and SS. Parigi.

SELECTION. Geographical Location—Factor in Choice of Stoker, J. F. Springer. Combustion, vol. 8, no. 2, Feb. 1923, pp. 109-111 and 113. Economies of mechanical stokers; importance of location; fields of stoker application; discusses different classes of stokers.

STRESSES

MICRO RECORDER. The Cambridge Micro-Stress Recorder. Engineering, vol. 115, no. 2977, Jan. 19, 1923, p. 87, 2 figs. Recorder constructed by Cambridge and Paul Instrument Co., London, will measure and record varying stresses such as stresses arising in bridges when trains are crossing at various speeds.

SUBSTATIONS

OUTDOOR. Outdoor Substation for 2,400 Volts, E. D. Searing. Elec. World, vol. 81, no. 6, Feb. 10, 1923, pp. 330-332, 3 figs. Describes type adopted in Portland Ore., cost of which, including real estate is $8500.

SURVEYING

INSTRUMENTS, WITHOUT. Surveying Without Instruments on Siberian Railway, William Ewald. Eng. News-Rec., vol. 90, no. 5, Feb. 1, 1923, pp. 202-203, 4 figs. How topographic work may be done with reasonable accuracy by improvised plane table and other devices.

T

TAPER PINS

STANDARDIZATION. Can Taper Pin Practice Be Standardized? Am. Mach. vol. 58, no. 7, Feb. 15, 1923, pp. 255-256, 5 figs. Problems in connection with standardization.

TERMINALS, LOCOMOTIVE

CONSOLIDATED TYPE. Is This the Answer to the Locomotive Terminal Problems? Ry. Rev., vol. 72, no. 4, Jan. 27, 1923, pp. 176-183, 9 figs., partly on pp. 184 and 185. Describes plans for consolidated type of terminal, which is radical departure from conventional design.

TERMINALS, MARINE

ELECTRIFICATION. Electrification of Seattle Port Terminals, O. P. Seim. Elec. World, vol. 81, no. 3, Jan. 20, 1923, pp. 155-158, 6 figs. Factors influencing undertaking and requirements of electrical equipment to meet port needs; essential features of lighting and power distribution.

TERMINALS, RAILWAY

CHICAGO. Another Study of Chicago Railway Terminals. Ry. Rev., vol. 72, no. 4, Jan. 27, 1923, pp. 192-196, 5 figs. Design suggested for magnificent new passenger station on side of present Dearborn station.

TESTING MACHINES

ROCKWELL HARDNESS. The Rockwell Hardness Tester. Machy. (Lond.), vol. 21, no. 539, Jan. 25, 1923, pp. 535-536, 2 figs. Comparison of Rockwell with Brnell and scleroscope methods; description of machine.

TEXTILE MACHINERY

WARP KNITTING MACHINES. Warp Knitting Machines, Edward Murden. Textile World, vol. 63, no. 3, Jan. 20, 1923, pp. 51 and 53, 7 figs. Origin and development.

TEXTILE MILLS

COTTON MILLS, WASTE IN. Waste in Cotton Manufacturing, Ralph E. Loper. Textile World, vol. 62, nos. 25 and 26, Dec. 16 and 23, 1922, pp. 37-39, and 41, 43 and 45. Avoidable losses in human energy, time, equipment, power, curtailment or low production, supplies and material; how waste and spoilage affect profits of mill.

THERMIT WELDING

RAIL JOINTS, PRE-WELDING OF. Installing Pre-Welded Rails. Welding Engr., vol. 7, no. 12, Dec. 1922, pp. 25 and 28, 4 figs. Describes method adopted by Wash. Ry. and Elec. Co., Wash, D.C., in some track relaying work, i.e., Thermit welding rail joints before laying tracks; which resulted in considerable saving, without interruption to traffic.

TIME STUDY

FOUNDRIES. Time Study Means Progress, A. J. Kramer. Foundry, vol. 51, no. 2, Jan. 15, 1923, pp. 72-76, 7 figs. Discussion and amplification of six fundamental reasons for adoption of time-study system; workmen's co-operation needed; qualifications of time-study observer enumerated.

TOOLS

DESIGN. Control of Tool Design, C. J. Dorer. Am. Mach., vol. 58, no. 7, Feb. 15, 1923, pp. 251-254, 8 figs. Standard instructions to draftsmen; sizes of drawings, part members, etc.; machinery, tool, pattern and alteration records.

LATHE. Lathe Tools. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 146-147, 1 fig. Results of experiments to determine durability of tools under various operating conditions, such as different cutting speeds, different tool angles, etc. Extracts of report issued by Lathe Tools Research Committee.

Lathe Tools Research. Engineering, vol. 115, no. 2979, Feb. 2, 1923, pp. 137-139, 7 figs. Resumé of report of Lathe Tools Research Committee; deals with heat treatment; tests to determine cutting capabilities; Brinell hardness tests; etc.

TRACTORS

IMPROVING EFFICIENCY. Roadless Vehicles. Motor Transport, vol. 35, no. 929. Dec. 18, 1922, pp. 793-794 and (discussion) 795. How efficiency of track-laying machine may be improved.

MANUFACTURE. Safeguarding Quality in Manufacturing, Howard L. McLean. West. Machy. World, vol. 14, no. 1, Jan. 1923, pp. 8-9, and 17, 6 figs. Gages, fixtures and methods of inspection in tractor-manufacturing plant.

TRAILERS

REVERSIBLE. A New Reversible Trailer. Motor Transport, vol. 36, no. 934, Jan. 22, 1923, pp. 99-100, 3 figs. Details of patent of R. A. Dyson and Co., with steering arrangements for backing.

WARREN. The Latest Warren Trailer. Motor Transport, vol. 36, no. 936, Feb. 5, 1923, pp. 163-164, 1 fig. Designed for standardized inexpensive production and interchangeability affording easy replacements; light weight and stability; braking from vehicle or ground.

TRANSFORMERS

WELDING. Resistance Welding Transformers, J. B. Borgadt. Welding Engr., vol. 7, no. 12, Dec. 1922, pp. 40 and 42. Problems encountered in operation, design, and manufacture; Requirements of efficient welding transformers.

TRANSPORTATION

STEEL INDUSTRY. Transportation in the Steel Industry From an Engineering Standpoint, F. L. Egan. Blast Furnace and Steel Plant, vol. 11, no. 1, Jan. 1923, pp. 11-14. Railway surveys unproductive; river transportation. Analysis of difficulties which have limited free development of transportation through and about Pittsburgh territory. Possibilities of near future.

TUBING

WELDED STEEL. Making Welded Steel Tubing, Edward K. Hammond. Machy. (N.Y.), vol. 29, no. 6, Feb. 1923, pp. 421-423, 8 figs. Rolling tubing; welding by electricity and oxy-acetylene process; finishing welded seam.

TUNNELS

CONSTRUCTION. Tunnels, Ry. Engr., vol. 44, no. 516, Jan. 1923, pp. 30-35, 18 figs. Comparison of construction, reclamation and strengthening of various Canadian and American tunnels.

TURBO-GENERATORS

COOLING. The Cooling of Turbine Generators, A. R. Smith. Gen. Elec. Rev., vol. 26, no. 2, Feb. 1923, pp. 83-87, 6 figs. Heat transfer in surface air coolers.

PEDESTALS. The Design of Structural Supports for Turbo-Generators. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 2, Feb. 1923, pp. 274-278. Discussion of paper by Edward H. Cameron, published in Jan. 1923, Proc.

12500-KW. Electrical Extensions in Liverpool. Tramway and Ry., World, vol. 53, no. 3, Jan. 18, 1923, pp. 15-18, 4 figs. Describes new 12,500-kw. Metropolitain-Vickers turbo-generator of Lister Drive power station; and automatic substation at Walton, first British automatic substation, containing one 500-dw. rotary converter.

V

VALVES

LOSS OF HEAD IN. Experiments on Loss of Head in Valves and Pipes of One-Half to Twelve Inches Diameter, Charles I. Corp and Roland O. Ruble. University of Wis.—Bul., Eng. Series, vol. 9, no. 1, 1922, 143 pp., 55 figs. Presents results of 2200 tests on 48 different gate and globe valves; and results of 425 tests to determine pipe friction. Loss of head due to gate valves was measured for various openings and fully open; and loss of head due to globe valves was determined under fully open conditions.

VENTILATION

MOULDING SHOP. Ventilating a Moulding Shop James Mackay. Domestic Eng., vol. 101, no. 6, Nov. 11, 1922, pp. 227-229, 3 figs. Ventilating and air-conditioning apparatus furnishing 6,000,000 cu. ft. of air per hr., installed in iron-foundry moulding shop.

W

WASTE HEAT

UTILIZATION. Conserving Waste Heat in the Making of Corn Syrup, Thomas Wilson. Power, vol. 57, no. 4, Jan. 23, 1923, pp. 122-127, 4 figs. All exhaust steam from power generation used in processes, while gases of combustion are used for drying; modern boiler plant using forced-draft chain-grate stokers; plant contains 2500-kw. direct connected steam-engine unit.

Utilization of Waste Heat in Factories, John B. C. Kershaw. Power House, vol. 16, no. 1, Jan. 5, 1923, pp. 24-28 and 30, 5 figs. Condensation of information published lately on waste-heat utilization, describing heat-saving appliances used in England, America, France and Germany.

WATER FILTRATION

FLOC FORMATION FOR SEDIMENTATION. Experiments on Formation of Floc for Sedimentation. Edward S. Hopkins. Eng. News-Rec., vol. 90, no. 5, Feb. 1, 1923, pp. 204-210, 6 figs. Factors of velocity and time studied at Baltimore with hydrogen-ion concentration held constant.

WATER TANKS

ELEVATED. Heat-Loss from Elevated Tanks in Winter. Eng. News-Rec., vol. 90, no. 4, Jan. 25, 1923, pp. 159-160, 3 figs. Heat-loss curves from full-size tests; coldest water in return pipe should be kept above 35 deg. Fahr.

WATER WORKS

EQUIPMENT. Mechanical Equipment of Water Works Systems, George R. Collinson. Can. Engr., vol. 44, no. 4, Jan. 23, 1923, pp. 169-173, survey of the more general apparatus used in water works plants from sources of supply to distribution system inclusive; relative merits of various types of equipment in general use; pipes included in review. From paper read before Instn. Mun. and County Engrs.

WATERWAYS

ST. LAWRENCE RIVER. The Inevitability of the St. Lawrence Route to the Sea. Municipal and County Eng., vol. 63, no. 6, Dec. 1922, pp. 208-211. Points out reasons why obstruction of opponents of this route is certain to be futile, and why waterway itself will persist and become a fact.

WELDING

See Autogenous Welding; Electric Welding, Arc; Oxyacetylene Welding.

WOOD

KILN DRYING. Kiln Drying of Lumber, F. O. Farey. Can. Ry. Club — Proc., vol. 22, no. 1, Jan. 1923, pp. 20-37 and (discussion) 37-41, 1 fig. Study of kiln; various schedules for drying lumber; and condition which should be obtained in finished product.

ARTIFICIAL SEASONING. The Artificial Seasoning of Wood by the Ozone Process, Alex. Rule. Soc. Chem. Industry—Jl., vol. 41, no. 22, Dec. 1922, pp. 548R-549R, 1 fig. Describes French process, by M. Otto, consisting essentially in submitting wood to combined action of gentle heat and ozone; two kinds of apparatus, compartment and progressive kilns, are employed.

DISTILLATION. Wood Distillation (L'historique de la Carbonisation et la technique actuelle de la Pyrogénation des bois), Ed. Bruet. Outillage, vol. 7, no. 1, Jan 6, 1922, pp. 3-6, 2 figs. Describes Hennebutte and Goutal system of wood carbonization; by-product recovery.

WOOD PRESERVATION

TREATMENT. The Preservative Treatment of Timbers for Industrial Uses, Ernest S. Park. Raw Material, vol. 6, no. 1, Jan. 1923, pp. 17-22, 13 figs. Scientific methods of wood preservation.

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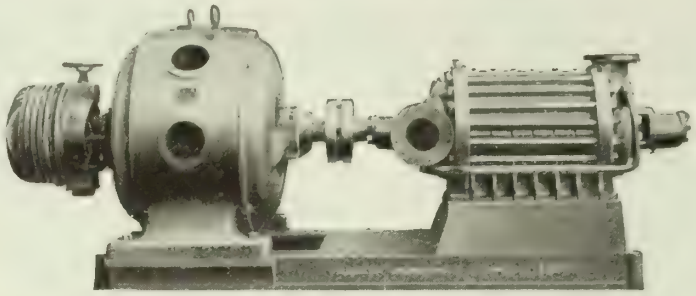

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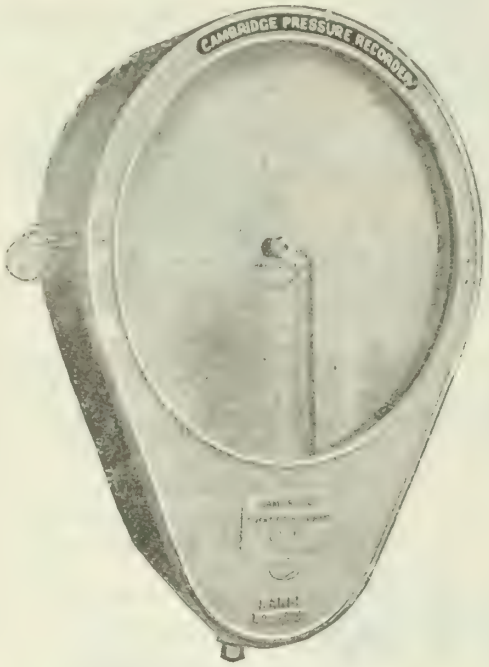

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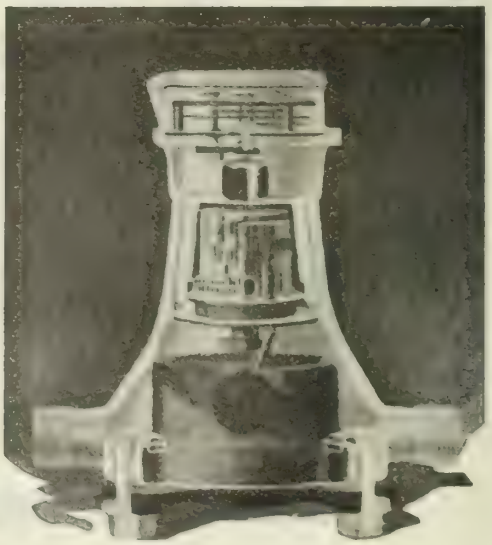

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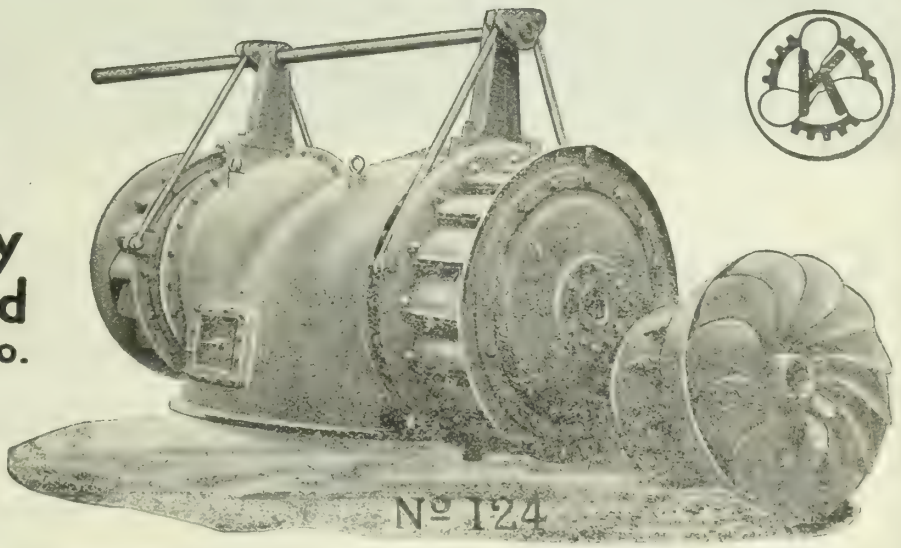

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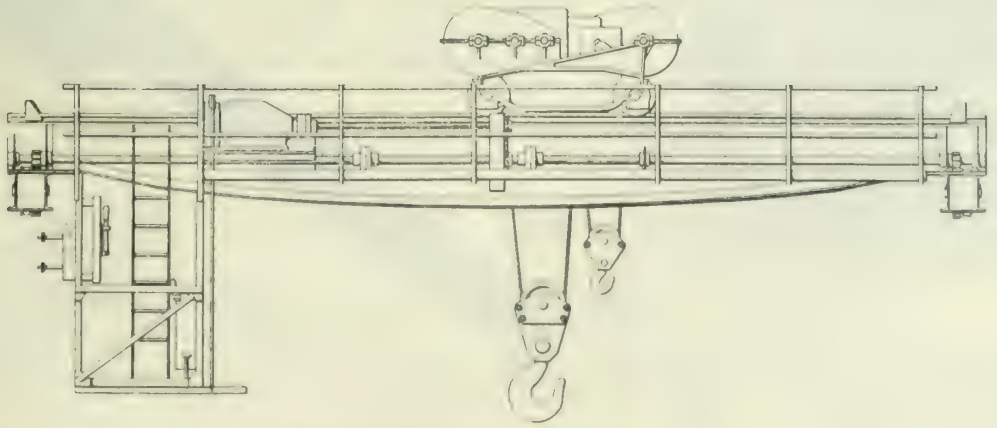
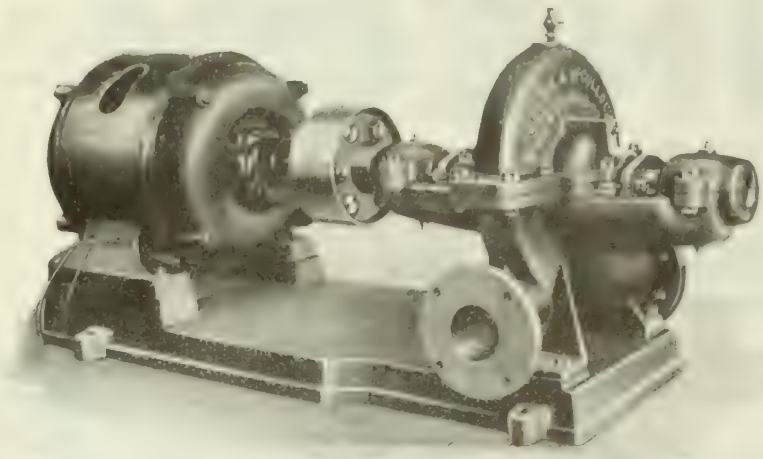


DOMINION BRIDGE COMPANY LIMITED

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

The advertiser is ready to give full information.



This type is built for capacities up to 1000 Imperial Gallons per minute.

"V" TYPE REES RoTURBo

Patent Pressure Chamber Pumps

These Pumps embody the advantages of our several Rees **RoTURBo** Patents and improvements. They are very compact and, like all other types of Rees Pumps, are self-regulating and highly efficient.

Rees RoTURBo Pumps are built in all sizes and to suit any pumping condition

CATALOGUES, PLANS, PRICES, ETC., SENT ON REQUEST.

The Goldie & McCulloch Co., Limited

Head Office and Works: GALT, Ontario, Canada

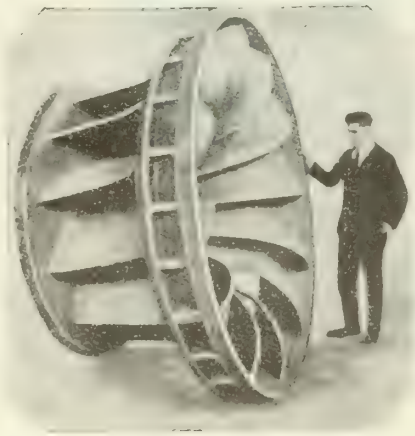
TORONTO OFFICE: Suite 1101-2. Bank of Hamilton Bld'g

WESTERN BRANCH: 248 McDermott Ave., Winnipeg, Man.

QUEBEC AGENTS: Ross & Greig, 400 St. James St., Montreal, Que.

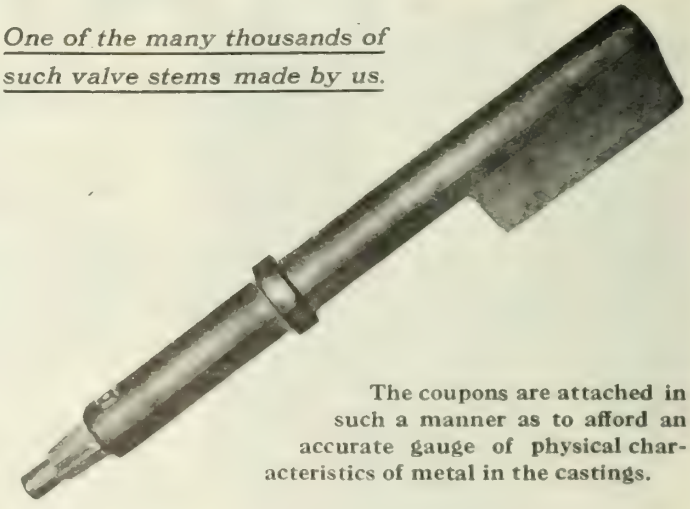
BRITISH COLUMBIA AGENTS: Robt. Hamilton & Co., Vancouver, B.C.

Bronze Castings for Hydraulic Use



One of the 3 Manganese Bronze Turbine Runners made by us for turbines, each of which developed 10,000 H. P. The weight of Runner shown above is 11,200 lbs.

One of the many thousands of such valve stems made by us.



The coupons are attached in such a manner as to afford an accurate gauge of physical characteristics of metal in the castings.

"Large valve Bodies and Bonnets also"

AMERICAN MANGANESE BRONZE COMPANY

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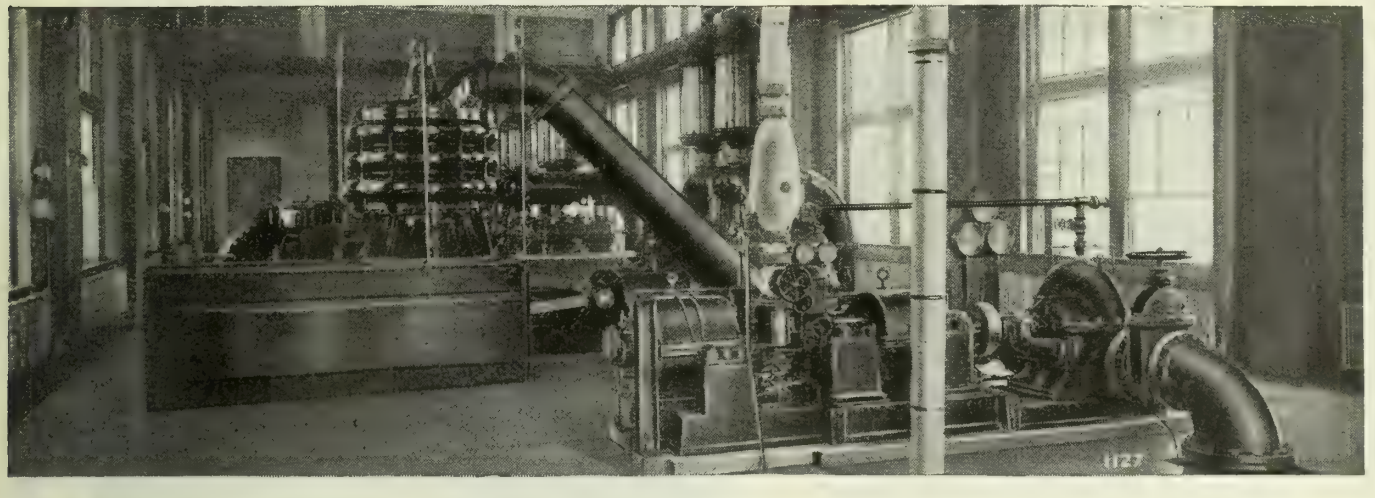

DE LAVAL STEAM TURBINE FOR STANDBY AT PETERBOROUGH

WATER for the City of Peterborough, Ont., is normally provided by pumps driven by hydraulic turbines, but when the water wheels are fouled by anchor and frazil ice, as frequently happens, a De Laval Geared Steam Turbine Driven Centrifugal Pump insures an uninterrupted supply, delivering 6,000,000 gal. per day against 228 ft. head for domestic service, or against 274 ft. head for fire service. The return tubular boilers are fitted with a mechanical draft fan driven by a gasoline engine, so that the steam plant can be put into service quickly.

If you will state your conditions and requirements, our engineers will supply plans and estimates.

Ask for Catalog B103

De Laval
Steam Turbine Company

TURBINE EQUIPMENT CO., LTD.
73 King St., West, Toronto

THE E. LAURIE COMPANY
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261

CAROMCO
PRODUCTS FOR WORLD USE

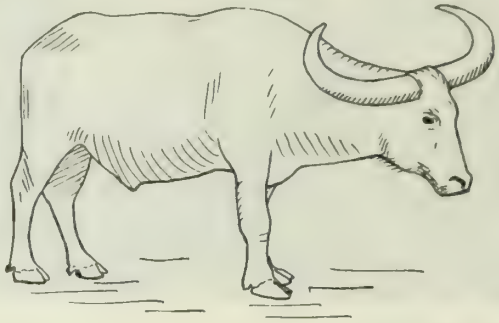
EXPANSION JOINTS

The Acknowledged Leader for roadways, pavements and all concrete work, requiring expansion material.

CANADIAN ROOFING MFG. CO. LIMITED
WINDSOR, ONTARIO.

Branches at Halifax, St. John, Montreal, Toronto, Winnipeg.

Alas, my poor brother!



Let us introduce you to our friend the East India Water Buffalo in the form of a Silent Rawhide Pinion

WRITE FOR QUOTATIONS

Hamilton Gear & Machine Co.

76 Van Horne St. - Toronto

DOMINION BRIDGE COMPANY, LIMITED

MONTREAL. P.Q.

ENGINEERS, MANUFACTURERS AND ERECTORS OF

STEEL STRUCTURES

RAILWAY AND HIGHWAY BRIDGES, SWING AND BASCULE SPANS, BUILDINGS OF ALL KINDS; HEMISPHERICAL BOTTOM AND OTHER TANKS; TRANSMISSION POLES AND TOWERS; RIVETED PIPE; CAISSONS; BARGES, TURNTABLES, ELECTRIC AND HAND POWER CRANES, HOISTING APPLIANCES, LIFT LOCKS, HYDRAULIC REGULATING GATES, ETC. GEAR CUTTING AND GENERAL MACHINE WORK.

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BRANCH WORKS: TORONTO, ONT., WINNIPEG, MAN., OTTAWA, ONT.

SALES OFFICES: MONTREAL, P.Q. TORONTO, ONT. WINNIPEG, MAN. OTTAWA, ONT.
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STEEL & FERRO-ALLOY CASTINGS

FOR ALL PURPOSES

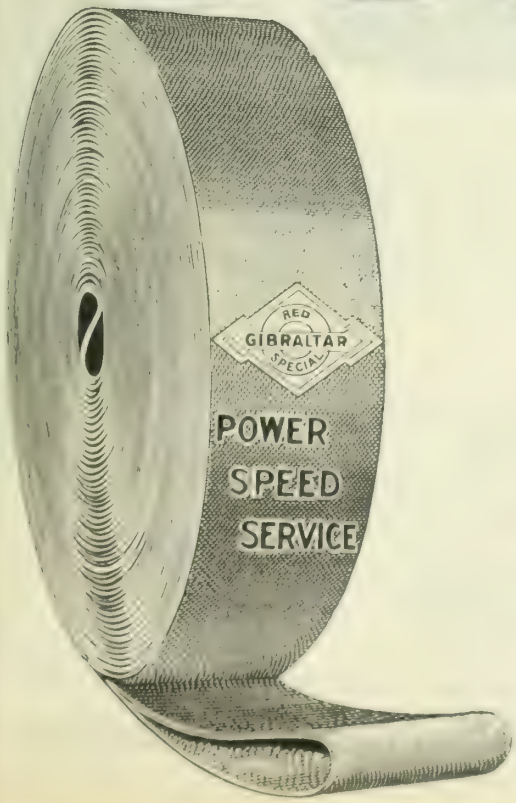
1 lb. to 50 tons.

ELECTRICAL, HYDRAULIC,
LOCOMOTIVE, MARINE,
MECHANICAL, MINING,
ETC.

CANADIAN
STEEL FOUNDRIES
LIMITED
MONTREAL

Please note that our Head Office is now at
307 Craig St. W.
Montreal

DUNLOP



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BELTING

for

Satisfactory, Economical Transmission Belt Service

DUNLOP TIRE & RUBBER GOODS CO., Limited

Head Office and Factories: TORONTO
Branches in Leading Cities

Don't fail to mention The Journal when writing advertisers.

EVIDENCE

Carrying even Superheat at Hell Gate

ELESCO SUPERHEATERS are making good in the twelve 1800 horsepower boilers at the Hell Gate Plant. The charts opposite give evidence of how closely they are maintaining the steam temperature under widely fluctuating boiler load.

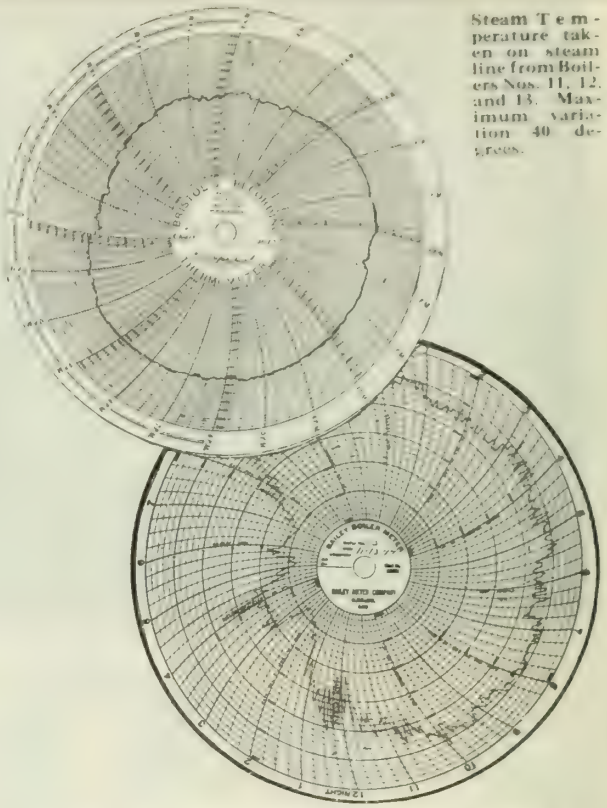
Other advantages are, high steam velocity with minimum pressure drop, uniform steam distribution, safe gas temperature zone location, fewest number of joints, elimination of baffle joints between superheater and boiler and accessibility of headers.

The most exacting requirements are met at a low first cost. The return on an investment for ELESCO SUPERHEATERS is high.

Let our engineers assist you.
Write for OT-Series Bulletins.

The SUPERHEATER Co., Limited

Transportation Building, Montreal
Works at Sherbrooke, Que.



Steam Temperature taken on steam line from Boilers Nos. 11, 12, and 13. Maximum variation 40 degrees.

Steam Flow from all of Boiler No. 13.

Designing Engineers and Manufacturers of ELESCO Steam Superheaters, and Pipe Coils for all purposes. Feed Water Heating Equipment for Locomotive Service. Boiler Feed Pumps for all Services; Exhaust Steam Injectors.

MADE IN CANADA

Do You Specify DART Union Pipe Couplings ?

They Mean Years of Trouble-Proof and Economical Pipe Coupling Service

Once installed you need never replace or repair.
" " " prevent loss and leaks.
" " " eliminate pipe thought and troubles.
" " " have no upkeep cost.

YOUR JOBBER HAS THEM

Manufactured by Dart Union Co. Limited, Toronto, Ontario.

CLEAN BRUSHES

FOREIGN material, such as grease smut and dirt, must be kept off the commutator.

This is done by brushes that are just abrasive enough to scour it and not rough enough to score it.

COLUMBIA
PYRAMID
BRUSHES

will give you this service.

Our brush Engineer will gladly advise you as to the correct brushes to use to get maximum service.

C N C

Canadian National Carbon Co.
Limited

Montreal Toronto Winnipeg

2005

Dependable Service is a feature of "RELIANCE" and "STERLING" Regrinding Valves

Fig. 500

The "Sterling" Bronze Globe Valve illustrated here is made for extra heavy service.

Designed with the exacting care that is a feature of every Jenkins Valve, and cast from bronze made of pure ingredient materials. Made in Globe, Angle, Cross and Horizontal Check patterns. Suitable for steam pressure of 300 pounds and water or air pressure of 500 pounds.

"RELIANCE" Regrinding Valves are equally dependable under a working steam pressure of 200 pounds per square inch. Made in Globe, Angle, Check, Horizontal Check and Swing Check.

Catalog No. 9 describes these and the other Jenkins models in detail. Copy sent free on request.

JENKINS BROS., LIMITED
103 St. Remi St., Montreal.
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Jenkins Valves
SINCE 1864

Journal advertisers are worthy of your business consideration.

Practical Coal Conservation

5000 Boiler Horsepower Electric Steam Plant of the Laurentide Co. Limited, Grand'Mere, Que. But one operator per shift required

KAELIN ELECTRIC STEAM GENERATORS

(PATENTED)

already installed in Canada are saving fuel at the rate of nearly 500 tons of coal per working day. Their first cost is moderate and operation and maintenance charges very low. In addition they are compact, cleanly, safe and reliable, and can be arranged for automatic control when required.

Sizes, 5 to 2500 boiler horsepower.

New Bulletin describing these Generators and outlining their field of application will be mailed on request.

Dominion Engineering Works

LIMITED

MONTREAL - CANADA

Date.....

Dominion Engineering Works, Limited, Montreal, Que.

Gentlemen:

Please send me a copy of your new Bulletin on the Kaelin Electric Steam Generator.

Name.....

Address.....

Business.....

(M-98.)

THE HUB OF CANADA'S LARGEST AND RICHEST PROVINCE

QUEBEC CITY

City of Quebec

Province of Quebec

Population	**110,500**
Total value of assessable property	**$120,540,965**
Building permits issued, 1921	**3,693,397**
Bank clearings, 1921	**302,237,674**
Port Statistics, Imports 1921	**26,663,862**
" " Exports, 1921	**28,799,768**
" " Duty collected, 1921	**4,772,693**
Number of Industries and Workshops	**835**
Number of Industrial Employees	**18,000**
Value of Production in 1919	**33,126,504**

QUEBEC—has plenty of electrical power at reasonable rates.

QUEBEC—means good steady labour.

QUEBEC—offers exceptional opportunities for new industries with nine railways entering the City and six miles of deep water front.

QUEBEC PROVINCE—offers over 2700 miles of unsurpassed motor roads radiating to Quebec City.

Manufacturers desiring any information as to sites and advantages.

Please apply to

THE INDUSTRIAL COMMISSIONER,
BOARD OF TRADE,
39 St. Paul St.

Consult the advertiser, his information is valuable.

EDDY'S

The Ideal Fire Pail for factories

Made with a round bottom, for use in racks, employees do not borrow them for temporary uses, since they will not stand on the floor.

Hard as steel, light as wood, they cannot leak, cannot be dented.

Practically indestructible, they will far outlast wooden or galvanized pails.

EDDY'S FAMOUS INDURATED FIBREWARE.

Used in many leading factories

The E. B. Eddy Co., Limited

HULL, QUEBEC

THE VULCAN IRON WORKS,

LIMITED

Established 1874

WESTERN CANADA'S PIONEER IRON WORKS.

Fire Hydrants,
Road Drags,
Snow Plows for attaching to Motor Trucks.
Municipal Castings (Iron and Brass)
Structural Steel
Boilers and Steel Plate Work
Iron and Steel Forgings
Steel Tanks of every description

Our facilities enable us to give prompt and efficient service

The Vulcan Iron Works, Limited,

WINNIPEG, MAN.

PEDLAR'S

"PERFECT" TONCAN METAL **Culverts**

WHENEVER you instal a Pedlar Culvert you can rest assured that it will always be equal to its job. They have the inherent strength to resist the greatest pressures. Being made from the celebrated anti-corrosive TONCAN METAL heavily galvanized, they will not rot or rust. Frost and ice will never crack them. All you've got to do to solve the culvert problem, whether on railway or highway, is to figure the capacity required and then send in your order for Pedlar's Culverts. We carry a stock of all sizes at all branch warehouses. Prompt shipment is always assured.

Sizes, 8 to 84 inches. Lengths up to 40 feet, with coupling bands supplied free for longer lengths.

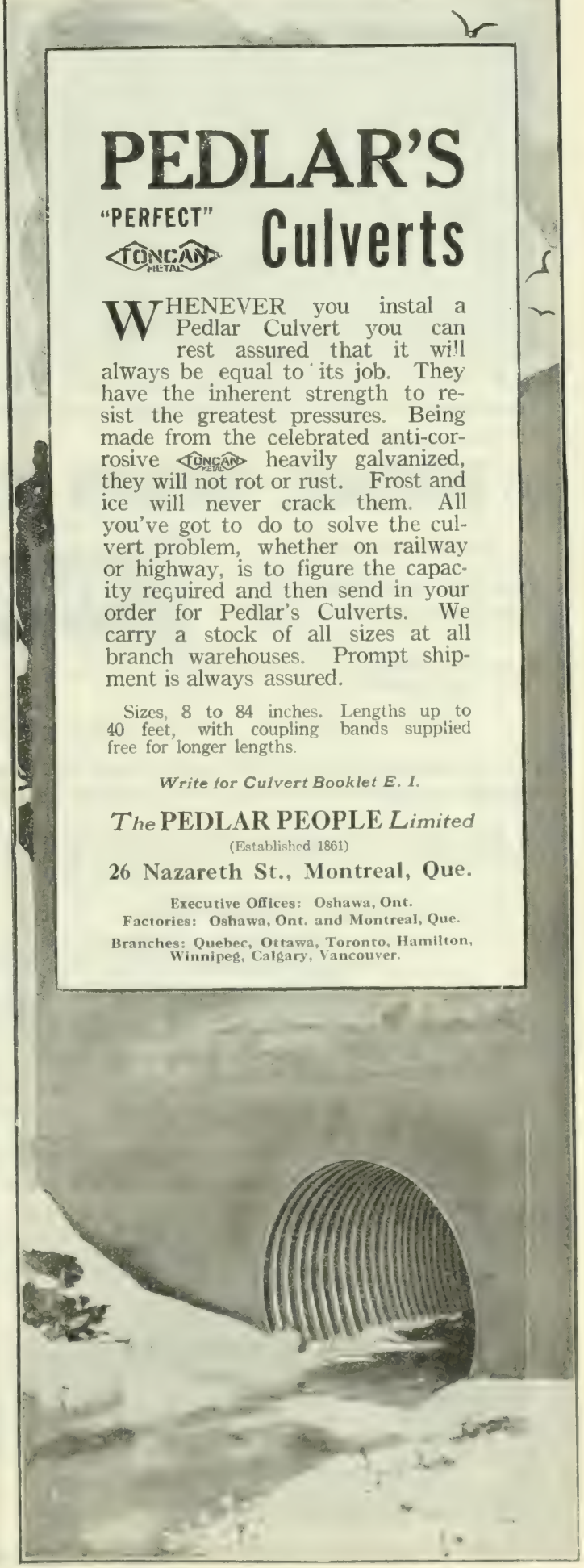
Write for Culvert Booklet E. I.

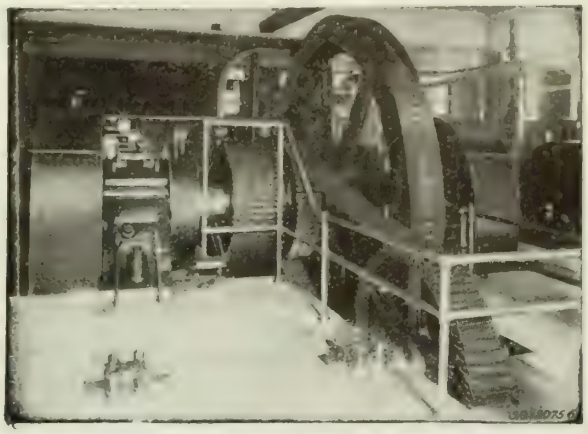
The PEDLAR PEOPLE *Limited*

(Established 1861)

26 Nazareth St., Montreal, Que.

Executive Offices: Oshawa, Ont.
Factories: Oshawa, Ont. and Montreal, Que.
Branches: Quebec, Ottawa, Toronto, Hamilton, Winnipeg, Calgary, Vancouver.





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(1000 and 500 H.P. Morse Silent Chain Drives from Engine to Lineshaft.)

TELL US YOUR TRANSMISSION PROBLEMS

JONES & GLASSCO REG'D

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MANUFACTURERS OF

Flexible and Flange Pipe and Special Castings

Flanged Ts., Bends, etc., made to any specification.

CAST IRON PIPE

3 inches to 60 inches diameter.

for Water, Gas and Culvert

HAMILTON, ONT.

Dominion Engineering Agency Limited

President: D. M. FRASER

24 Adelaide Street, East : : : Toronto, Ont.

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"I.-T-E." CIRCUIT BREAKERS AND U-RE-LITES.
"SUNDH" ELECTRIC CONTROLLING DEVICES A. C. or D. C.
"S. & C." FUSES, HI-TENSION AIR BREAK EQUIPMENT, LIGHTNING ARRESTERS, ETC.
"ACME" WIRE—COTTON COVERED, SILK COVERED, ENAMELLED.
"FEDERAL" ELECTRICAL PORCELAIN.

"Let us send you particulars of the lines you are interested in."

Hydraulic Turbines

—OF—

CANADIAN DESIGN AND MANUFACTURE
HIGHEST EFFICIENCY.
SUBSTANTIAL CONSTRUCTION.
CONTINUOUS SERVICE.
OUR HYDRAULIC TURBINES ENSURE A SOUND INVESTMENT.

Boving Hydraulic & Engineering Company Limited

LINDSAY, ONT.

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Gandy & Allison, St. John, N.B.
W. J. Banks, 103 St. John Street, Quebec.
MacFarlane-Douglas Co., Ltd., 250 Slater Street, Ottawa.
R. Y. Kilvert & Co., 402 Builders' Exchange, Winnipeg.
A. L. Charlebois, Avenue J and 20th Street, Saskatoon.
Gormans, Limited, Edmonton, Calgary and Vancouver.

The Rail Joint Company of Canada, Limited

McGill Building, MONTREAL

Makers of Base-Supported and 100% Rail Joints for Standard, Girder and Special Rail Sections. Also Joints for Frogs and Switches, Insulated Rail Joints and Step or Compromise Joints.

PROTECTED BY PATENTS Grand Prize, San Francisco, 1915

NATIONAL IRON CORPORATION, Limited

Head Office, Works and Docks:—TORONTO

Every size for Water, Gas, Culvert or Sewer, Carried in Stock at

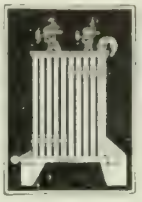
Lake or Rail Shipments TORONTO, PORT ARTHUR and MONTREAL

WILLIAM HAMILTON CO., LTD.

Hydraulic Turbines, Saw Mill and Pulp Mill Machinery, Iron Castings, Structural Steel and Steel Plate Work.

PETERBORO, - - - - ONTARIO.

Men of influence consult Journal advertising.



"MISERS OF FUEL"

Sturtevant Fuel Economizers are known by contractors and engineers as "Misers of Fuel" because they mean a saving of from 10 to 20% in coal bills wherever they are installed.

Ask for Folder 610.

B. F. STURTEVANT CO.
of Canada, Ltd.

MONTREAL GALT TORONTO

Sturtevant
PUTS AIR TO WORK

WATER-POWERS
—IN THE—
PROVINCE OF QUEBEC

To obtain authorization for the utilization of water-powers in the Province of Quebec, application should be made to the Honourable Minister of Lands and Forests.

They are granted under emphyteutic leases, the conditions of which are upon the following lines:

1.—Duration of the lease, from 25 to 50 years, according to the importance of the water-power.

2.—Payment of a yearly rental which does not vary during the term of the lease.

3.—An additional yearly charge of 50c per HP developed.

4.—The above charge (Art. 3) is subject to revision, every 10 years.

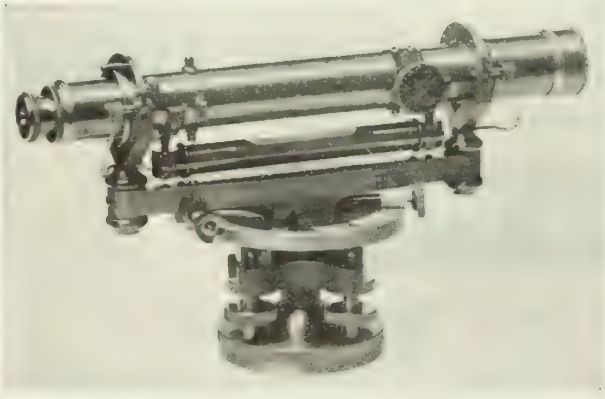
5.—A delay of two years is granted for beginning works and of two further years for producing power.

6.—The lessee is under obligation to make a deposit in money or in securities, as a guarantee of good faith in the carrying out of the contract.

7.—The grantee must submit plans of his works mills, etc., to the Dept., previous to their installation.

For further information, please write to the Dept. of Lands and Forests, P.Q.

Minister: Honourable Honoré Mercier;
Deputy-Minister: Elz. Miville Dechêne;
Chief of Hydraulic Service: Arthur Amos, A.M.E.I.C.



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WE ARE SPECIALLY EQUIPPED TO MAKE ACCURATE AND PROMPT

REPAIRS

TO ALL TYPES OF SURVEYING INSTRUMENTS

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LIMITED
56 Adelaide St. East
TORONTO - ONTARIO

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President

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Limited

CONSULTING and INSPECTING ENGINEERS, CHEMISTS and METALLURGISTS

Expert inspection and tests of all structural materials and mechanical equipment.

REPORTS ON PROPERTIES AND PROCESSES

Head Office and Laboratories: McGILL BUILDING, MONTREAL

Branches: Toronto Vancouver London, England

Chick Contracting Co.
LIMITED

Paving, Excavating, Sewer Construction and Rail road Grading

Office and Yards;

951 McDOUGALL ST.
WINDSOR, - ONTARIO

MacKinnon Steel Co.
LIMITED
SHERBROOKE, QUEBEC

Structural Steel
AND
Steel Plate Work

BUILDINGS - BRIDGES
TANKS

Forward enquiries to Department E.
Estimates promptly furnished.

Hull
CANADA
Wants your Business -

HULL, Canada, stands on the left bank of the Ottawa River and is connected by bridges with Canada's capital.

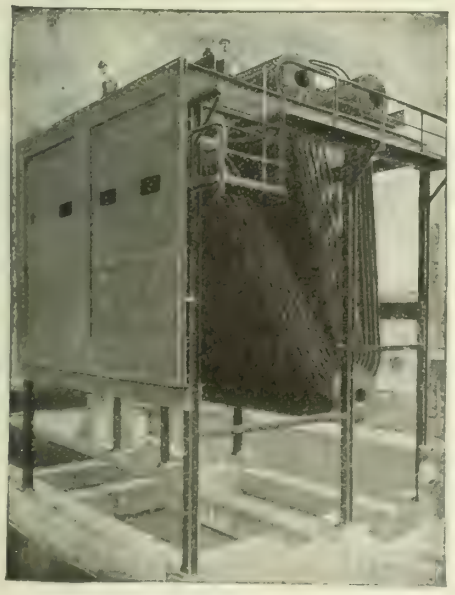
Situated mid-way between Quebec and Windsor or Detroit, Hull is the hub of the most populous district in Canada.

The City Council of Hull wants more and still more industries to locate there and, to get them, is offering attractive inducements in the way of low tax rates, fixed assessments, choice locations and unrivalled shipping facilities.

Hull is a live, prosperous, thriving city in which to have your business or your Home.

"Bring your Industry to Hull"

For fuller particulars apply to
EUGENE ST-JEAN
Industrial Commissioner
HULL - CANADA



Connelly Water Tube Boilers

are of the 4-drum type: have 100% tube area in the path of circulation, and deliver steam superheated to from 5 degrees to 10 degrees Fahrenheit. Simple in design, no flat surfaces, no stay bolts, no crown bars, no braces, no hand-holes, free from joints.

All parts easily accessible for cleaning, both internally and externally. Can be built in units from 200 H.P. up to 4,000 H.P. and 300 lbs. pressure. Over 150,000 H.P. in successful operation.

E. Leonard & Sons, Ltd. Head Office and Works
LONDON, CANADA

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Wm. W. Hicks, 567 Banning St., Winnipeg, Man.
George Stewart, 5 Lineham Block, Calgary, Alta.
Vancouver Machinery Depot, Ltd., Vancouver, B. C.
Thos. A. Pippy, Waldegrave St., St. Johns, Nfld.

ESTABLISHED 1834

LEONARD

STEEL
PLATE WORK

We design, fabricate and erect stacks, tanks and riveted pipe of every description. The efficient service of our erection crews is only a small part of the CANADIAN DES MOINES whole.

Canadian Des Moines Steel Co., Ltd.

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CANADIAN DES MOINES

E. G. M. Cape & Company

Engineers and Contractors
General Building Construction

Some buildings recently completed or in course of construction;—

Factory for Northern Electric Company; Office Building and Shipbuilding Plant for Canadian Vickers, Limited; Liverpool & London & Globe Insurance Company's new building; Atlantic Sugar Refinery, St. John, N.B.; Ross Pavilion, Royal Victoria Hospital; Reinforced Concrete Storage for The John Bertram & Sons Company, Limited, Dundas, Ont.; The Military Hospital at Ste. Anne de Bellevue, Que.; New Buildings for Can. Connecticut Cotton Mills, Sherbrooke, Que.; New Buildings for Brown Corporation, La Tuque, Que.; Additions to old Medical Bldg and Library for McGill University.

Estimates and tenders furnished on all classes of Construction Work.

Head Office:

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MONTREAL

Seamless Steel Tubing

MADE IN ENGLAND

COLD DRAWN SEAMLESS STEEL TUBING FROM 1/4" TO 14" DIAMETER.

CYCLE AND MOTOR TUBING.

LOCOMOTIVE SUPERHEATER TUBES.

BOILER TUBES.

LARGE SIZE, SQUARE AND RECT. TUBING.

CANADIAN REPRESENTATIVES:

Openshaw & Bennet Ltd.

416 Phillips Place — Montreal.

THE MARK

OF EXCELLENCE

MARCONI SERVICES

Trans-Atlantic and Shore to Ship Telegraphs. Marine, Direction-Finding, Aerial, Railroad, Forestry, Mining Camp, Broadcasting, Telephone and Telegraph installations, sold outright or rented on a maintenance basis. Amateur Radio Installations and Accessories of every description.

THE Marconi
WIRELESS TELEGRAPH COMPANY OF Canada
LIMITED

MONTREAL
VANCOUVER HALIFAX TORONTO ST. JOHNS, Nfld.

Invest In

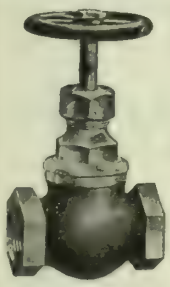
WATER POWER SECURITIES

— a basically sound industry
— supplying a national necessity
— for which there is a rapidly increasing demand
— on practically a cash basis
— with a product that does not depreciate
— the average earnings of which steadily increased throughout the period of depression.

There are few types of investment so well safeguarded or with so promising a future.

WRITE FOR BOOKLET E-19

NESBITT, THOMSON & COMPANY
LIMITED
145 St. James Street, MONTREAL
TORONTO HAMILTON WINNIPEG LONDON, Ont.



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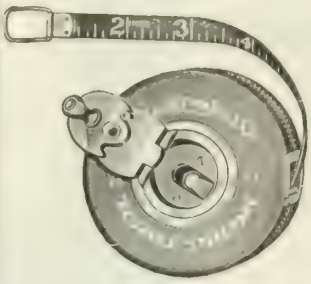

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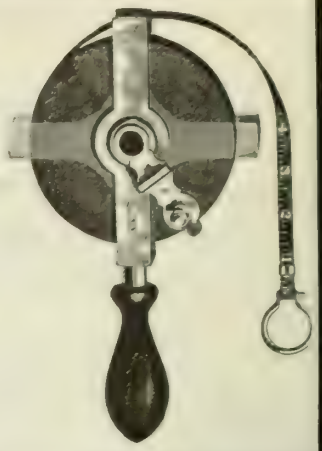

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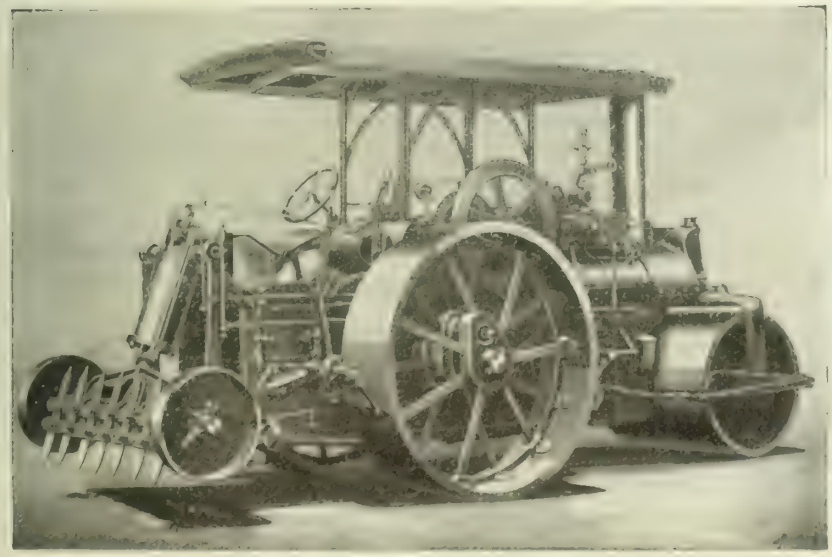

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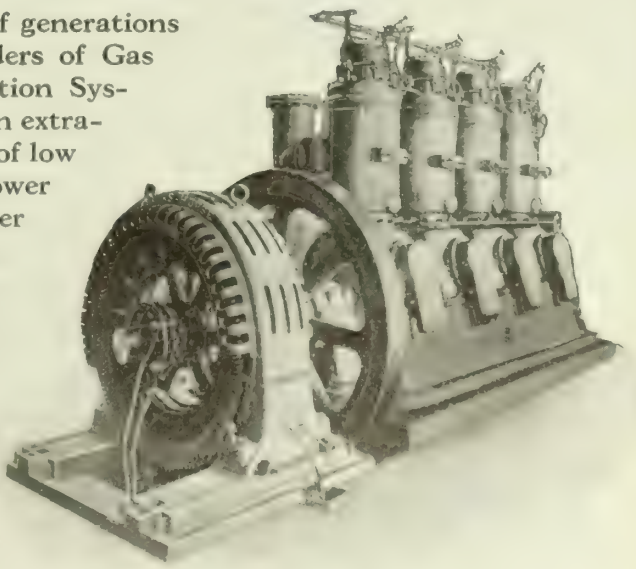

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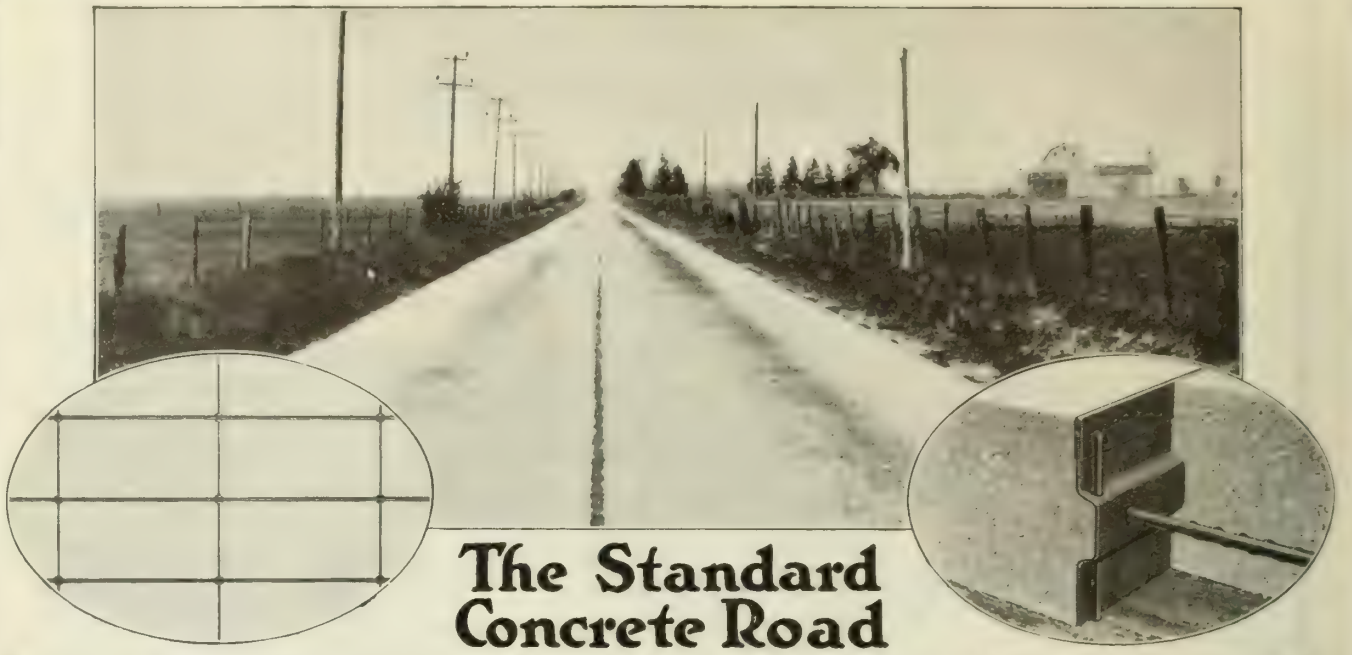

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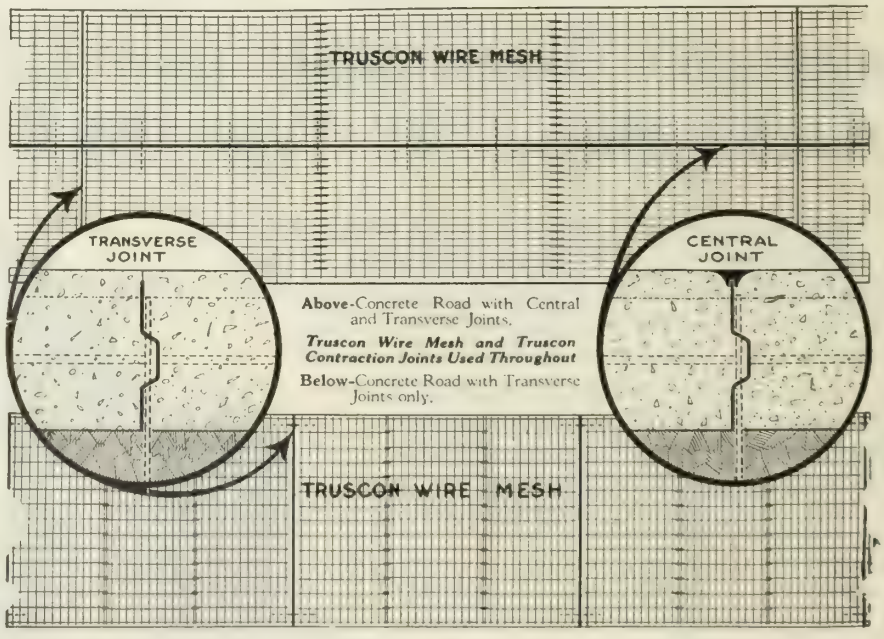

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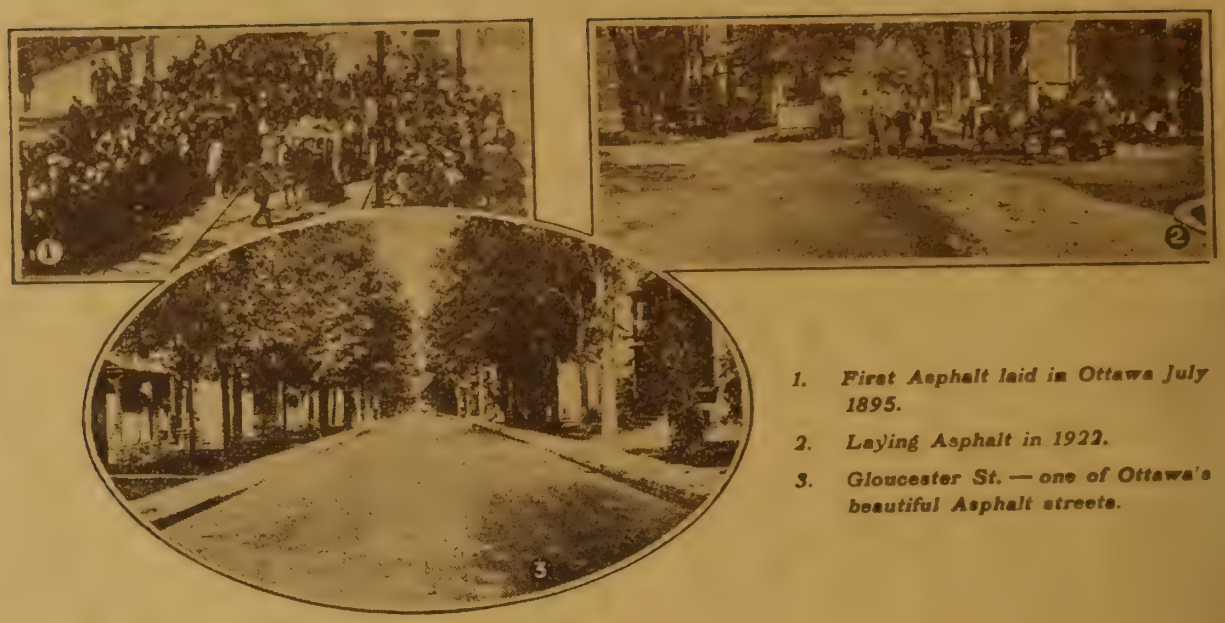

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MAY 1923

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THE POURING OF THE INGOT.

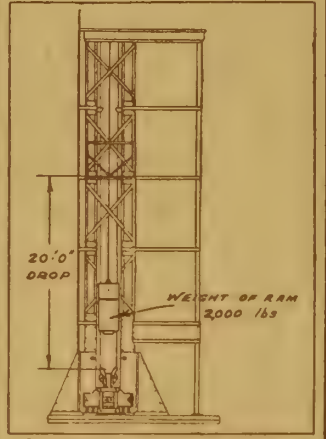
THE COOLING OF THE INGOT.

THE DISCARD FROM THE INGOT.

THE ANALYSIS OF THE INGOT.

THE ROLLING OF THE BLOOM.

THE TOP AND BOTTOM DISCARD FROM THE BLOOM.



"THE DROP TEST ON THE RAIL."

THE ROLLING OF THE RAIL.

THE DISCARD FROM THE RAIL.

THE DROP TEST ON THE RAIL.
(2,000 LBS. DROPPED THROUGH 20 FEET.)

THE NICK AND BREAK TEST. (THE RAIL BEING BROKEN THROUGH AND EXAMINED FOR DEFECT.)

THE MARKING AND SHIPPING OF THE RAIL

WHAT OTHER COMMERCIAL STEEL GOES THROUGH SUCH A GRUELLING?

AND ALL WE DO IS TO CONTINUE THE ROLLING TO THE SIZE YOU REQUIRE IN YOUR STRUCTURE, AND THE RESULT IS THE RAIL-CARBON BAR, *EMBLEMATIC OF STRENGTH AND PURITY.*

SPECIFY YOUR REINFORCEMENT TO COMPLY WITH THE AMERICAN SOCIETY OF TESTING MATERIALS STANDARD SPECIFICATION A-16-14.

The BERTRAM Page

MACHINE TOOLS

No. 8 Double Angle Shear
on plain base

Capacity—8″ x 8″ x 1¼″ angles.

Motor Drive—15 H. P. Motor.

The John Bertram & Sons Co., Limited
DUNDAS. ONTARIO.

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32 Front St. West
HALIFAX
Roy Building
WALKERVILLE
103½ Sandwich St.
WINNIPEG
1205 McArthur Bldg.
VANCOUVER
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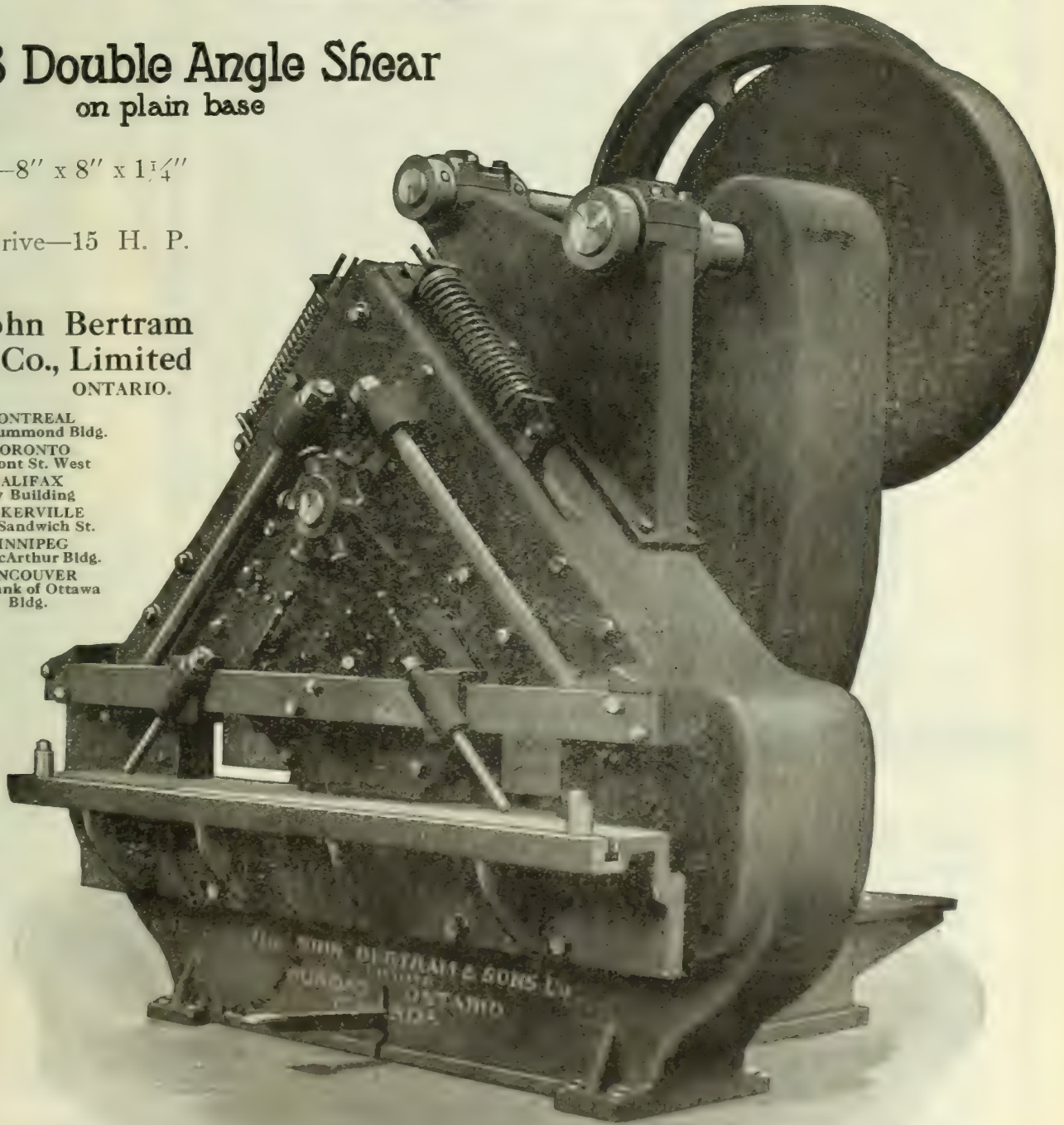
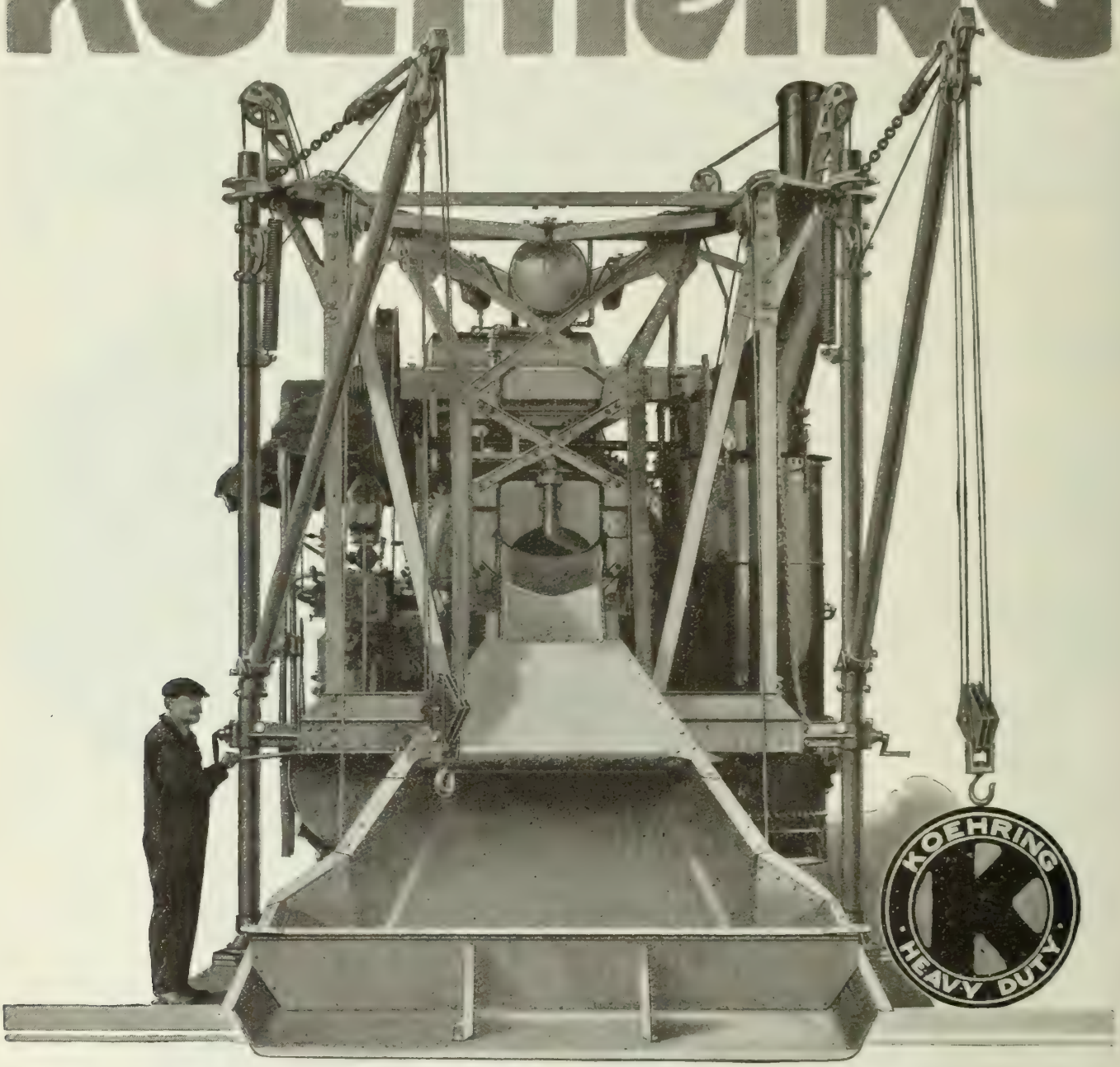


P13201

Men of influence consult Journal advertising.

KOEHRING



Loading End Strains

THINK of strains that the loaded fast-moving skip puts on the mixer frame! How they must tug and twist at the frame! Hundreds of times every working day. Thousands of times every season!

Now look at the Koehring frame construction—how the frame is braced, and re-inforced against strains and stresses from every direction. This is one reason why Koehring driving parts do not get out of alignment and set up unusual wear, breakages and delays. Get this Koehring "Heavy Duty" construction fixed in your mind, and recall it when you think about mixers.

Koehring Capacities

Pavers: 7, 10, 14, 21, 32 cu. ft. capacities mixed concrete, steam and gasoline. Write for catalog P35.

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline. Write for catalog C35.

Dandie: A light staunch mixer for footings, culverts, foundations, etc. 4 and 7 cu. ft. mixed concrete, steam and gasoline. Power charging skip, low charging platform, batch hopper, light duty hoist. Write for Catalog D 35. Rubber tires optional.

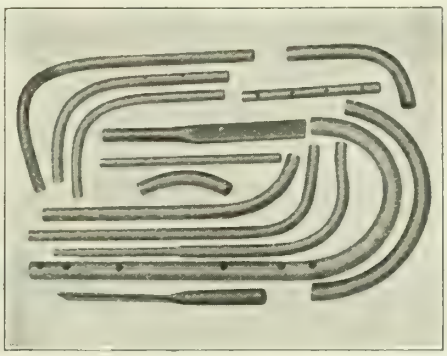
KOEHRING COMPANY OF CANADA, LIMITED

105 Front Street, East - - Toronto, Ont. Phone Main 1498

Montreal Office: 616 Canada Cement Company Building. Phone Uptown 3026

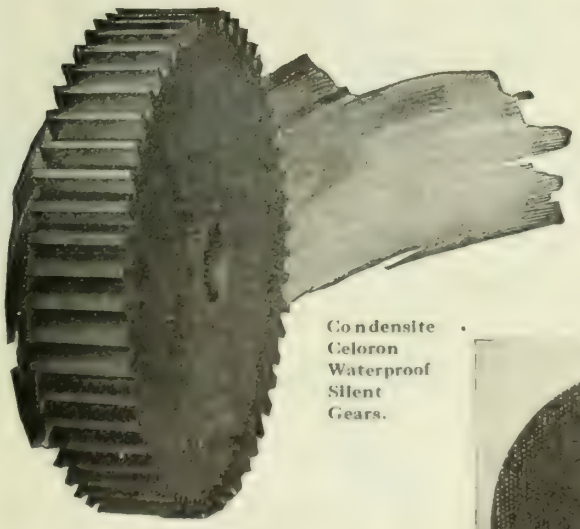
Cutting Fibre on a Band saw in the plant of the Diamond State Fibre Co.

Bent Fibre Tubes.



Adaptable to any Machining Process

DIAMOND FIBRE

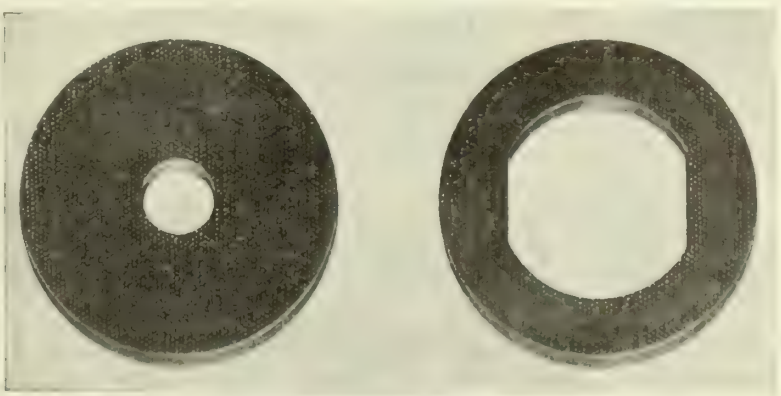


Supplied in Sheets, Rods, Tubes and Fish Paper or in parts machined to your specifications.

Diamond State Fibre Company of Canada, Ltd.

TORONTO, ONT.

Condensite Celoron Waterproof Silent Gears.



Condensite Celoron Pump Valve Discs.

Diamond·F

Reasons for the use of

Domtar

Domtar Pavement, Constant Spring Road, Jamaica, B.W.I. Built 1922.

Domtar

Makes Good Roads

IT is carefully refined from pure **COAL TAR** *bases and possesses to the utmost all the unique qualities characteristic of such products.*

Ease of application, maximum penetration in Bituminous Macadam construction and results when used for surfacing waterbound macadam, all justify our claims for **Domtar** *as being unsurpassed as a Road Bitumen.*

Specifications, Literature, etc. on request.

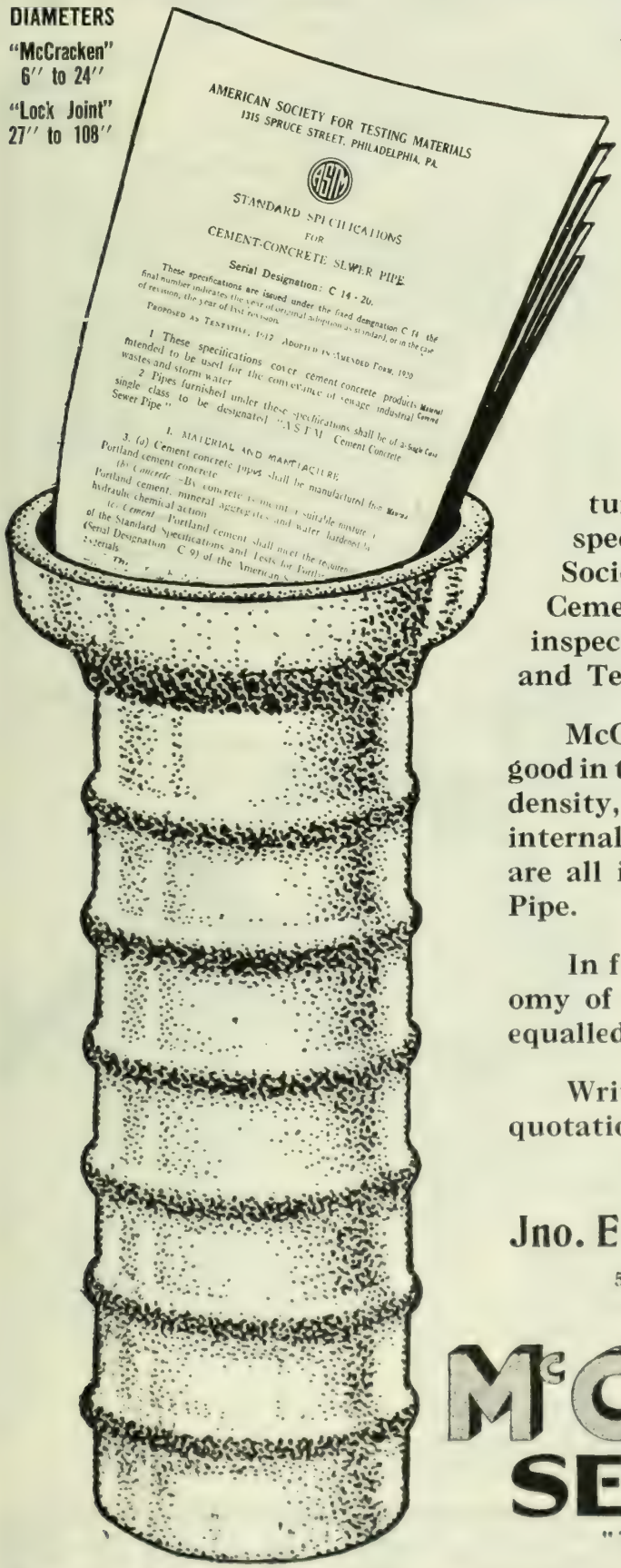
Dominion Tar & Chemical Company, Limited

MONTREAL and TORONTO

Every advertisement is a message to you.

Manufactured According to Specifications

DIAMETERS
"McCracken" 6" to 24"
"Lock Joint" 27" to 108"



Means Bonded For Service

EVERY engineer admits that Concrete Pipe made according to standard specifications is eminently satisfactory.

That is the strongest argument in favor of McCracken Sewer Pipe.

McCraken Pipe is manufactured in accordance with standard specifications issued by American Society for Testing Materials for Cement-Concrete Sewer Pipe; and inspected by the Canadian Inspection and Testing Company Limited.

McCracken Pipe unfailingly makes good in the most trying service. Strength, density, impermeability, resistance to internal pressure and to agents of decay are all inherent features of McCracken Pipe.

In first cost and last cost the economy of McCracken Sewer Pipe is unequalled by any other dependable pipe.

Write for complete information and quotations.

GENERAL SALES AGENTS

Jno. E. Russell Company, Limited

504 Harbor Administration Building,

TORONTO

McCRACKEN SEWER PIPE

"The Pipe That Endures"

From Ore to finished product —ALL within the Empire

A comprehensive list of the products and activities of the

British Empire Steel Corporation, Limited

IRON ORE COAL
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BLOOMS, ETC.
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MISCELLANEOUS ROLLED STEEL PRODUCTS
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RIVETS PIPE BANDS
TIE RODS
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COKE OVEN BY-PRODUCTS
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(*Cargo Wagons*)

ORE MINES—Wabana, Nfld.
COAL MINES—Cape Breton, Pictou, and Cumberland Counties, N.S.
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COAL DEPOTS—Sydney, North Sydney, Louisburg and Halifax, N.S.; St. John, N.B.; Montreal and Quebec, P.Q.

SALES OFFICE
Canada Cement Building
Montreal, P.Q.

The
British Empire Steel Corporation, Limited

by reason of the magnitude of the operations of its constituent companies, is able to render a wholly unique service to the industrial organizations of the world—and of Canada in particular.

The vast scope of these operations necessitates the maintenance of the highest possible standards of efficiency and economy, which, naturally, reacts to the benefit of our customers.

DOMINION IRON & STEEL CO., LIMITED
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Commanding unlimited resources of ore, coal and other raw materials for the making of steel products of every description.

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CANADA CEMENT BUILDING MONTREAL, CANADA

Dominion OXYGEN
FOR WELDING AND CUTTING.
Prest-O-Lite
DISSOLVED ACETYLENE

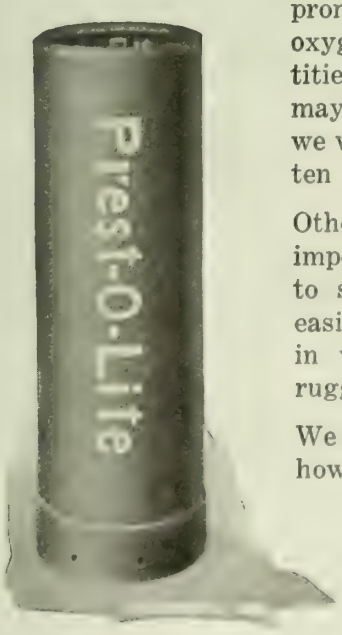
We Are Your Neighbours

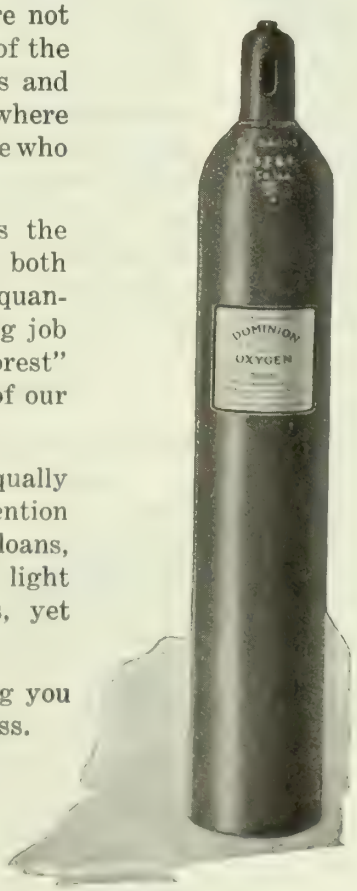
Unlike the man who made the better mouse trap and built his house deep in the forest where the world had to find a path to his door, we are not only making oxygen and dissolved acetylene of the highest quality, but have located our plants and warehouses in the busy commercial centers where our products are most easily available to those who need them.

An important part of Dominion Service is the promptness with which you can secure both oxygen and dissolved acetylene in unlimited quantities. Even though your plant or contracting job may be as inaccessible as the "house in the forest" we will find the shortest way to it from one of our ten plants and distributing warehouses.

Other features of Dominion Service are equally important to you—lowest prices, careful attention to shipping instructions, liberal cylinder loans, easily-handled cylinders of the newest types, light in weight to save transportation charges, yet ruggedly constructed.

We shall appreciate an opportunity of telling you how Dominion Service will help your business.





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Operating the Welding and Cutting Gas Division of
PREST-O-LITE COMPANY OF CANADA, LIMITED

General Offices: 80 Adelaide St. East, TORONTO.

DISTRIBUTION POINTS: Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, Winnipeg.

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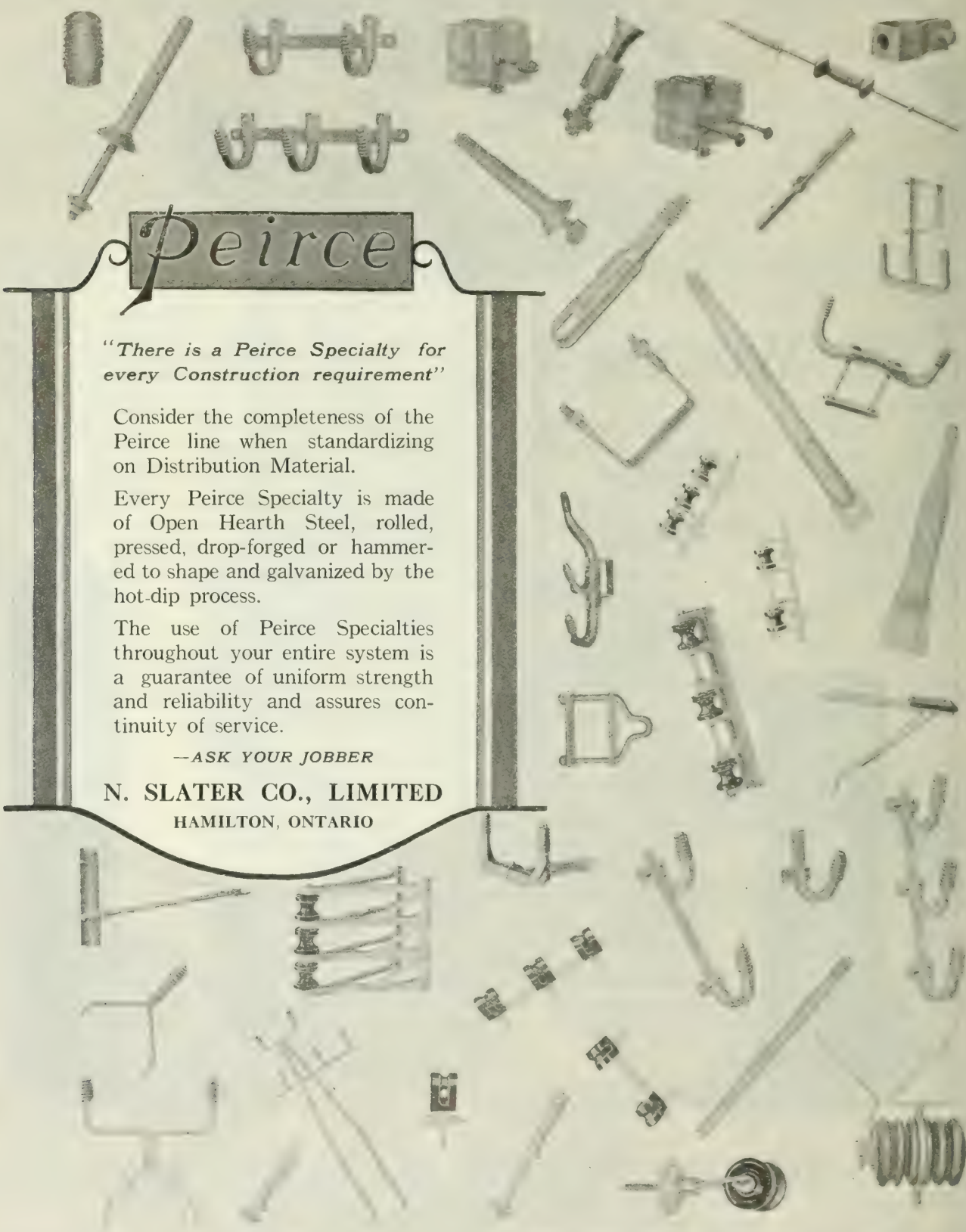
Peirce
"There is a Peirce Specialty for every Construction requirement"
Consider the completeness of the Peirce line when standardizing on Distribution Material.
Every Peirce Specialty is made of Open Hearth Steel, rolled, pressed, drop-forged or hammered to shape and galvanized by the hot-dip process.
The use of Peirce Specialties throughout your entire system is a guarantee of uniform strength and reliability and assures continuity of service.
—ASK YOUR JOBBER
N. SLATER CO., LIMITED
HAMILTON, ONTARIO

Peirce

"From start to finish, Peirce Pole Line Hardware Leads the Way"

Every piece of Peirce Pole Line Hardware, from the Ground Rod to the Through Bolt, is made of a uniformed grade of New Rolled Open Hearth Steel, closely inspected in the Manufacturing operations to see that the uniform strength is retained and finally galvanized by the hot-dip process to preserve that strength.

Specify "Peirce" for dependability and permanence.

—*ASK YOUR JOBBER*

N. SLATER CO., LIMITED

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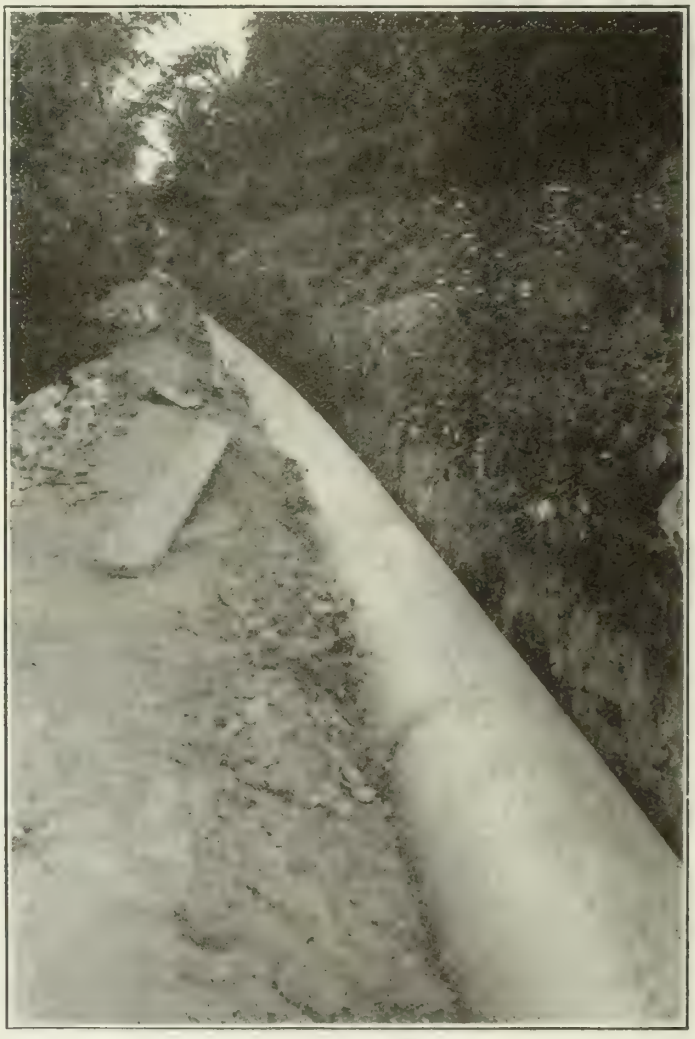
Eleven important cities in United States of America and in Canada now receive their water Supply through - - -

Pipe Lines of Reinforced Concrete

— OF —

Lock Joint Pipe Company Design and Construction



36" Lock Joint Pipe supplying Water to Cumberland, Ind.

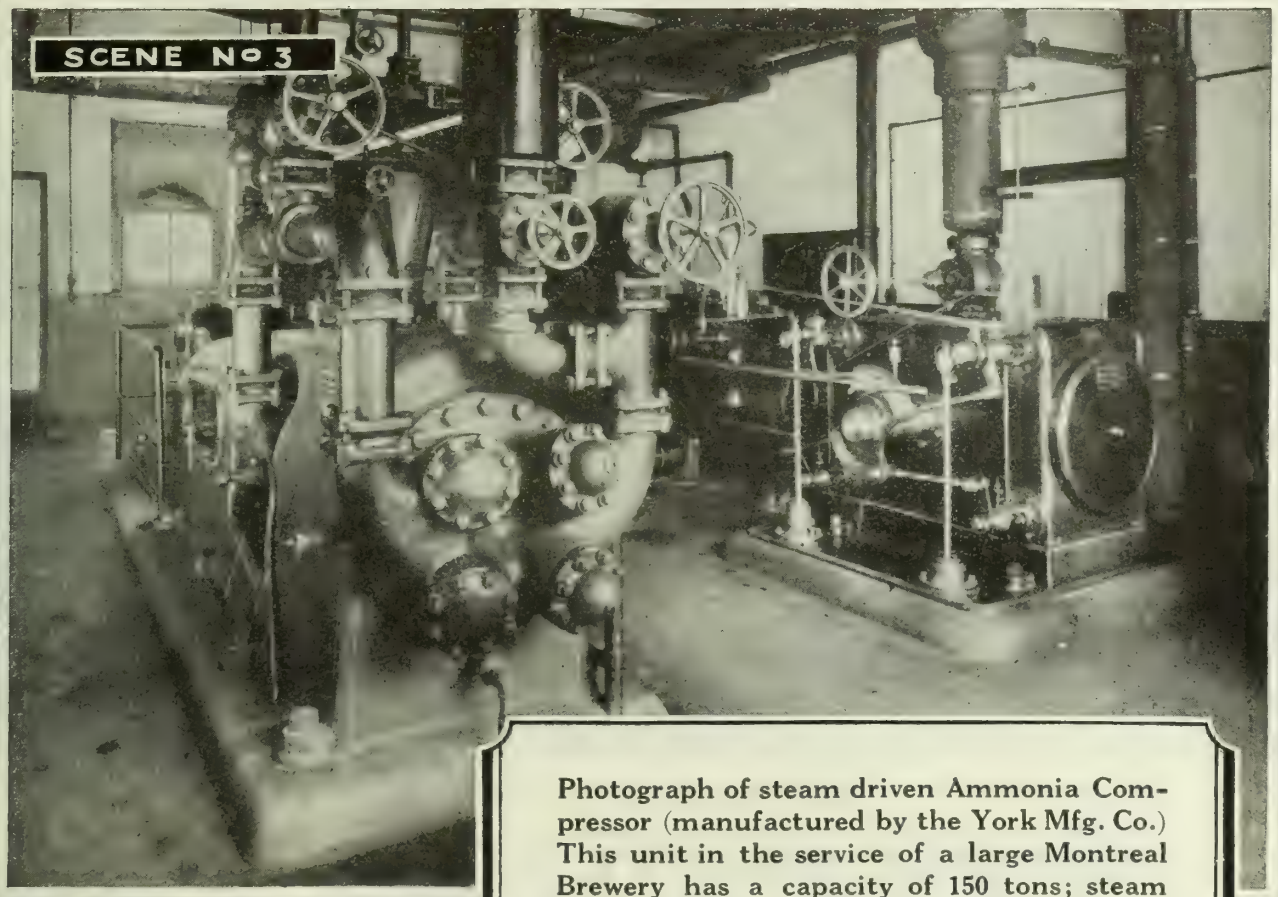
These lines were built under guarantees of water tightness

❖ ❖ ❖

Let us study your Pressure Pipe Needs.

CANADA LOCK JOINT PIPE Co., LIMITED

65 Pleasant Boulevard, Toronto, Ont.



Photograph of steam driven Ammonia Compressor (manufactured by the York Mfg. Co.) This unit in the service of a large Montreal Brewery has a capacity of 150 tons; steam pressure 150 lbs.; speed 65 R.P.M.

Imperial Lubricants in use:—

Imperial Cylinder Oil.
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IMPERIAL LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS
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FOR VARIOUS INDUSTRIAL USES
Imperial Black Oils
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Expensive machinery warrants the protection which Imperial Lubricants assure through correct lubrication of every bearing, journal and other moving part. Plant operation is made more profitable by the standardized use of the right grades of Imperial Lubricants on your different units. When you are confronted with a difficult lubrication job write our nearest branch office for the expert advice and service of our lubrication engineers.

IMPERIAL OIL LIMITED

Murray Street Bridge, Brantford, Ontario.

BRIDGE BEAUTY EXEMPLIFIED
IN A CONCRETE STRUCTURE AT BRANTFORD, ONTARIO

Grace of line and pleasing simplicity characterize the bridge erected at Brantford, under the supervision of Frank P. Adams, A.M.E.I.C., Brantford's City Engineer.

The arch ring is a solid barrel arch, the intrados being an ellipse. The span of the arch is 60 feet, the rise 12 feet, width 48 feet and thickness of crown 18 inches. The arch ring is reinforced with 1 inch square corrugated bars at 12 inch centres placed 2 inches from intrados and extrados of the arch. Half-inch square corrugated bars are placed at right angles to the main reinforcement at about 36 inch centres.

The abutments are of solid concrete mixed in the proportion of 1 to 7 pit run gravel and the arch ring is mixed in proportion of 1 to 4 pit run gravel.

Spandrels and wing walls are plain concrete gravity type retaining walls, mixed in proportion of 1 to 4 pit run gravel.

The wing walls are curved on a radius of 35 feet. The concrete railing is of the open baluster type over the arch ring and solid over the abutments.

The base, posts and railing were cast solidly in place and the baluster posts were made up on the ground

The many advantages of Concrete in the construction of bridges are now widely appreciated.

SPECIFY
CANADA CEMENT
UNIFORMLY RELIABLE

CANADA CEMENT
CONCRETE
FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

CANADA CEMENT COMPANY BUILDING
Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary

P · A · X

Private Automatic Exchange

RELIABLE

The Automatic Telephone

No misunderstanding through messengers—the dial will do your bidding.

A great business needs a quick, accurate means of communication between departmental executives, far away shipping room, engineers, chemists, etc.

Such is the P. A. X.—as necessary to the operation of your plant as electric power.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
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"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
Fire Alarm Systems
Radio Sending and receiving Equipment

DISTRIBUTING
Construction Material
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Power Apparatus
Household Appliances
Electrical Supplies
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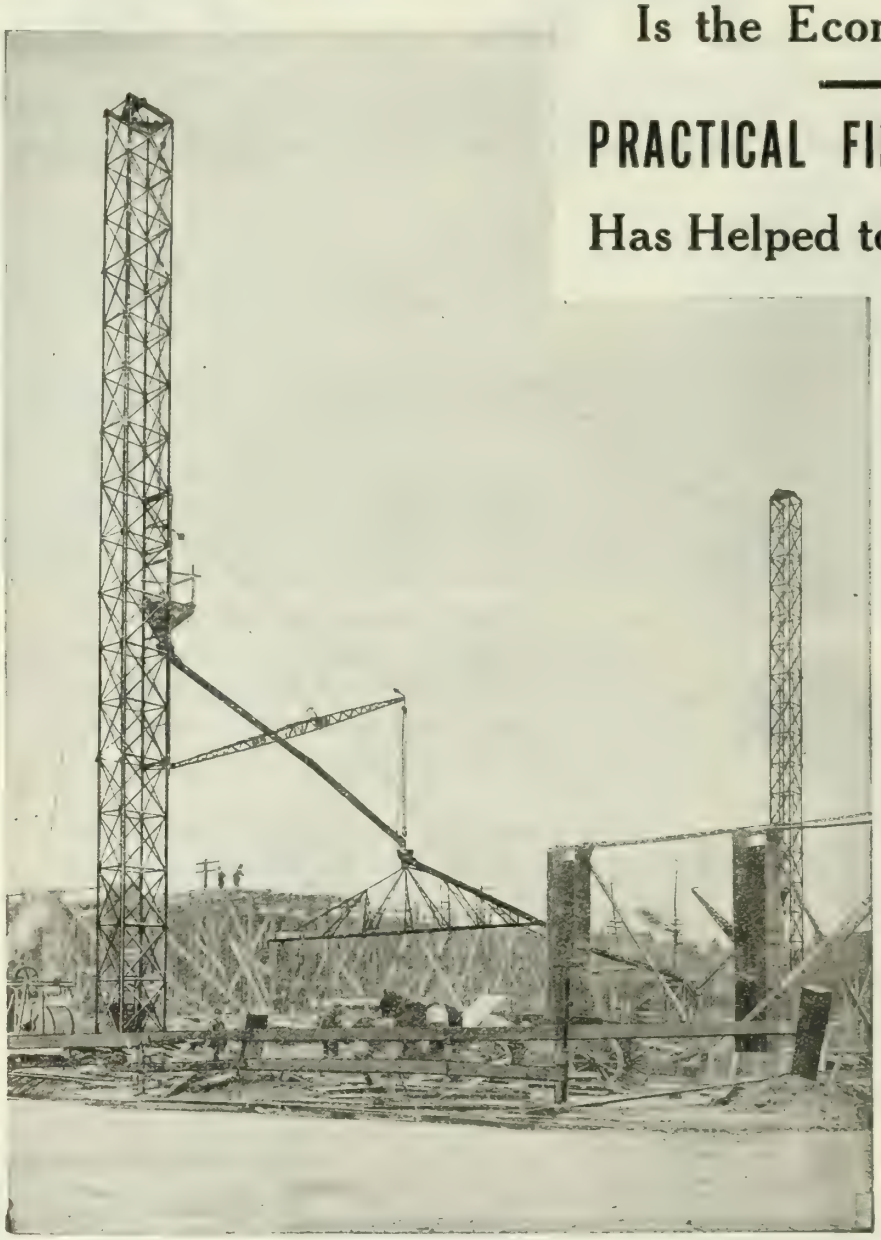
DISTRIBUTING CONCRETE
By THE INSLEY METHOD

Is the Economical Way

PRACTICAL FIELD EXPERIENCE

Has Helped to Design—



INSLEY STEEL TOWERS and CHUTING

also

THE INSLEY MAST HOIST BUCKET PLANT

FOR THE SMALLER JOBS

Send for Particulars

Smith Mixers, Marsh Hoists, Derricks, Buckets, Cars, Carts, Wheelbarrows, Etc.

Barber—Greene Bucket Loaders and Conveyors, Bucyrus Shovels and Draglines, Western Cars, Vulcan Locomotives.

MUSSENS LIMITED

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The Standard of Quality

Type H

Type H Transformers, through many years of satisfactory service, have earned an enviable reputation, resulting in their being regarded as the standard of quality. Large central stations, and operating companies specify Type H Transformers because of their long life, and excellent operating characteristics. Low depreciation rates, and uninterrupted service will eventually win on any system.

"Made in Canada" by

Canadian General Electric Co., Limited

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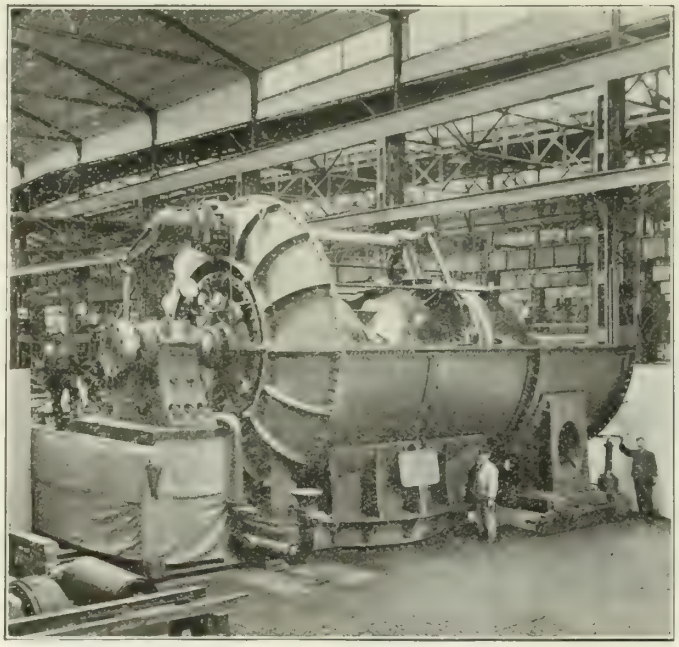
Branch Offices: Halifax, Sydney, St. John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

The advertiser is ready to give full information.

ESCHER WYSS & Co.
Zurich
Switzerland



FRANCIS TURBINE

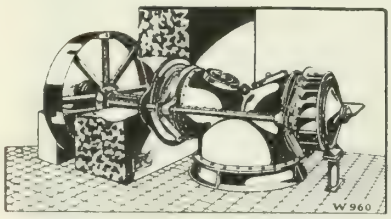
Constructed by

Escher Wyss & Co.

-- for --

Peterson Engineering Corporation

Four Units
16,000 Horse Power
167 Feet Head

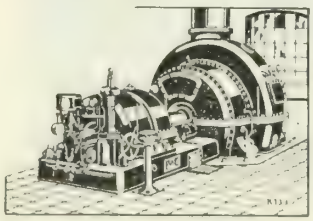


Francis Horizontal and Vertical Wheels

OPEN AND ENCLOSED TYPE

3.28 to 690 Feet Head —— 1.3 to 22,000 H. P.

Open Type — Horizontal and Vertical - - - - Heads up to 65 ft.
Enclosed Type — Horizontal and Vertical - - - Heads up to 700 ft.
Tangential Type — Horizontal and Vertical - - Heads up to 3,280 ft.
Power 1.3 to 22,000 Horse Power



Zoelly Steam Turbines

1,000 to 3,600 RPM Direct Connected to Generators
6,600 to 7,500 RPM Gear Reduced for Generators
Steam Consumption 8.14 to 9.72 lbs. Per H. P. Hr.

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OTTAWA

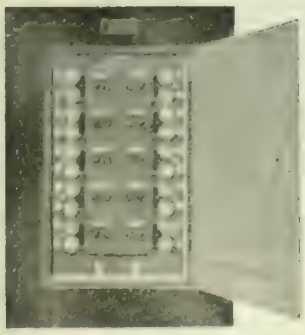
MONCTON, MONTREAL, TORONTO, NORTH BAY, WINNIPEG, VANCOUVER.

BENJAMIN

BENJAMIN STARRET PANEL BOARDS

Standardized Panel Boards and Cabinets

Are distributing centres for electric wiring and mark the new safety era in panel Board Construction --- Best in material, lightest in weight, smallest in size: they need less labor in installation.



Three points of panel Board construction which are of vital interest to the Building owner (1) Safety—(2) Good appearance—(3) Low maintainance. Benjamin Starret pannel Boards are built on that basis.

WRITE US FOR FURTHER DETAILS IF INTERESTED

BENJAMIM ELECTRIC MFG. Co. of CANADA, Limited

MONTREAL TORONTO WINNIPEG

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

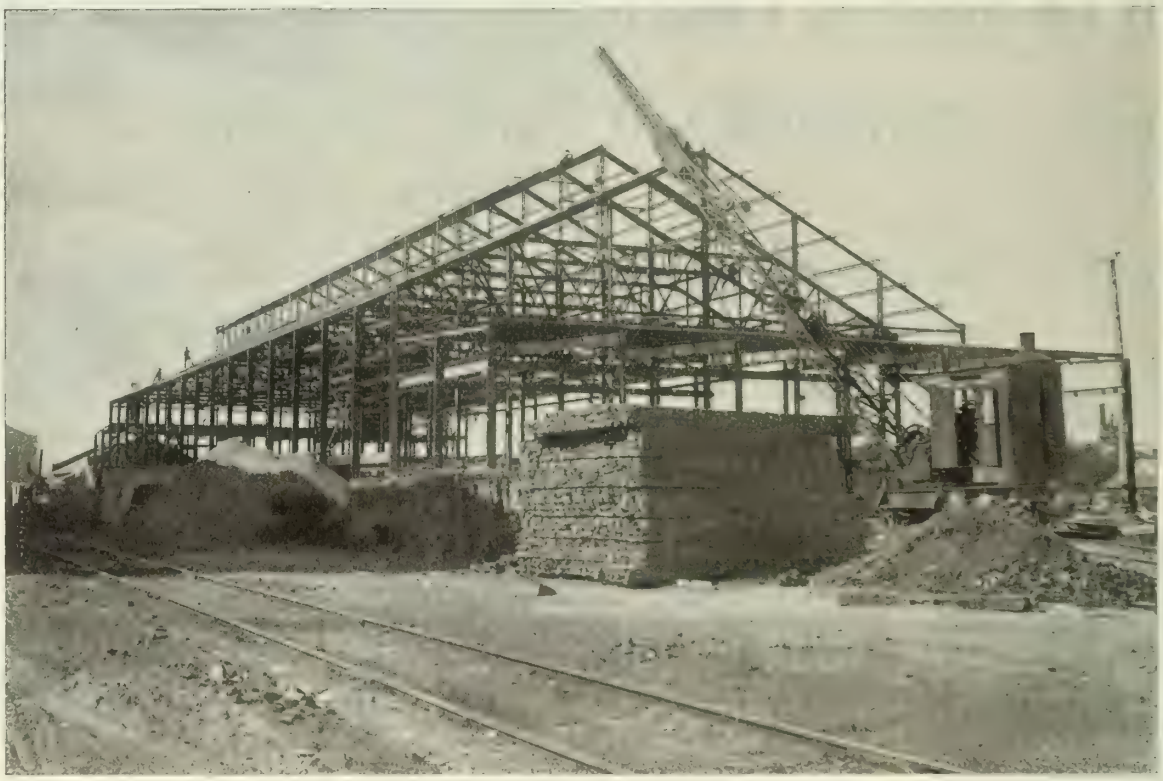
ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.



We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

Firms advertising in The Journal are considered as absolutely reputable.

LT. COL. R. G. STEWART, PRESIDENT
E. A. LARMONTH, VICE PRESIDENT
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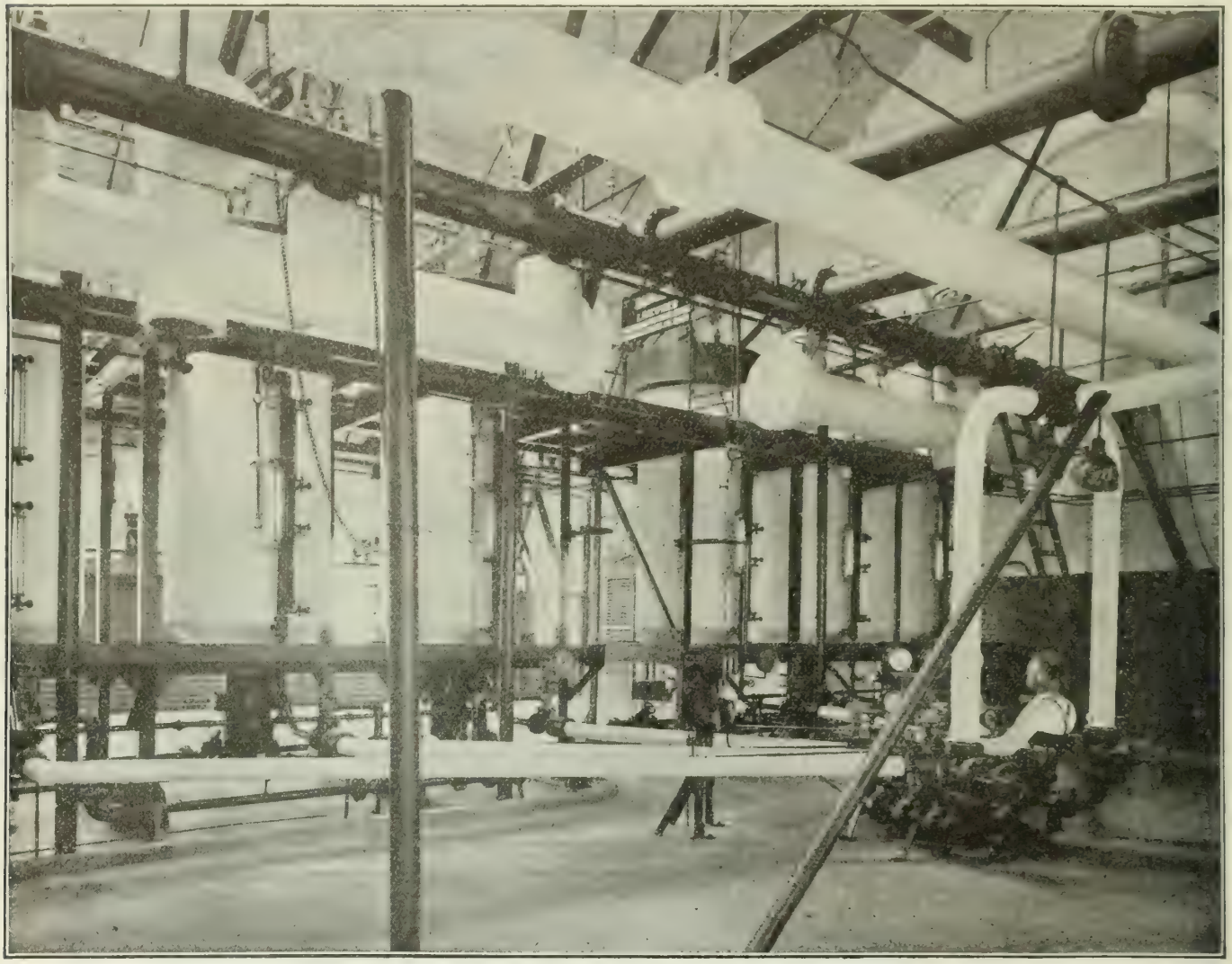
E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:
OTTAWA,
Ont.

Don't fail to mention The Journal when writing advertisers.



Electric Steam Generators,
Laurentide Company Limited

CRANE
Power Plant Equipment

Plays an important part in any well-designed power plant, and it insures a system having long life and low maintenance cost.

We can supply all the necessary valves, fittings and fabricated pipe work for any pressure or temperature that can be generated, by any pratical steam generating units.

CRANE
LIMITED
GENERAL OFFICE AND EXHIBIT ROOMS
386 BEAVER HALL SQUARE
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Branches and Sales
Offices in all principal cities.

Works:
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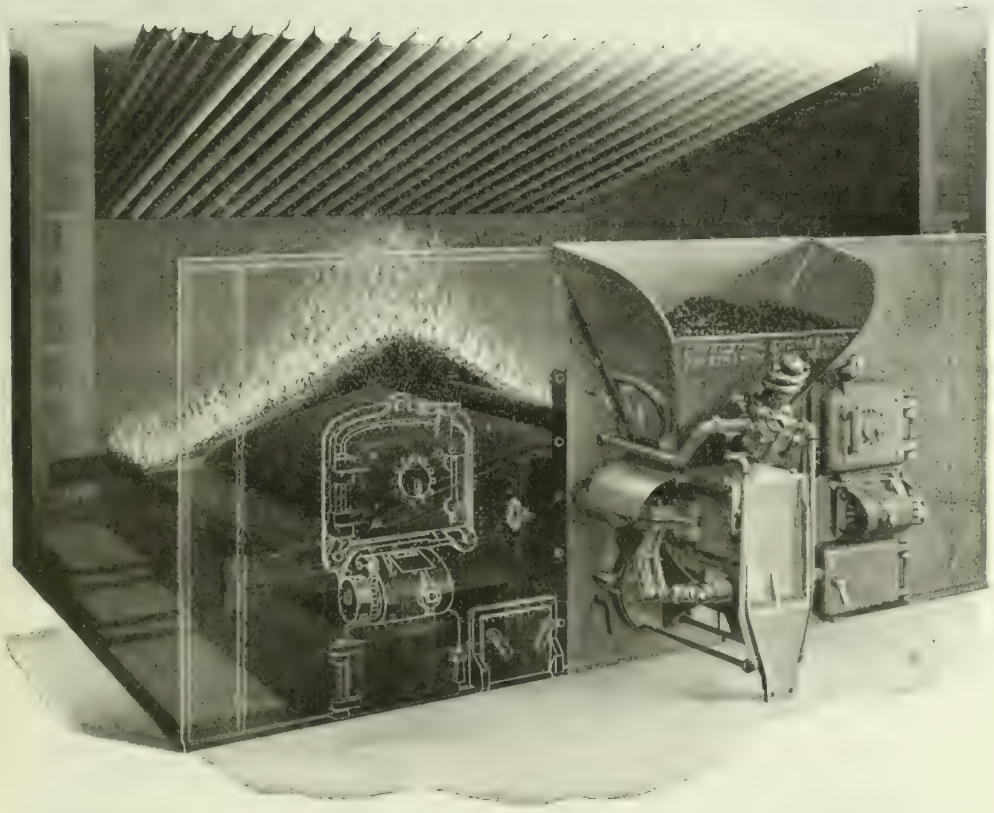
22a

SIMPLICITY
Type E Stokers



No Complicated Parts to Get Out of Order
95% of Grate Surface is visible from Front Door
100% of the clinker line is in view
Operation is very simple

We also manufacture and supply

Type "E" Stokers
Self-contained Stokers
Flat Furnace Arches
Uehling Recording Instruments
Combusco Ash Conveyors
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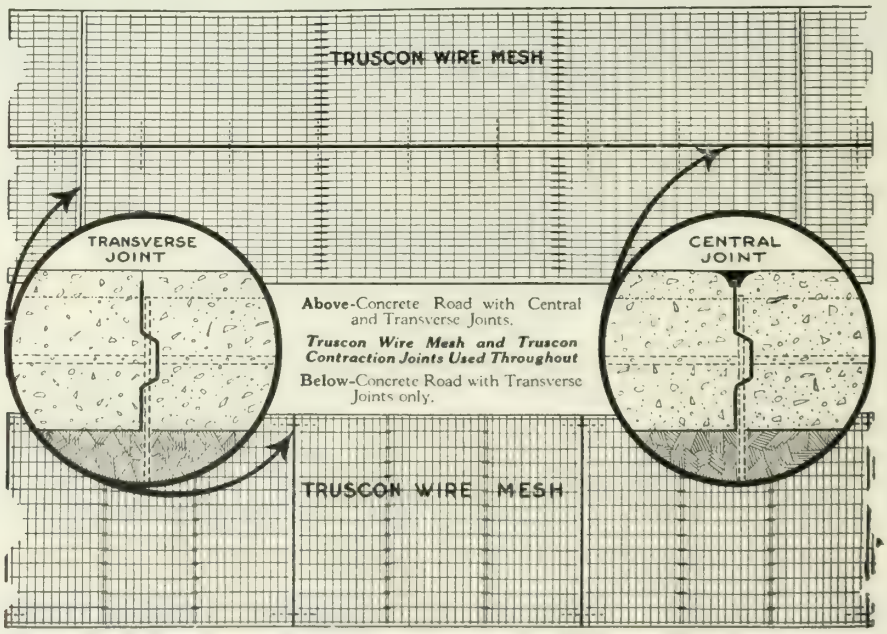

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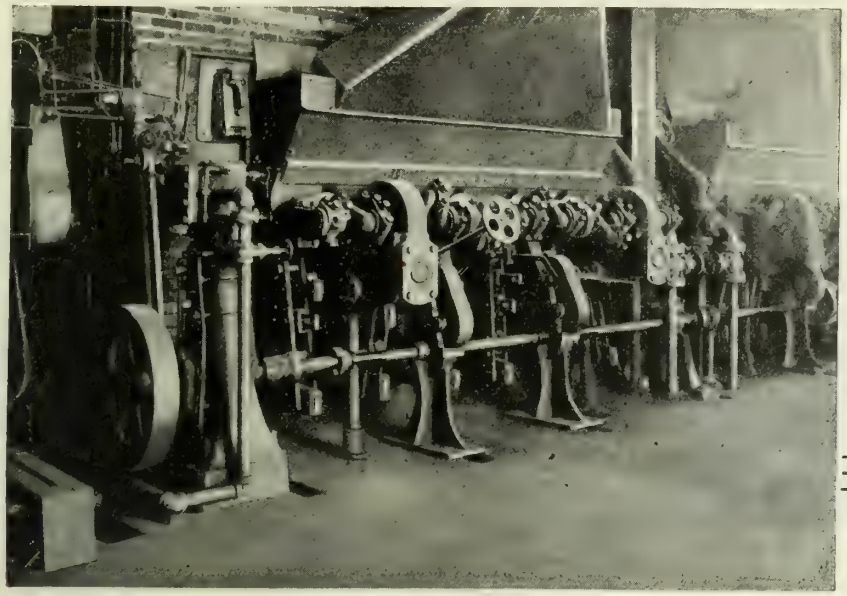

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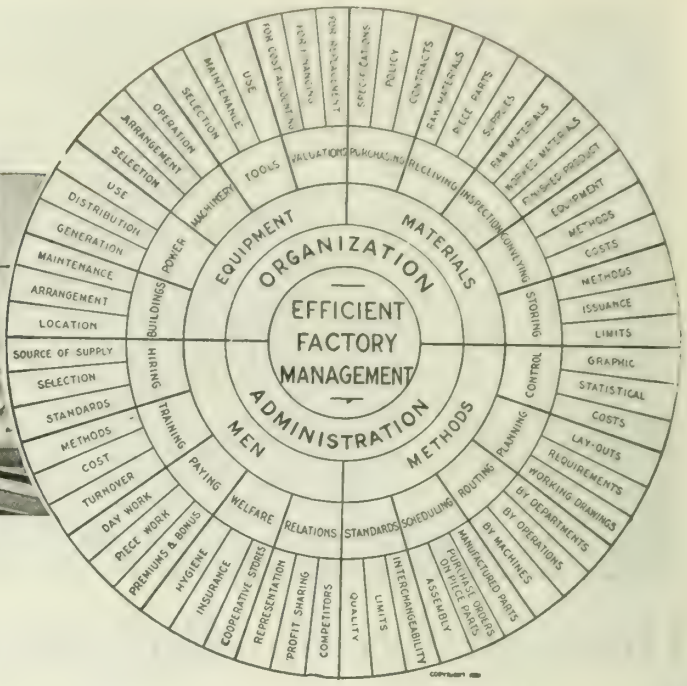

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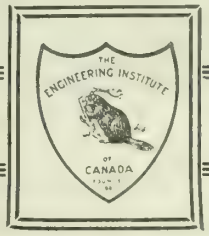

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The Principles of Three-wire Distribution for Electric Railways

As Applied to the Mitigation of Electrolysis due to Stray Currents

W. Nelson Smith, M.E., M.E.I.C., F.R.S.A.
Consulting Electrical Engineer, Winnipeg Electric Railway Company.

Paper read before the Winnipeg Branch, The Engineering Institute of Canada, February 15th, 1923.

Three-wire distribution for electric railways, although not new, is met with so seldom as to be something of a novelty. The reason for its use on single trolley electric railways is to secure a sufficient reduction of fall of potential along the tracks to reduce leakage of the railway return current from the rails into the earth and into conducting structures like underground pipes and cables. Stray currents do not harm pipes and cables where they enter them but, in moist soil, metallic pipes and cables may be corroded at the point where the current leaves them, if the current is strong enough and flows for a sufficient length of time; the time element being as important as the current strength. The principal object of electrolysis mitigation, as it is called, is to reduce stray currents to a minimum by reducing the potential differences, along the tracks, which cause them.

Three Methods of Reducing Stray Currents

In general, there are three ways of doing this:– First, by increasing the number of generating stations, which obviously reduce both the total amount of current returned through the rails to any one station and also the distance through which it must travel, either of which causes is effective for reducing the track drop and consequent leakage. Another way, is by equalizing track potential differences by draining the current out of the track at selected points by means of insulated copper feeders tapped into the track and connected with the negative station bus bar, the resistance of all such connections between track and station being mutually adjusted to the currents they carry. When the potential drops through all the track connections to the station bus are equal, there is no potential difference along the track. The main drawback with this system is the relatively large amount of copper required to drain heavy currents out of the rails and carry them for considerable distances to the station. Besides the fixed charges on the cost of the feeders, there is inherently a loss of power due to the fall of potential through them, the cost of which must be added to the annual charges on the capital costs of the feeders. This method was followed in one substation district in Winnipeg.

When the track rails are of light weight, and consequently of high resistance, and the traffic heavy, the distances between generating stations considerable, and the restrictions on fall of potential severe, recourse may be had to the three-wire system, which is attractive because of its inherent ability to reduce the drop in the track without the large extra investment in track feeders, that is otherwise necessary. This method was adopted for six of the seven substation districts supplying the Winnipeg Electric Railway.

The Three-wire System of Electrical Distribution

The three-wire system utilizes a method of electrical distribution invented and patented by Edison over forty years ago, for electric lighting, but in a somewhat different way. The original Edison three-wire system is easiest described by referring to the accompanying diagram, figure No. 1, which shows how the same number of lamps, or other consumers of electrical energy, may be fed with half of the actual current, but at double the potential, by placing them in groups of two in series so that the current which traverses one lamp when all are in use must traverse a second lamp also. To make each lamp independent of every other lamp a third wire, the same size as the two necessary feeder wires, is run parallel with them and is then connected to every junction between the two lamps of each pair. Two generators in series are required to produce the double potentia and

this third wire is run to the junction point of the two generator terminals. The third wire is commonly called the neutral. On the three-wire system the same number of lamps at the same distance from the generating station can be fed with positive and negative feeders of *half* the size of feeder that would be necessary if all the lamps were in parallel. Assuming the neutral wire is the same size as the other two, the three-wire system of feeders comprises three wires of *half size* instead of two wires of *full size*. The economy of copper for transmission is thus obvious, and is the reason for the prompt adoption and for the persistence of this system of distribution ever since the beginning of the industry.

In the early days of electric traction which followed hard on the heels of electric lighting, between 1885 and 1890, it seemed as though the three-wire system might be applied in a similar way to save copper for electric railway feeders, particularly with double track railways. However, it will be seen from the diagram in figure No. 2, that the only saving that the three-wire system makes possible when applied to the single trolley system with track return, is the elimination of the loss in the track return, no saving being possible in the trolley feeders. To illustrate the condition in a three-wire system applied to a double track railway, assume that the trolley wire over one track will be positive, and that over the other track, negative to the rails; the latter would form the neutral and would be well provided with cross bonds between the two tracks. It will be seen from the diagram that with the ten cars on each track taking 50 amperes apiece, the positive feeder will have to carry 500 amperes going out to the cars, and the negative will bring back an equal amount of 500 amperes from the negative trolley wire to the station. If the negative generator be reversed back to the same polarity as the positive generator, and the negative trolley changed to a positive trolley, all then being on the two-wire system, the same amount of current, involving the same loss in the feeders, will flow out through the feeder to cars on the former negative track, as was the case before the negative trolley was reversed. There is thus no saving in feeder losses on the single trolley system of electric railways by using the three-wire system. This principle holds good, not only for the so-called "parallel system" of three-wire distribution shown in figure No. 2, but also in the so-called "sectional system" shown in figure No. 3.

Parallel System of Three-wire Distribution

The parallel system has been put in practice only once, to the writer's knowledge, and that was in the case of the first underground tube railway in the world, the City and South London Railway, which was built about thirty years ago. The double tracks were in two separate tubes and the third rails of opposite potential. About 1893, shortly after the corrosion of underground pipes by stray currents from electric railways first began to attract attention, the parallel three-wire system as exemplified in figure No. 2, was suggested as a means of preventing it. Provided that the two wires of a double track trolley line could be kept insulated from each other for 1,000 to 1,200 volts, and protected from other wires falling across them, the only place where stray currents could circulate would be between the rails of the two parallel tracks, and this could be easily obviated by substantial cross bonding. This method was proposed for cities which had practically abolished all overhead wires in the principal streets, excepting the trolley wires, which was the case in Chicago about that time. *However, the difficulties of maintaining double the usual railway voltage between two sets of trolley wires over adjacent tracks then seemed to be too formidable to be tackled seriously, and in those days the Edison three-wire patent was still in force and any railway would have had to have a license to use it. The parallel three-wire system was also not convenient for single track lines; but it was proposed to overcome that difficulty by cutting the trolley wires into sections of opposite polarity successively along the railway line. This is of course equally applicable to double track lines, and as the voltage between the trolley and the track is the same whether its polarity is positive or negative, there is no more danger from the falling of other wires with the sectional system of three-wire construction, than with the ordinary two-wire method.

Sectional System of Three-wire Distribution

Considering now the sectional system, it is evident that the cars in the negative sections will pull out of the rails the current put into them by the cars of the adjoining positive sections, so that the average fall of potential from one end to the other of any one section becomes the basis of estimating the overall track drop. The sectional method shown in figure No. 3, is not quite as ideal as is the parallel method in figure No. 2, because the currents circulating in the rails may have to traverse the entire length of a section before they can be drained out by the cars in the next adjoining section; however, as will be shown below, the practical results are very often much better than what pure theory would indicate.

As in the case of the parallel system, the sectional system requires at least two generators in each power station. There is great freedom possible in selecting the number of sections into which the line is to be divided, and the order of their polarity with respect to the power station. The general object to be sought, is an arrangement of sections such that the cars in the negative trolley sections will pull out of the track as much as possible of the current put into the track by the cars in the positive trolley sections. It is evident that this object is also controlled by the relative capacity of the two sets of machines in the power station or substation, but where the two sets are of equal capacity it is obviously desirable to balance the load between them as equally as possible, it being obvious that the more nearly these loads are equal the less current will flow back through the rails to the power station, and the less will be the drop along the track, the reduction of which to a negligible quantity is the principal object sought.

Drainage of Underground Cables

Before proceeding to the matter of sectioning, it is proper to consider one of the most important features of the control of stray currents, namely, the drainage of underground cables. In the early days when most railways were run from a single power plant the return currents in the rails all headed back toward the one station, and there was a general fall of potential in that direction in the rails and in the underground pipes and cables paralleling the rails.

* See article by the writer in the Street Railway Gazette for February 17, 1894. In an issue of the same paper a few weeks subsequently, J. Stanford Brown proposed the sectional three-wire system for single track lines.

Lead covered cables differ from cast iron water and gas pipes because the cable sheaths, being without joints, are continuous conductors, and the stray current getting on to a cable sheath tends to stay on it until the point of lowest potential is reached. The ultimate point of lowest potential is at the power station, and if the cable sheath, or a metallic continuation of it, be taken into the power station bus, the stray current will not leave the cable for a path of lower resistance as there will be no such other path. It is very desirable to keep the stray current from leaving the cable sheath at unknown places, because lead is susceptible to electrolytic solution in whatever water it may be in contact with. Consequently the practice has become universal of draining stray currents out of cable sheaths by substantial metallic conductors connected as directly as may be to the power station negative bus, so as to keep all stray current from leaving the cable excepting at this predetermined point selected for it.

Reversals of Rail Currents

As can be readily inferred from the figure No. 3, three-wire distribution on the sectional system will tend to set up reversals of current in the rails according to whether more cars are in the positive than in the negative sections at a given moment, or vice versa. Cars on the road are always intended to be in motion, and when in motion the currents they transmit from the rails are varying constantly with starting, stopping and variation in running speed. Consequently the relation shown in figure No. 3, both as to the amount and the direction of a current flow in any one section at any time, is subject to an infinite variety of conditions, each one of which would require a separate diagram to describe it.

The continual reversal of rail current anywhere and everywhere along the line directly causes corresponding reversals in all stray currents leaking from the rails, which are necessarily proportional to the original rail currents. So long as the cable owners can be sure that the stray current in the cable is running continually toward the power station, there is no cause for worry. But whenever there is a tendency to reversal of current in a cable sheath, cable owners become apprehensive of trouble from corrosion, because they do not know where the stray current is leaving the cable, nor whether the lead sheath is being corroded at the unknown point of exit.

It has thus come about that the cable owning companies, especially the telephone companies, have shown much solicitude over the application of the three-wire system because of its inherent quality of causing reversals of stray currents in the cable sheaths. It should be said here, in passing, that the two-wire system of negative return feeders is also subject to the same difficulty as a practical matter of fact. Theoretically, reversals are commonly supposed to be preventable in a two-wire track feeder system, but the theory does not usually work out that way in practice, (see figure No. 5).

Investigation to Minimize Reversals of Current in Rails

The three-wire system has up to the present time been judged by electrolysis experts, chiefly by its effect in producing reversals of stray currents in the cable sheaths. A few years ago a study was made of the various ways of sectioning a trolley system for three-wire operation, for the sake of ascertaining which method would best minimize the reversals of current in the rails, evidently in the interest of securing continual cable drainage in one direction. This theoretical study of trolley sectioning was made by E. R. Shepard, who, for some years, was connected with the United States Bureau of Standards in electrolysis investigations, and his conclusions were published some five or six years ago by the United States Bureau of Standards, in their Technologic Paper No. 52. Of the following seven diagrams, shown in figure No. 6, the first three and the sixth one, counting from the top, are reproduced from Mr. Shepard's paper. The fourth, fifth and seventh were prepared by the writer to show the extension of the principle to a greater number of zones than three.

It must be remembered that these curves are based on several distinct assumptions, the most rational of which, is a constant track resistance, the other two assumptions being that the number of amperes of load successively put into or taken out of the track in each successive 1,000 feet is a certain average quantity, and that this average does not fluctuate from moment to moment. Such assumptions with reference to the load are of course impossible of realization in practice, with a load that is inherently fluctuating every instant, but they are used to establish the method of arriving at a judgment regarding the effect of averages. In a problem of this kind dealing with quantities that are essentially variable, one has to assume something in order to get anywhere, and these curves show the order of magnitude of the practical results that may be expected if the average local conditions assumed can be regarded as possible, if only for the sake of argument.

The diagrams cover a stretch of track 15,000 feet long having a resistance of 0.0025 ohms per 1,000 feet, which is roughly the equivalent of four 100-pound rails. The cars are assumed to be spaced at regular intervals, each car contributing or taking out an average of 40 amperes for each 1,000 feet of track, the power station being at the left hand side of the diagram, (see figure No. 6). Leakage to earth, which would reduce track drop, is neglected.

The potential curve in the top diagram shows the increase in drop over the whole 15,000 feet with the above assumptions of load spacing, all of the current accumulating in the track as the power station is approached, and flowing out of it into the station at the left hand end. The drop in the first 1,000 feet is 0.0025×40, or 0.1 volts; over the second 1,000 feet it is $0.0025 \times 40 \times 2$, or 0.2 volt, or a total of 0.3 volt from the starting point. At the end of the third 1,000 feet the total drop from the starting point is obviously 0.6 volt. The drop over a total of n 1,000-foot sections is therefore, 0.0025×40, or 0.1 volt, multiplied by the sum of the series $1 + 2 + 3 + \ldots n$, which sum is $\frac{n^2 + n.}{2}$ When n is 15, as in this case, the total drop over the 15,000 feet becomes 0.1×120 or 12 volts. It will be evident that the curve of voltage drop is a parabola.

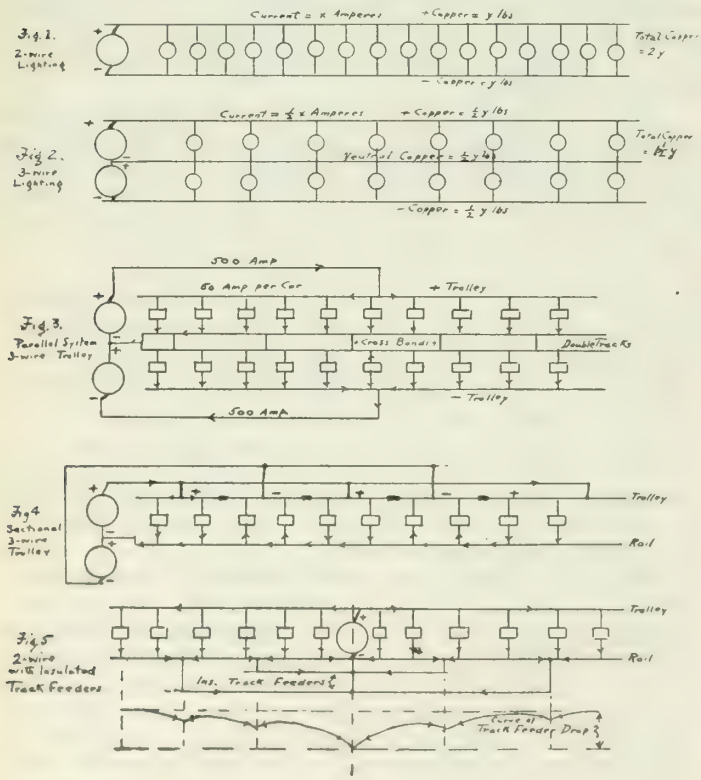
In like manner where the current is pulled *out* of the tracks by the cars at the same rate, the curve of *decrease* in voltage drop is also a parabola, but reversed. The curves showing the current that causes the drop are of course straight lines, and the arrows indicate the direction of increase or decrease as one progresses from the starting point toward the power station. The drop per thousand feet is greatest where the current is heaviest, in both curves, and reaches zero where the current

increases from or decreases to zero. It will be noticed that the curve of *increasing* voltage drop crosses the current curve, while that of *decreasing* drop has the same direction of slope as the curve of the current that causes it. This helps somewhat in working out the combinations of successive voltage drops over successive sections.

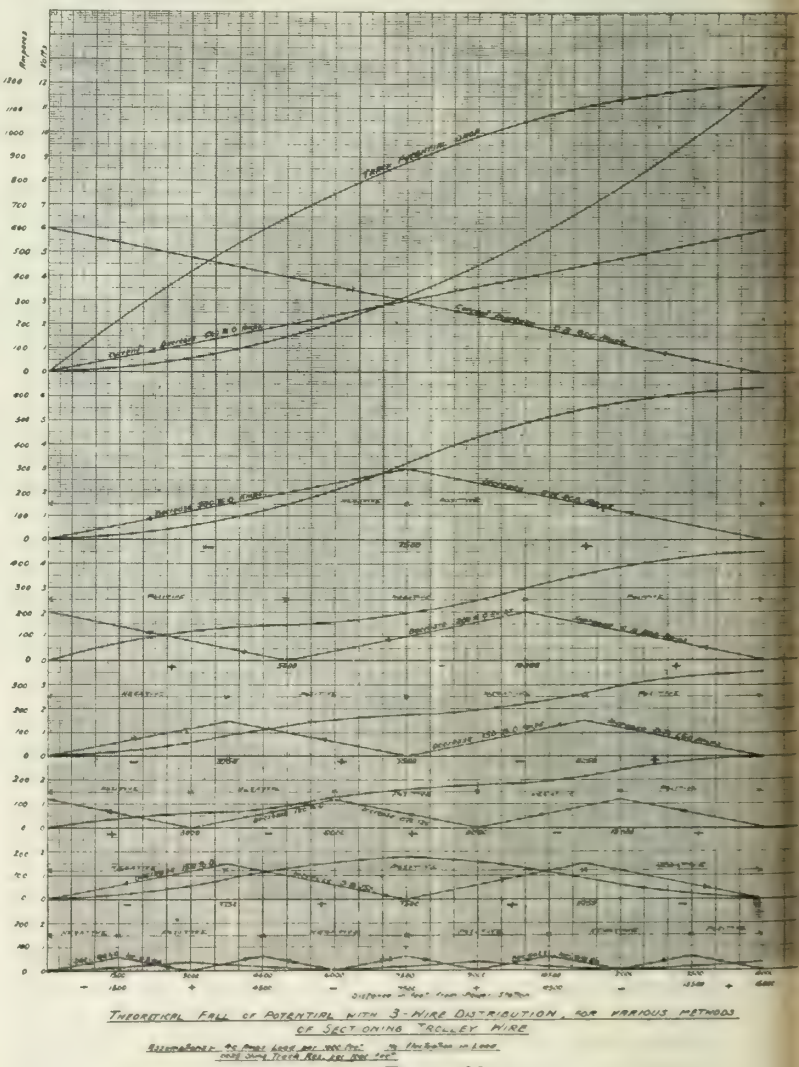
Taking now the various combinations of trolley sectioning with the same unit values of resistance and current, assume first that the 15,000-foot track is cut into two sections, one half being the negative section nearest the power station, and the outer half the positive section. All the current in the positive half travels along the rails and is pulled out by the cars in the negative half, so that none is left to enter the power station. Assume the drop at the power station to be zero, the negative parabolic voltage drop curve drawn from the station end increases as far as the half-way point, 7,500 feet from the station. Here the current in the rail is at the maximum, all that from the positive section having accumulated at this point. The outer end of the positive section is 7,500 feet distant, so the parabolic voltage curve for a positive section 7,500 feet long is applied at this point, and the total overall drop is the sum of the drop in the positive and negative sections as determined by the ordinates of the two parabolas laid off successively and added together.

It will be noticed that the direction of the current in the rails is the same throughout, so the drops caused in each section must therefore be added to each other to get the overall drop, which becomes 6.375 volts. Theoretically, a drained cable paralleling this track would have no reversal in it if the load conformed to the assumption from which this voltage drop curve is based. In the same way the three-zone lay-out assumes a positive zone, next the power station, in which the current flows directly back to the station; the middle zone is negative and pulls out of the track the 200 amperes that the outer positive zone puts into it. Beginning at the outermost point 15,000 feet from the power station, the rail current increases to 200 amperes, then decreases in the negative section from 200 amperes to zero, then increases to 200 amperes again at the power station, which thus only gets one-third of the total amount of current put into the cars. The flow of current is still, in theory, uniformly toward the power station at all points; the voltage drops in all three of the sections are thus added to each other, and the successive voltage curves in the three sections are built up as before, from parabolas of the proper lengths, the sum of the three being 4.5 volts over the entire 15,000 feet of track, as compared with the 12 volts when no sectioning is done.

Similarly four zones and five zones are laid out, care being taken to alternate the zones in such a way that the flow of current is always towards the station, for the theoretical benefit of the cable drainage. The voltage drop is therefore, still cumulative, each time, but the overall amount gets smaller each time because the parabola ordinates decrease faster than do the abscissas, as the length of each section becomes shorter. With four sections the total drop is 3.56 volts; and with five sections, (the power station only taking 120 amperes out of the 600 required by the cars), the net total overall theoretical drop is 3 volts for the 15,000 feet, or only



Figures Nos. 1,2,3,4, and 5.



THEORETICAL FALL OF POTENTIAL WITH 3-WIRE DISTRIBUTION FOR VARIOUS METHODS OF SECTIONING TROLLEY WIRE

Figure No. 6.

one-quarter of that in straight two-wire operation without sectioning. If the order of the polarity of the sections were reversed, the voltage curves would drop below the horizontal base line instead of rising above it, the drop at the far end would be negative with reference to the station, and the track current and consequently all stray currents parallel to it in cables and pipes would be flowing away from the station.

Special arrangement of Sections to further reduce Track Drop

We now come to a scheme of sectioning which is twice as efficient in reducing track drop, because the drop in each principal section is automatically cut in half by halving the maximum current in a section, through the simple expedient of so arranging the sections that instead of all the current in one section flowing completely through to the next section in one direction only, half of it is made to flow one way and half the other.

This is done in the simplest case by creating three zones, making the two negative end sections each half as long as the centre positive section. This is shown in the sixth diagram from the top. Note that in the short negative section next to the power station, the current flows in the direction of the station, decreasing to zero as it approaches the station. The current all comes from the adjoining half of the central positive section, the starting point of this current being the central point of the section, where the value of the flow in either direction increases from zero. Therefore, the current in either half of the centre section only rises to a maximum half as great as if it flowed the whole length of the section. To the right of the centre of this section, the current flows in the opposite direction beginning at zero and accumulating to 150 amperes, which in turn is absorbed by the outer short negative section, which is of the same length and has the same number of cars on it as the outer half of the centre section. The net maximum overall voltage with reference to the power station thus becomes a maximum at the centre of the middle section, falling to zero at either end, because the current flows along the rails in opposite directions from the centre. This gives a net maximum track drop which is only half that in the four-zone diagram above, although the total length of positive and negative track, and the amount of current accumulated in one section, is the same in both cases.

This method of sectioning, on paper, has the theoretical result that the rail current and the stray current in the half that is more remote from the power station, flow away from the station and not towards it. This result is objectionable in the eyes of cable owners and electrolysis experts, so that the latter, on the strength of this theoretical showing, proclaim a preference for the three-zone, four-zone or five-zone systems which theoretically produce a continuous direction of rail current and stray current towards the station, although a higher track voltage is built up at the outer extremity.

Six Zone Sectioning

Comparing now the seventh diagram at the bottom of the sheet with that immediately above it, the voltage curves show what a remarkable further reduction is effected by following this principle a little further, and sectioning the 15,000-foot line into six zones of which the two end ones are 1,500 feet in length and the four central ones 3,000 feet, which is the same length of section as in the five-zone diagram. The splitting effect of this arrangement causes a flow of half the current in a 3,000-foot zone of only 60 amperes in either direction, instead of the 120 amperes in one direction in the five-zone diagram. The drop caused by 60 amperes over 1,500 feet, which is half of a 3,000-foot zone, is only 0.1875 volts. The current, as shown from the diagram, flows in the same direction over two 1,500-foot sections in series, and then reverses, flowing the other way for the same distance, thus alternating in direction every 3,000 feet over the whole 15,000 feet of track. On account of these alternate reversals which bring back the track drop to zero, the effect of having the successive drops in each 3,000-foot stretch added to each other is non-existent, because the drop in one 3,000-foot stretch neutralizes that in each 3,000-foot on either side of it, and the maximum overall drop is the same as that in any one 3,000-foot stretch, and not the sum of the drops in the four 3,000-foot and two 1,500-foot stretches, being in fact only 0.375 volts.

Theory based on Uniformly Unvarying Car Currents

It must be remembered that these curves are all based on the assumption that the car currents are *uniformly unvarying* in amount and in distribution along the line, or that their average is uniform enough to produce the smooth type of curve shown by the diagrams. As a matter of fact, the car currents are anything but uniform either in amount or distribution, for the cars in all the sections are constantly varying their currents at every instant, and the distribution of cars varies constantly, so that at no time is there a constant flow of current in any section or between any two sections, no matter what method of sectioning is followed. On the contrary, each section is exchanging current with the adjoining sections on both sides of it every instant, first in one direction and then in the other. Some sections will be overloaded with current for a few minutes while others may be almost or quite empty of it, all according to circumstances. Due to this constant exchange of current from any one section to the two on either side of it, the net real result in a three-zone, four-zone or five-zone diagram for instance, like those in the upper figures in the curve sheet, is that in fact a condition of current interchanging between sections is actually set up, like that in the six-zone diagram at the bottom of the sheet. Thus the interchange of current between any one section and the two on either side of it in reality cuts the overall track drop down for a split six-zone diagram, to one-eighth of the overall value in the theoretical five-zone diagram where current interchange is assumed to be in only one direction. The gain in voltage drop over that theoretically estimated for the four-zone and the three-zone diagrams, is proportionally greater.

The six-zone diagram shows why in practice there is an oscillating interchange between all adjoining sections of any length, in any system of alternate zoning having more than two sections, no matter whether or not it is laid out theoretically to produce a uniform track current flow in one direction. As a practical matter this condition is what really happens anyhow, in sectional three-wire operation; no matter how dense or how uniform the traffic may be, it becomes at once equivalent to what is here shown as a split six-zone diagram. It becomes inevitable that the rail currents reverse, and the stray currents of necessity reverse in tune with them, and apprehensions of trouble begin to fill the minds of the cable owners and electrolysis experts until they begin to realize from actual tests that the voltages and the amounts

of stray current in three-wire practice, are so very much smaller than they ever were under the two-wire system, and so constantly reversing, that there is not enough left of them to do any perceptible damage in dissolving the metal of underground pipes and cables as compared with stray currents that do *not* reverse.

Constant Current Reversals in Three-wire System

The promulgation several years ago, by the United States Bureau of Standards, of the theory showing why the zoning of a three-wire system should be laid out to produce a net current flow toward the station, naturally influenced the writer very strongly to attempt to utilize the three-zone system as far as possible. These same considerations were however, influenced by the fixed capacity of the substation machines, which could not be ignored, and prompted him to utilize the four-zone system in some instances where it was really a practical necessity from a substation standpoint, by reason of the two machines being of nearly or exactly the same size. However, the net practical result was of the same order practically everywhere, in producing constant reversals of voltage and stray current that were nearly always equal above and below zero. The writer believes the above demonstration, which is simply a continuation of the original theory to its logical conclusion, (when the fact of inter-sectional current exchanges is realized), will explain the inherent impossibility of expecting anything but current reversals in a three-wire system in practice, no matter how carefully a system of sectioning may be planned in advance. This logical development of the theory of sectioning also explains why the much advertised two-wire system of insulated track feeders draining the track at fixed points, usually shows reversals in practice, although theoretically it is supposed to be possible to grade the resistance of such feeders from the outer extremity toward the power station in such a way as to prevent these reversals. In practice reversals happen just the same, and the situations in the cities of Milwaukee and New Haven have demonstrated that the two-wire system of drainage of tracks at fixed points needs just as much attention to the control of reversing stray currents, as the three-wire system, and has required just as much ingenuity in solving the current reversal problem, to which reference will be made further on in this paper.

The foregoing demonstration will explain why the chart shown herewith, which was published sometime ago, gives an average indication of track drop that is algebraically zero with respect to the point of lowest potential (see figure No. 7). It was taken on the Winnipeg Electric Railway Company's Main Street line between Portage avenue (which is nearest the substation) and Euclid avenue about one mile north. There are four sections in this district, and not less than twenty-five cars at the peak hour on this mile of track with probably ten more cars not far from Main street on several cross streets. The four sections total altogether about 6,500 feet in length, although their individual lengths vary considerably. The fourth, or outermost section, runs some distance beyond Euclid avenue where the potential drop was measured. This chart is an excellent illustration of the effect of the continual interchange of current between sections in reducing overall track potentials, as predicted theoretically in the six-zone diagram above mentioned. It is also a good demonstration of the great improvement effected by three-wire over two-wire operation in reducing the track drop. During the morning peak the net average with two-wire operation

Figure No. 7

Reduction of Track Drop by Three-wire operation over four sections of alternate polarity

was about ten volts over this distance. During the evening peak with three-wire operation the arithmetical average on either side of zero indicated by this chart was possibly two volts constantly reversing, and the algebraical average was zero. An especially noteworthy fact is that the balance between the positive and negative sections is so perfect that the existence of a peak load during the evening rush hour would hardly be suspected from the appearance of the chart, although the two-wire operation during the morning peak betrays the load variation very emphatically. The low average values of track drop shown on the three-wire section of this chart thus reflect the interchange of current in both directions between adjacent sections, and indicate that it is this continuous reversing interchange and splitting up of current between all adjoining sections of track which is more responsible for the low average track voltage than is the successive order of the polarity of trolley sections with respect to power station.

Importance of Sectioning and Special Considerations

This leads to the general conclusion that, as a practical rather than a theoretical matter, the lowest overall track drop, and consequently the least amount of stray current irrespective of direction, will be secured when the number of sections is the maximum suitable for a given load distribution and weight of rails. The track currents and the stray currents will reverse anyhow, and the more frequently the line is sectioned the less important do the stray currents become, and the less difficult it is to render them harmless, by the means to be discussed further on.

Considerable time might be taken up by discussing various features entering into the practical matter of determining the proper length of sections. The lengths of the intervals between cars on a given line is the principal consideration and the wear and tear and maintenance of trolley section insulators, which is a very indeterminate quantity, must also have some influence. In the central portion of Winnipeg the sections are not shorter than

800 feet nor longer than about 2,700 feet or one-half mile. It is obviously useless to have sections so short that there may be no cars in them much of the time.

There ought to be at least one or two cars in any section to get the desired effect in exchanging current with adjoining sections, both for the sake of the track drop and of the balancing of substation load, which last is extremely important from an operating standpoint. It is evidently desirable to have the total number of cars in the positive sections equal that in the negative sections if the two machines required in each substation are of the same size. If the substation machines are of different sizes, the relative number of positive and negative cars can be adjusted accordingly. This feature, and the weight of the track rails on any line or combination of lines, carry the principal weight in determining the length and number of sections. If one substation machine is larger than the other, the principle has been followed of giving the larger machine the positive load and the smaller the negative load, which of course helps cable drainage to preponderate towards the substation.

The light weight of rails, which on some of the tracks weigh only 60 to 70 pounds per yard, or less, if badly worn, tends to shorten up the zones and in several cases there are now four or five zones in succession from the substation instead of three.

Control of direction of Stray Current Flow

Most cable engineers and all electrolysis experts insist that it is necessary to take whatever practical steps are possible to prevent stray currents on drained cable sheaths from flowing away from the power station. This has been tried in two ways. First, by operating small negative booster generators, so as to artificially make the station end of a cable sheath the point of lowest potential regardless of the momentary polarity of the stray current leaking from the track rail. This negative booster may generate any desired voltage, say from 5 to 20 volts or more, or whatever is necessary to keep the current in the cable sheath flowing towards the station when the momentary polarity of the track voltage tends to cause it to flow *away* from the station. This results in a fairly steady inflow of drainage current to the neutral bus, but at times when the current would naturally flow inward anyhow, the negative booster may tend to draw more stray current away from other underground structures than would otherwise flow. This condition, having been suspected and subsequently proved to exist, has somewhat discredited the negative booster method in the eyes of experts who first proposed it, and recourse has been had to another method that has been tried for several years past and has so far been found successful, namely, the automatic opening of the drainage circuit at the station end, whenever the stray current reverses the flow away from the station.

Some of the telephone companies in the United States have used an automatic device of this kind, which consists essentially of a polarized relay of high resistance which is always in the drainage circuit. When the stray current passes zero and increases its flow inward to the substation, this relay automatically closes a contact device and shunts most of the drainage current around itself, permitting practically all of it, up to 50 or even 100 amperes or more, to flow directly to the station bus. When the drainage current decreases, passes through zero and reverses to flow away from the station, the polarized relay reverses and causes the auxiliary contact to open the main drainage circuit. This cuts off the supply of current that would otherwise be drawn from the station bus and would flow into the cable system and thence leak back from the cables into the rails at the unknown outermost points which are at that moment at a lower potential than the station. It seems to be well substantiated that when the supply of reverse current is thus cut off, either at the station or at some convenient point outside, or both, the resulting leakage from the cables is reduced to amounts that are the more harmless as the track voltage drops, which produce them, become smaller.

Consequently, as the three-wire system has been shown to be able to reduce these overall track potential differences to as low as two or three volts or less over distances of a mile or more, the voltages, tending to send reverse stray current through the cables back to the leakage points, become so small that when cut off by the automatic reverse current switches the leakage currents leaving the cables are reduced to a negligible and harmless quantity if the automatic reverse switches are properly located.

The cable engineers and electrolysis experts have not yet been able to come to any conclusion or agreement about the limits that should be set to the voltage amplitude or the time duration, of these reversing cycles of stray currents to and from cables before the latter may be regarded as harmful to the cables at outside points. Their point of view is that the reversing condition is essentially a risk and should be reduced to a minimum, both as the amplitude and duration, without being able to set any limits. However, the automatic reverse current switches have now been tried long enough, at least four or five years, to encourage their further use, and the telephone companies in the United States seem to be satisfied to continue using them, where necessary, although they naturally desire to restrict their use as much as possible, on account of the necessary maintenance. It is probable that more of these automatic devices are used to protect cables against reversals, where the insulated track feeder system is used with two-wire operation, than has been the case with three-wire installations.

Special Automatic Reverse Current Switch

H. E. Brockwell, chief engineer of the Manitoba Telephone System, has recently developed a small self-contained automatic reverse current switch on the foregoing principle, which he calls an "electrolysis protector". This device is much smaller and simpler than the device previously used in the United States and has experimentally handled currents as high as 70 or 80 amperes. The details of this switch are not yet available for publication as it is still in the development stage, but the device has already proved its practicability, and its application to whatever situations may require it, is now simply a matter of time for factory production and for adjustment to each special condition of use. It is believed that the application of this type of device will satisfactorily take care of the very small reversing stray currents in cable sheaths that are caused by three-wire operation.* The drainage of underground pipe systems has been entirely avoided in the Winnipeg installation.

To sum up the foregoing, it therefore appears that the most economical protection to underground pipes and cables is afforded by utilizing the three-wire system, with reasonably short sections to cut the potential differences and resulting stray currents in either direction to a

* Patents on the particular device have been applied for.

minimum, in combination with means for cutting off the flow of stray current in cables, when the same is in a direction away from the station.

Substation Equipment

Referring briefly now to substation equipment, the generators are fitted with double throw main switches, so that they can be thrown either on the positive or negative side of the system. Three bus-bars are provided, positive, negative and neutral. A suitable circuit-breaker of large capacity is inserted in a connection between the positive and negative bus-bars. For three-wire operation this breaker is kept open, and when two-wire running is necessary or desirable in emergencies or during the midnight to morning hours, the breaker is closed. The feeder switches are all arranged permanently on either the positive or the negative side, so that the polarity of the sections, when once decided upon, cannot be changed by substation operators.

In the Winnipeg system, it is found that the power consumption of the positive and negative generators is such that the difference between the positive and the negative kilowatt-hour output, is from 12 to 15 per cent of their sum. This means that the net incoming current through the tracks to the substations averages from 12 to 15 per cent of what it would average with ordinary two-wire operation, or in other words, that 85 to 88 per cent of the current required by the cars on two-wire operation, is pulled out of the tracks by the cars in the negative sections when running three-wire.

Features of the Overhead Trolley

There is nothing especially distinctive about the overhead trolley construction except the frequent use of section insulators. It has been found preferable to use a single insulator with a 16-inch wooden runner rather than two standard insulators in series, being both cheaper and imposing less weight in the overhead construction and fewer hard spots for the trolley to run over. There are about seventy-seven separate sections, forty-six positive and thirty-one negative, in the Winnipeg system which is nearly all double track, excepting the outskirts. On account of the greater frequency of section insulators, and the mechanical blows that are struck upon them by the trolley wheel, which tend to crystallize the wire, it has been found desirable to improve the usual standard malleable iron tipped section insulator by adding to it a tapered brass extension tip on each end of the insulator, as the design of the malleable iron tips in ordinary use requires a thickness of metal that causes the wheel to strike the wire a blow on entering and leaving the breaker. In all other respects, the maintenance of the trolley wires is no different from what it is under two-wire operation. In some respects fairly frequent sectioning is a help to efficient operation and maintenance, rather than a hindrance.

There is one matter of note respecting the trolley feeder construction, on the Winnipeg system, and that is the continuity of both positive and negative feeders from one substation to another, with remote control switches inserted in them, about half-way between stations. Ordinarily each substation district is run separate from every other one, but in case one station needs assistance in carrying its load the remote control switches in these feeders can be closed, and two stations can be run in parallel, both on the positive and negative sides.

The losses incident to always operating two machines in a station instead of one, are sometimes referred to as a drawback to the three-wire system. This is not the case in Winnipeg, where the synchronous railway motor generators are valuable for power factor correction on a large transmission and distribution system.

Results obtained through use of the Three-wire System

Coming now to the matter of practical results in securing freedom from stray current corrosion in pipes and cables in territory where electric railway lines have been operated on the three-wire system: — the first instance of this, of which there is any record, was at Portland, Oregon, about the year 1891, when several small trolley systems in that city were unified under one management and supplied from one source of power, on the three-wire system. This was done at that time for other purposes, partly to keep two separate trolley lines entirely separate from each other as regards their power supply, and partly to get some saving in copper feeders, although just how this latter result was to be secured is not clear from the information available; but it was noticed then, that is to say, thirty years ago, that the districts in Portland operating on the three-wire system were immune from damage by electrolysis of water pipes, while those traversed by other lines operating on the two-wire system were frequently annoyed by this trouble.

The next demonstration of this kind was in Brisbane, Australia, about ten to twelve years ago, where the manager of the system, who was a former Edison engineer from the United States, changed it to sectional three-wire operation for the express purpose of preventing electrolysis damage, in which he was entirely successful from the start. In 1915 the Pacific Electric Railway, at Los Angeles, stopped electrolysis damage to water pipes in their inter-urban territory surrounding Los Angeles by changing to three-wire operation, subsequently enlarging their first installation to cover more of their territory. In Omaha, Nebraska, the trolley system was changed to three-wire operation in 1916, and the installation enlarged in 1917, and the damage to underground pipes ceased very promptly. It is worthy of note that in Omaha, the gas mains were injured by stray current only on streets where there were railway tracks. The soil there is of clay and of very low resistance, but it does not carry any amount of the alkaline salts like those found in Winnipeg. In 1917 one of the substation districts in Milwaukee was changed to three-wire operation with very successful results in reducing track potentials. A survey made in 1919, under the direction of the Bureau of Standards, resulted in the recommendation that the three-wire system be ultimately extended to other districts.

In 1918 the three-wire system was adopted at Wilmington, Delaware. Here the system is not nearly as extensive as in Omaha or Winnipeg. One of the special problems there was the protection of a very important long-distance underground telephone cable system in the outskirts of the territory, a negative booster with a rather long feeder being applied for this purpose. A description of this system published about a year and a half ago indicated that it was accomplished the results for which it was intended.

Three-wire System Applied in Winnipeg

In 1919 the three-wire system was applied to the Winnipeg situation, first in the Fort Rouge district, then

in the St. Boniface, and successively thereafter in Mill Street, North End, Sherbrooke and St. James districts, all of which had more than one machine in each substation. The Logan Avenue district having only a single machine in the substation was continued on the two-wire system and the installation of insulated track feeders in that district was extended and improved. As explained above, this two-wire system of insulated track feeders brings about reversals in the rails between the various points in the track to which the feeders are tapped, and charts taken from various points in the track in this district are of the same general character as the three-wire chart accompanying this paper.

As regards the practical results following the use of the three-wire system in Winnipeg, these cannot be discussed in detail at this writing because the report that is being prepared by the experts appointed to deal with this subject, has not yet been received. However, it may not be out of place for the writer to express his conviction that the ultimate object, namely, the prevention of electrolysis of underground pipes by stray current, will be found to have been obtained, when all the evidence pointing in that direction has been duly considered by competent and responsible engineering authority.

It must not be forgotten that the whole question of underground pipe corrosion must necessarily hinge upon *whether or not the pipe is electrically positive to the earth at the point of corrosion*, for it is physically impossible for stray current to dissolve the metal of an iron pipe *except where a positive condition can be shown to exist.* This fact is at last officially recognized by the United States Bureau of Standards, who have recently devised an instrument which in competent hands is suitable for field testing, and which makes it possible to determine whether an underground pipe is discharging or collecting stray current. This instrument has thereby, to use their own words, "revolutionized electrolysis testing".* Henceforth, it should be possible to determine closely what damage is due to stray currents and what is due to self-corrosion in a manner that will eliminate the groping and uncertain guesswork that for thirty years has beclouded this question.

* See article entiteled "Some New Light on Electrolysis" by E. R. Shepard, Electric Railway Jortnal, April 7, 1923.

Specifications the Essence of Contract

A discussion of a few Important Points relative to Specifications for Building Contract

G. F. Blair, K.C.
City Solicitor, Regina, Sask.

Paper read before the Saskatchewan Branch, The Engineering Institute of Canada, November 9th, 1922

A contract is a completed agreement between two or more persons with respect to some matter and is made up of conditions. These conditions in building or construction contracts are called specifications, and these in turn can be divided into general and particular or detailed specifications. It is of first importance that no specification shall be omitted from the contract and care should be exercised to exclude from it any specification that is unnecessary or irrelevant. The real aim and purpose of the contract composed of plans and specifications is to clearly and definitely describe the proposed work and the terms and conditions on which it is to be constructed, so that the owner will know, either of his own knowledge or by reason of that of his trusted engineer or architect, that it is just what he wants and the contractor will also know exactly what he is required to do, if he undertakes the work.

In all major contracts of the said type the owner, if wise, engages the services of a skilled engineer or architect to give definitness and practical expression to the more or less indefinite ideas that he as owner has with respect to the proposed work. The assuming of the task of preparing these detailed specifications calls for much technical skill on the part of the engineer. If he is going to discharge the duty thus assumed with credit to himself and with satisfaction to the owner he must be possessed of a wide knowledge of matters that are outside of the detailed specifications. He for instance should be able with fair accuracy to estimate what the work, as he has specified it, will cost. He must exercise intelligent and skilled care to see that he has selected the most suitable material and devised a plan that will give to the owner the best return for the money expended. In addition he must have such a knowledge of the prices and qualities of materials and the cost of labour as will enable him to wisely advise the owner with respect to the acceptance of any of the offers to construct that he may receive. Unless he has this knowledge he cannot prepare the best kind of specifications for the proposed work.

Particular Specifications

In addition to those specifications which can only be drafted by or under the advice of the skilled engineer or architect there are general specifications that are directly connected with the method of carrying out the work and these in many instances will be best drawn by a solicitor on the advice of the engineer and the owner.

There will of necessity be a specification as to the time of commencing the work, the rate of progress and the date of completion. It will be quite possible that time will in very truth be of the essence of the contract and, where it is, it will be necessary to impose on the contractor such conditions as will as far as possible insure the completion of the work at the time agreed on and not simply provide a means of recovering damages for default.

One method is by empowering the architect or engineer to increase the staff of workmen or to intervene with the way in which the contractor is carrying on the work, and speed it up, by increasing the staff, taking over the plant, adding to it or subletting a portion of the work. All of these things should be provided for in the specifications and it should be made clear that the engineer in doing this is acting as the authorized agent of the contractor and not on behalf of the owner. His exercise

of these powers should always be characterized by professional ability and judicial fairness.

Provision for Penality or Liquidated Damages

Another very common specification is one imposing a penalty or providing for the recovery of liquidated damages for failure to complete the work at the agreed time. The essential difference between "penalty" and "liquidated damages" is that if you adopt a penalty clause the owner and contractor agree that if default arises the extent of the loss will then be ascertained and paid by the contractor, whether the sum be more or less than the penalty. If you desire to have liquidated damages then the parties should agree at the time the contract is made on an amount that is satisfactory to both, as a fair pre-estimate of the loss per day, or otherwise, that the owner will sustain as a result of the work not being completed at the agreed time. It is important therefore to determine, when fixing in a specification an amount to be paid for each day of default, to indicate clearly whether it is penalty or liquidated damages, and the mere use of the word is not sufficient. If it is to be regarded as damages then the engineer should make as careful a pre-estimate of the damages as he can, so as to be fair to both parties and he should state in the specification that it is his pre-estimate of said damages and that the acceptance by the contractor of the terms of the agreement by executing it will indicate his assent thereto.

Control of Work vested in the Engineer or Architect

There is another specification that requires careful consideration and that is the one giving wide powers to the engineer or architect to control the work at all times and say what shall be done if any condition arises that has not been foreseen and provided for in the contract. It is almost essential to a major contract to vest these wide powers in some one person, who is possessed of capability and a keen appreciation of the responsibility thus imposed on him to deal fairly with both parties. To enable him to discharge his duties he has the right to ask the assistance of a legal adviser or that of another engineer or architect who has no interest in the parties but upon him and him alone finally rests the responsibility for deciding what is the fair thing to do in the premises.

Specifications to cover all work to be performed

In drafting specifications great care should, as already indicated, be exercised to provide for everything that the contractor should be required to do and to fully guard against any omission there is generally a specification inserted to the effect that the contractor is to give the owner the works completed as set out in the plans even though some essential detail has been omitted from both the plans and specifications.

To illustrate, the writer has been advised that the plans and specifications for the city hall had no provision for a chimney. The contractor, if the above mentioned clause was properly drawn, would be required to build a chimney because it would be presumed that he must have known that a chimney was an essential part of such an agreement. Many illustrations might be given, however, of omissions that would not even with such a clause, impose on the contractor an obligation to make them good without extra pay.

It is usual also, to provide that differences between the plans and specifications require everything to be done that is shown on one, though not on the other. If there is conflict the specifications should govern, because they are the detailed explanation of the plans.

Even at the expense of repeating, it is well to urge the importance of not falling into the careless plan of using a standard specification for disimilar work on the assumption that the parts that are not relevant to the particular contract, will not hurt even if not necessary. Fit the specifications of each contract to its particular requirements. It is of the greatest value to have carefully drafted standard specifications for every kind of work and for every conceivable condition that should be provided for in describing the work and how it is to be carried out. Having such clauses before you in drafting specifications lessens the likelihood of any serious omission.

Specifications may be actually or constructively incorporated in the agreement. They may also be signed, if separate from the contract or they may be clearly identified without being specially signed. It will make no real difference which plan is followed provided always that the agreement so called and the plans and specifications are so clearly bound together that they constitute the completed contract. There of course will be differences of opinion as to which method gives the best results.

Instructions to tenderers must include Terms of Contract

There is another matter that should be borne in mind and that is that in inviting tenders you should have in the hands of the tenderer everything that he should know as to the conditions he will have to submit to, if his offer is accepted. The instructions to tenderers with the offer and its acceptance by the owner must include all the terms of the contract so that any subsequent agreement can not add to or detract from the conditions in those documents except by the consent of all parties thereto.

In drafting specifications great care should be taken not to impose any condition on the contractor that is not essential to the carrying out of the work in a satisfactory manner because every additional condition that is onerous to the contractor is reflected in increased cost of this work.

The reputation for ability, integrity and fairness of the person drafting the specifications, especially if he is also charged with the interpretation of them and of enforcing their provisions, means much to the owner, who employs him, because the skilled and honest contractor, bids the lowest price for the work that he believes it can be done for, knowing that if he gets it, he will be fairly and justly treated.

Hear then the conclusion of the whole matter. Specifications should be a clear concise statement of the various requirements or conditions that go to make up the contract. They are intended to clearly inform the minds of the owner and the contractor of what each agrees to do in return for that which he requires from the other. Good specifications are the product of a draughtsman or draughtsmen having ability and a fair amount of judicial fairness together with a fixed determination to use it in the interests of justice and fair dealing.

Electrons, Atoms and the Ether

An outline of the present knowledge of the subject resulting from recent investigations.

W. B. Cartmel, M.E.I.C.

Fellow of The American Physical Society.

Transmission Engineer, Northern Electric Company, Ltd.

Paper read before the Montreal Branch, The Engineering Institute of Canada, March 30th, 1922.

(Continued from April 1923 issue, "The Engineering Journal")

Early Work on the Electric Discharge through Gases

So far an endeavour has been made to give a conception of electrons as they exist in the atoms of matter and something has been said about optical experiments which pointed to the existence of electrons. However, their existence was actually proved by experiments in which they were entirely separated from matter. This was done by passing an electric current through tubes from which practically all the air had been pumped out. A great deal of investigation work has been done in connection with the electric discharge through tubes containing rarified air and other gases. We will however only take up two conditions of gaseous discharge.

First consider the case of a glass tube having electrical terminals or electrodes sealed into the ends, and exhausted by means of an air pump so that only about one ten thousandth of the original air remains. Very beautiful effects are obtained when electricity passes through tubes pumped out to this degree of exhaustion. Tubes of this sort, known as Geissler tubes, are often made into fantastic shapes as shown in Figure No. 8. A demonstration was given by the author with five such tubes connected by wires with the terminals of an induction coil, during which he said,—"You will note that the air in these tubes has become conducting to such a degree that the current passes through the five tubes in series, giving an air path of approximately forty inches, rather than jump between the sparking terminals of the induction coil, through half an inch of air at atmospheric pressure." The other

Figure No. 8

case we shall take up is where the air is pumped out to a very much higher degree of exhaustion. Pumping out more of the air from the tubes causes the electric current to pass through them with more difficulty, because the further removal of air makes a shortage of molecules for ionization. On exhausting a tube to a very high degree, a voltage sufficient to produce a spark of several inches in air is necessary to cause current to pass through the tube. Sixty years ago experiments were made by Sir William Crookes, with tubes evacuated to a millionth of an atmosphere, which was about as high a degree of exhaustion as it was possible to produce at that time. In these tubes known as Crookes tubes (see figure No. 9) it was found that there was no glow with beautiful colors as in the Geissler tube, but instead there was a beam of bluish light proceeding normally from the cathode or negative terminal of the tube. This bluish light known as cathode-rays impinging on the walls of the glass tube caused it to glow with a yellowish-green glow. In 1876 Crookes announced the view that the cathode-rays consisted of particles of matter, which he called radiant matter. He assumed that in addition to the three known states of matter, solid, liquid, and gaseous, there is a fourth state, which bears a relation to gaseous matter similar to that which gases bear to liquids.

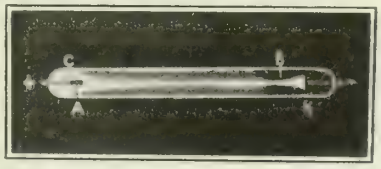


Figure No. 9

Investigations of the electric discharge through gases as illustrated in the tubes just referred to, were carried out for a long period of years by Sir J. J. Thomson and his pupils. It was finally demonstrated that the stream of cathode-ray particles in the Crookes tubes were particles of negative electricity. This was very puzzling at first because it gave a clear understanding of negative electricity, but not of positive electricity. However, it was in accordance with Benjamin Franklin's old single fluid theory of electricity which assumed that there was only one electricity, that positively charged bodies had an excess of this fluid, and negatively charged bodies a deficiency. We now know that it is the sulphur rubbed with wool that has an excess of electrons, and glass rubbed with silk has a deficiency, so that in assigning the terms positive and negative we should have chosen the sulphur rubbed with wool as the positively charged body because it does actually have an excess of electrons, while a piece of glass after rubbing with silk has a deficiency. If this had been done our conventional direction of flow of electricity would be in accordance with what we know to be the actual flow of electrons in a substance. Thus the electrical charge on the zinc plate of a battery is of the same sign as the charge on a piece of sulphur rubbed with wool, hence on connecting a wire between it and the carbon plate, there is a flow of electrons through the wire from the zinc to the carbon. We see therefore that the experiments of Sir J. J. Thomson established the single fluid theory of electricity but they still left open the question of the nature of positive electricity. To-day we know that the atoms of all substances consist of a minute, central, positively charged nucleus surrounded by a certain definite number of electrons, but at the time of the discovery of the electron or particle of negative electricity, the nature of positive electricity was very mysterious. Many discoveries however, (such as the discovery of X-rays and

radium) came along in rapid succession, the meaning of which was not immediately apparent. Ultimately these discoveries enabled physicists to piece together various odds and ends of knowledge so that not only was a knowledge of the structure of the atom attained but even of its minute nucleus. The rest of this paper will be devoted to an explanation of these discoveries and of their bearing on the structure of the atom.

The Relation between Electrons and X-rays

X-rays were known just previously to the discovery of the electron. They were discovered by means of the Crookes tube (figure No. 9) which played so important a part in the investigations that led to the discovery of the electron. A curious effect already mentioned is that the electron stream in the Crookes tube causes the glass of the tube to glow with a faint yellowish-green light. It was known that a chemical called barium platino-cyanide would glow in a similar manner if held near a Crookes tube. This phenomenon is known as fluorescence. Professor Roentgen, the discoverer of X-rays was interested in investigating phenomena connected with the action of a Crookes tube on a fluorescent screen, that is to say a piece of cardboard smeared over with a thin layer of barium platino-cyanide. He noticed that the fluorescent screen fluoresced even when the Crookes tube was covered with a black cloth, and hence the Crookes tube emitted some sort of rays which could pass through substances opaque to the rays of ordinary light. It was also found that these rays could affect a photographic plate and that hence pictures could be taken with them. These rays he called X-rays. I have here a tube better adapted for X-ray work than the old Crookes tube. On exciting the tube with an electric current you will note that in the dark the glass walls of the tube fluoresce with a yellowish-green glow. These tubes require for their operation a powerful electric machine capable of giving a spark of 6 or 7 inches in length. Figure No. 10 shows an X-ray tube. Under the action of the high potential, electrons are forced onto the cathode and jump across the vacuous space in the tube with a velocity of 18 thousand miles per second. When these electrons are stopped by a solid substance, the sudden stoppage sets them into violent oscillation which starts similar oscillations in the ether which fills vacuous and all other space everywhere and is within the pores of all substances. These ether vibrations, which we call X-rays, are extremely rapid and their wave-length is correspondingly small, being as previously stated about one ten-thousandth of the wave-length of ordinary light. In order to focus the X-rays and produce a clear sharp picture, a third terminal called the anti-cathode or target, is placed within the tube, and connected by a wire with the cathode. The anti-cathode receives the impact of the stream of electrons and at its surface the ether vibrations are set up and the X-rays therefore proceed from this anti-cathode, as shown in the figure.

The Discovery of Radium

After the discovery of X-rays a distinguished French experimenter named Henri Becquerel, having in mind the fluorescence which was excited in certain substances by X-rays, determined to investigate phosphorescent substances with regard to the possibility of their emitting X-rays without being bombarded by an electron stream. It was known that certain substances such as uranium compounds were phosphorescent under the action of light, that is to say if exposed to light they would afterwards emit light in the dark. These substances were also fluorescent, that is, under the action of light of one colour would emit light of a different colour, in other words if acted on by light of one wave-length would emit light of a different wave-length. The question in Professor Becquerel's mind was this; if uranium compounds were acted upon by ordinary light would they emit X-rays? He found that crystals of uranium-potassium sulphate after being exposed to light could be wrapped in paper and would affect a photographic plate, showing that these crystals emitted rays which could pass through paper. He also found that rays which would pass through opaque substances were emitted, even if the crystals of uranium potassium sulphate were not previously acted upon by

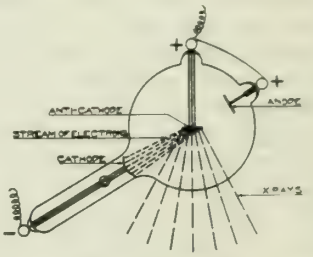


Figure No. 10

light. Thus was radio-activity discovered. Later Madame Curie, one of Becquerel's pupils, found that the degree of radio-activity was proportional to the amount of uranium in the compound. She then found that certain ores of uranium were more strongly radio-active than pure uranium, and from these ores she separated by chemical analysis a number of substances much more strongly radio-active than uranium, the most important of which was radium.

Radio-Activity brings the Existence of Atoms to our attention

The mechanism of radio-activity was discovered by a professor at a Canadian university. Sir Ernest Rutherford formerly MacDonald professor of Physics at McGill University has probably done more than any other one man to develop our present conceptions of atomic structure In 1899 he discovered that there were two different kinds of rays emitted from radium and later discovered a third kind. These he called alpha, beta and gamma rays. He found that the alpha rays were slightly deviated in one direction by a magnet, the beta rays were deviated in the opposite direction but more strongly and the gamma rays not at all. There is also a difference in their power of passing through opaque substances. It is now known that alpha rays are the positively charged particles which form the nuclei of atoms of helium gas and are now usually called alpha particles, beta rays are electrons, and gamma rays are a kind of rays differing only from ordinary X-rays in being of shorter wave-length. Radio-activity is the breaking up of atoms and the formation of new atoms. It appears that the atoms of certain substances are very unstable. An alpha particle or an electron flies out of the nucleus of the atom, and an entirely different substance is formed. In this way uranium after several intermediate changes turns into radium, which in its turn changes into other substances by stages, finally becoming lead which is very stable.

These changes which have been observed in the laboratory have been confirmed by the finding of helium gas and radium in uranium minerals. I shall have occasion to speak of these changes later in more detail, but for the present they have been brought in to show the complex structure of the atoms of certain elements and the fact that they emit electrons, and alpha particles, that is to say positively charged helium atoms.

Very definite evidence of the emission of alpha particles by radium was given by a simple piece of apparatus devised by Crookes and called by him the spinthariscope. A very minute speck of radium on the tip of a needle "R" (see figure No. 11) is held near a zinc sulphide screen "S". Alpha-particles from the radium striking

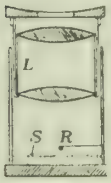


Figure No. 11

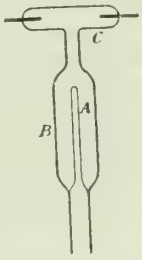


Figure No. 12

on the zinc sulphide screen gave a flash at every impact, and these flashes were observed by the low power microscope "L". In a somewhat similar apparatus the helium gas given off by the radium was collected and measured, and by counting the number of flashes on the zinc sulphide screen it was possible to determine the number of alpha-particles, hence the number of atoms in a cubic centimeter of helium gas at standard temperature and pressure. The number of molecules in a cubic centimeter at the same pressure and temperature is the same for all gases. The number of molecules in a cubic centimeter of a gas at standard temperature and pressure is called Avogadro's number. Avogadro's number as found by counting the flashes of alpha-particles on a zinc sulphide screen agrees very well with the number found by other methods. It is equal to twenty-seven million million million.

The enormous number of atoms in a cubic centimeter however gives us no conception of the minuteness of the nucleus. Rutherford has been able to prove in a very simple way that the alpha-particle is much more minute than the helium atom and that it can shoot through glass, right through the atoms themselves. This experiment confirms the identity of alpha-particles as positively charged helium atoms. In other words it shows that the alpha-particle is a helium atom lacking its two outer electrons. A discharge tube of the form shown in figure No. 12, had sealed into it a very thin walled glass tube A. Helium gas was admitted to the inner tube and allowed to stand for several hours. A discharge was then passed between the terminals of the discharge tube and examined with a spectroscope and helium was found to be absent, showing that helium gas could not pass through the thin wall of tube *A* into tube *B*. Niton, a gas which is radioactive emitting alpha particles, was then admitted to the inner tube *A*. After awhile a spectroscopic examination of the discharge showed helium gas to be present. We see therefore, that while uncharged helium atoms could not pass through the thin walled glass tube into the discharge tube, the alpha particles shot out from niton gas with a velocity of 18,000 miles a second or go through the glass easily, passing either between the atoms of glass, or more probably shooting straight through the glass as if the atoms were not there. A better understanding of this experiment may perhaps be obtained from the results of an experiment of C. T. R. Wilson's, in which alpha particles were shot right through the atoms of ordinary air. We have already seen that air is ionized or broken up into electrons and charged atoms by the passage of X-rays. (see figure No. 7). Alpha particles produce the same result. Swift alpha particles from radium C, are

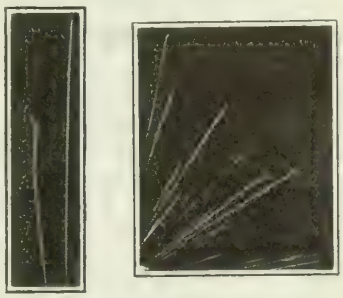


Figure No 13.

shot through moisture laden air, while a sudden expansion is produced, and a fine line of water drops marks the passage of each alpha particle. The alpha particle moving with an immense speed, knocks electrons loose from the atoms of air which it encounters, the resulting ions serving as condensation nuclei. (see figure No. 13).* These trails are sometimes as long as 4½ inches. The alpha particle goes in a straight line through the atoms, knocking out electrons. However, near the top of the shorter one in the picture at the right (figure No. 13) there is a sharp bend due to an encounter between the alpha particle and the nucleus of the atom. There is also a very slight bend shown, due to the alpha particle having come so close to the nucleus of one of the atoms that it is slightly deviated from its course. It is somewhat similar to what happens when a comet comes through our solar system. We may consider the nucleus as similar to a sun having electrons revolving around it like a number of planets. When a

Figure No. 14

comet comes through our solar system it may be only slightly deviated from its course or it may be shot back in a direction nearly parallel to the line along which it approached the solar system. Figure No. 14 shows the path of an electron shot through the air. In this case the projectiles being much lighter than in the case of the alpha particle the line is no longer a straight one.

*It may be of interest to call attention here to an apparatus invented by a Japanese named Shimizu which shows this experiment objectively. One of the Shimizu equipments has recently been installed in the physics department of McGill University, where it has been on exhibition.

(This paper will be concluded in the June issue of The Engineering Journal.)

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VOL. VI May 1923 No. 5

Ontario Professional Association.

In this issue of *The Journal*, under "Other Societies News," will be found some valuable information regarding the Association of Professional Engineers of the Province of Ontario, and also a strong request from the president, backed by the board of what is called the civil section, calling upon all members of *The Institute* in Ontario to become registered under the act.

As previously mentioned, to be of any effect, registration must be uniform and universal, and the only way that this can be accomplished is by all members joining hands to give it a fair trial.

To the very slight powers granted by the act in Ontario is no doubt due a great deal of the indifference to registration in that province, and it is only by combining and all registering that an act may be secured conforming more definitely to the acts in the other provinces. Those responsible for the carrying out of the act are very anxious that all members should register, and they deserve every support in realizing that ambition.

Canadian Engineers in the War

Every Canadian engineer will feel a thrill of pride and satisfaction on hearing that definite arrangements have been made whereby a complete history of the noble and wonderfully effective part played by our Canadian engineers in the Great War, is to be published as a volume of the general history of the war now being compiled under the direction of the Federal government. Following some correspondence with Colonel A. F. Duguid, D.S.O., A.M.E.I.C., in charge of the historical section of the general staff of the department of national defence, under whose direction the history is being prepared, the Council of *The Institute* placed the matter in the hands of a special committee under Brig.-Gen. Charles J. Armstrong, C.M.G., M.E.I.C., chairman of the Honour Roll and War Trophies Committee of *The Institute*.

The whole profession owes a debt of gratitude to General Armstrong for the result of his splendid efforts in this connection, the thanks and appreciation of Council being expressed to him at the meeting held on April twenty-third, at which time General Armstrong's letter of April fourteenth was presented to Council. Inasmuch as General Armstrong's letter to the Secretary gives full details of this welcome news, it is published herewith.

Dear Sir, 14th April 1923.

With reference to your letter dated the 21st February, 1923, and further to my reply of the 5th March, I have now received replies from some seven or eight of the senior officers of the Canadian Engineers to whom I wrote for their remarks and suggestions. They are unanimous in their opinion that the general history of the Canadian Army during the late war, now being compiled, could not possibly record fully or adequately the work of the Canadian engineers and the engineering services, and that a more detailed account should be written to form part of the general history. In this I concur.

We all greatly appreciate the interest which the Council of *The Institute* has taken in this direction and during the week while in Ottawa, I had an opportunity of putting the whole matter before the authorities of the department of national defence. I may say that they at once assured me they were in full sympathy with the ideas of *The Institute* with whom they would be very glad to co-operate.

After going into the question thoroughly, the department finally decided to undertake the preparation and publication of a separate history of the work of the Canadian engineers, the cost to be borne by the government.

This history, it is proposed, should form a volume of the general history and would be compiled much on the same lines as the History of Work of the Canadian Army Medical Corps during the late war.

The name of Colonel Alex. MacPhail, C.M.G., D.S.O., LL.D., late C.R.E., Canadian Engineers, and a member of *The Institute*, was suggested as a most suitable officer to write the history and it is expected that he will be invited to do so.

I might add that Colonel MacPhail has intimated that he would be pleased to undertake the work if invited.

I trust that the decision of the department will meet the approval of the Council of *The Institute*.

Yours very truly,

CHARLES J. ARMSTRONG, M.E.I.C.,
Brig.-Genl.,
Commanding Military Dist. No. 4.

American Society of Mechanical Engineers

Spring Meeting — Montreal, May 28-31, 1923

Definite plans are being made by the executive committee of the Montreal spring meeting of the American Society of Mechanical Engineers, to be held at the Mount Royal Hotel from May 28 to 31. This will be the first meeting in Montreal of the American Society of Mechanical Engineers, and it is expected that about 600 delegates will be in attendance from all over the continent, including several engineers of world-wide reputation. At the invitation of the A.S.M.E., the *Engineering Institute of Canada* is co-operating in arrangements for the convention and the Montreal Branch is taking charge of arrangements for the local meetings.

On the opening night of the convention the council of the A.S.M.E., will be entertained to a dinner at the St. James Club by the council of *The Engineering Institute of Canada*. On the following evening, the 29th, the Montreal Branch will tender a complimentary smoking concert at the Mount Royal Hotel to the delegates.

The Montreal committee in charge of the arrangements is composed of: H. H. Vaughan, M.E.I.C., chairman; J. A. Duchastel, M.E.I.C., vice-chairman; Fraser S. Keith, M.E.I.C., secretary and Messrs. Fred. B. Brown, M.E.I.C., John T. Farmer, M.E.I.C., George R. McLeod, M.E.I.C. and Major C. M. McKergow, M.E.I.C. This group comprises the chairmen of the various committees who are taking charge of arrangements for the convention, with other members of the Montreal Branch.

The work of the convention itself will be largely of a technical nature. In addition to the general sessions on the opening day, there will be technical sessions on the following days devoted to the following subjects: Power, textiles, machine shop practice, management applied to the pulp and paper industry, port development, fuels, railroads and general mechanical engineering, with papers by experts in these lines from all over the continent.

Programme Includes Many Excellent Technical Papers

A feature of the technical programme will be the paper on Tuesday morning on hydro-electric development, by Julian C. Smith, M.E.I.C., vice-president and chief engineer of the Shawinigan Water and Power Company, who will speak on the power developments in the province of Quebec, and Fred Gaby, M.E.I.C., chief engineer of the Hydro-Electric Power Commission of Ontario, who will discuss the progress of that work.

The second session on power will have two papers, one by H. G. Acres, M.E.I.C., hydraulic engineer of the Hydro-Electric Power Commission of Ontario, on "Modern Hydro-Electric Turbines of Large Capacity," and Payne Dean, Stamford, Conn., on "Sectionalization of Remote Control of High Pressure Steam Lines."

It is planned by a large number of the delegates to come to Montreal by automobile. Following the convention, excursions have been planned to visit the power developments and paper mills on the St. Maurice river, at Grand'Mere and Shawinigan Falls. Visits will be made to the plants of the Laurentide Company and the Laurentide Power Company at Grand'Mere, and at Shawinigan Falls the plant of the Shawinigan Water and Power Company will be inspected, as well as the other industries at that hydro-electric centre.

Local excursions have also been planned, with visits to the Dominion Engineering Works, McGill University, the Art Gallery, Mount Royal Park and a trip down the rapids. A ladies' committee has also been organized with Mrs. Frederick B. Brown as chairman, to arrange a programme of entertainment for the ladies of the party.

The complete programme as at present arranged is as follows.

MONDAY, MAY 28

Morning: (Morning sessions at 9.30)
Council Meeting.

Afternoon:
Business Meeting.
Address by CALVIN W. RICE, Secretary A.S.M.E., on his South American Trip.
Public Hearing on Power Test Codes.

Evening:
Joint Dinner, Council of *Engineering Institute of Canada* and Council of American Society of Mechanical Engineers.

TUESDAY, MAY 29

Morning:

POWER

Power Development in the Province of Quebec, JULIAN C. SMITH, M.E.I.C
The Development of Hydro-electric Power Plants in Ontario, FREDERICK A. GABY, M.E.I.C.

MANAGEMENT

Management Engineering as Applied to the Pulp and Paper Industry, R. B. WOLF.
A Practical Laboratory and Drawing Room Course in Industrial Engineering, M. A. LEE.

RAILROAD

Steel Car Construction at the Angus Shops, Canadian Pacific Railway, H. R. NAYLOR.
Notes on Some Recent Developments in Railway Motor Cars. C. E. BROOKS.

Afternoon:
Excursions.

Evening:
Smoking Concert. Montreal Branch, *Engineering Institute of Canada.*

WEDNESDAY, MAY 30

Morning:

TEXTILES

Bleachery Engineering and Operation, F. P. BASCOM and J. C. MCDOWELL.

PORT DEVELOPMENT

Port Development, R. S. MACELWEE.
Harbor of Montreal, FREDERICK W. COWIE, M.E.I.C.

POWER

Modern Hydraulic Turbines of Large Capacity, H.G. ACRES, M.E.I.C.
Sectionalization and Remote Control of High-Pressure Steam Lines, PETER PAYNE DEAN.

Afternoon:
Excursions.

Evening:
Dinner Dance.

THURSDAY, MAY 31

Morning:

MACHINE SHOP

Recent Developments in Balancing Machines, CARL R. SODERBERG.
Machine-Tool and Paper Industry, G. E. WILLIAMSON.

FUELS

Chimney Design, A. COTTON.
Lignite Char, O. P. HOOD.

GENERAL

Endurance Test Data and Their Interpretation, K. HEINDLHOFER and H. SJOVALL.
Bending Stresses in Curved Tubes of Rectangular Cross-Section, S. TIMOSHENKO. (By title.)
Control of Flying (Contributed by Aeronautic Division)

Afternoon:
Excursions.

THIS MONTH'S CONTRIBUTORS

The Principles of Three-wire Distribution for Electric Railways

W. Nelson Smith, M.E.I.C., winner of the Plummer Medal for the year 1922, has contributed another valuable paper, entitled The Principles of Three-wire Distribution for Electric Railways, which appears in this issue of *The Engineering Journal*.

Mr. Smith was born in Brattleboro, Vt., in 1868, and graduated in electrical engineering from Sibley College, Cornell University, in 1890, with the degree of mechanical engineer. His earliest electric railway experience was as a workman with the Thomson Houston Electric Company, predecessor of the General Electric Company, in building and equipping trolley lines in the early days of the change from animal and cable to electric power. He was with the Westinghouse field organization, equipping the first trolley lines of the Chicago City Railway in 1893, and was the first electric car repair foreman employed by that company. From 1894 to 1897 he was assistant, and later electrical engineer of the New Orleans Traction Company. After spending a year as draughtsman at the General Electric works in Schenectady, he joined the staff of Westinghouse-Church-Kerr and Company in New York, in 1899, later becoming electric traction engineer of that organization. For nearly thirteen years he handled the power equipment engineering for all the heavy electric railway construction executed by that company, including a number of the earliest and longest interurban railways in Pennsylvania, Ohio and Michigan, the Long Island Railroad electrification (the pioneer of all suburban heavy steam railway electrification) the Erie Railroad Rochester Division electrification, and the Denver and Interurban electrification, all of which included considerable pioneer work in the electrification of steam railroads. During 1904 he was connected in an advisory capacity with the Electric Railway Test Commission at the time of the St. Louis Exposition, and devised the dynamometer method of determining the atmospheric resistance of car bodies at various speeds, which was successfully used in the tests. He also devised a formula for electric train resistance, which coincided so closely with observed facts that it has been published in a number of electric railway handbooks. In 1912 he was consulting engineer of the Washington and Old Dominion Railway during the electrification of a fifty-two mile steam railroad running from Washington into northern Virginia. In 1913 he was with the Boston Edison Company, and in 1914 with the San Francisco Oakland Terminal Railway, on trolley feeder rearrangement, power equipment determinations, and appraisal work. In 1916 and 1917 he was efficiency engineer of the American Agricultural Chemical Company, on steam plant improvements and process development work. In 1918 he was at Vancouver, B.C., for several months with the S. E. Junkins Company on an important railroad power survey, and since June 1918, has been consulting electrical engineer of the Winnipeg Electric Railway Company, in charge of electrolysis mitigation, appraisal work, steam plant improvements, and such other special engineering assignments as circumstances have required.

Mr. Smith joined the American Institute of Electrical Engineers in 1902, and *The Engineering Institute of Canada* in 1919, and in 1922 was elected a Fellow of the Royal Society of Arts, of London.

PERSONALS

N. MacNicol, S.E.I.C., of Toronto, has just been appointed engineer for the township of Etobicoke.

A. G. McCrudden, Jr.E.I.C., has been transferred from Montreal to the Ottawa office of the Department of Soldiers Civil Re-establishment.

A. Gillies, A.M.E.I.C., is acting superintendent of the Dominion Mines and Quarries Limited at their Killarney Quarries.

G. D. O'Connor, Jr.E.I.C., has been appointed assistant to the city manager and engineer of Niagara Falls, Ontario.

G. R. Doull, Jr.E.I.C., of the engineering department of the Canadian National Railways, on the design, detailing of bridges, buildings, wharves, has been transferred from Toronto to Montreal.

J. H. Holliday, M.E.I.C., formerly of the Bedford Construction Company, Halifax, Nova Scotia, has given his present address as the Colonial Surveyor's Office, Bermuda.

J. R. Cooper, S.E.I.C., is with the Peruvian Corporation, Limited, Lima, Peru, South America. Mr. Cooper was taking the engineering course at McGill University when he received his recent appointment.

M. J. MacMillan, Jr.E.I.C., has accepted a position with the firm of Arnold Rooch and Hartline, New Philadelphia, Ohio. Previous to this appointment Mr. MacMillan was with the American Coal Company of West Virginia.

John C. O'Donnell, A.M.E.I.C., who for the past three years has been engineer for the Jos. Gosselin Company, Limited, general contractors of Quebec, has accepted a position with the department of Public Works and Labour, as maintenance engineer.

Edwin J. Beugler, M.E.I.C., vice-president of the Foundation Company, New York City, has announced the opening of an office at Cheshire, Connecticut, as a consulting engineer on railways, water powers, foundations, examination and reports.

R. Jack Grant, A.M.E.I.C., who for the past four years has been connected with the firm of Frank Barber and Associates, Limited, is now assistant to the engineer of York township. Mr. Grant was for some years on the engineering staff of the city of Toronto as resident engineer on sewer construction.

E. L. Zealand, S.E.I.C., has accepted an appointment with the Quebec Development Company at St. Joseph d'Alma, Lac St. Jean. Mr. Zealand is a graduate of the University of Toronto and was recently inspector and instrument man on the Bruce division of the Canadian Pacific Railway Company located at Erin, Ontario.

P. E. Rosenorn, A.M.E.I.C., has accepted a position with Price Bros. and Co., Ltd., at Chicoutimi West, Quebec.

J. R. Bradfield, S.E.I.C., is plant engineer for the Acme Cement Corporation, at Catskill, N.Y., having received his appointment in March last. Mr. Bradfield graduated in civil engineering from McGill University in 1922.

Capt. W. A. Irvine Grim, M.E.I.C., has returned to Mexico and is with the Pan American Petroleum and Transport Company, at Tampico, Tamps. Capt. Grim has already spent some time in Mexico having been connected with the United Sugar Companies in 1920.

K. E. Whitman, A.M.E.I.C., is with the Nova Scotia Power Commission on work at Lochaber Mines, Halifax County. Mr. Whitman was for a time instructor in surveying, structural drawing and design at the Nova Scotia Technical College for the Department of Soldiers' Civil Re-establishment.

Leon S. Tuck, A.M.E.I.C., is mill engineer with the Pejepscot Paper Company of Brunswick, Maine, Mr. Tuck graduated from the University of Maine in 1913 and was on the staff of the reclamation service of the United States for two years, later accepting the position of assistant engineer with Price Brothers at Kenogami, Que.

D. O. Lewis, M.E.I.C., announces that he has severed his connection with the Engineering Corporation, Ltd. of Vancouver, B.C., and will in future engage in a civil engineering practice, specializing in railways, wharves, timber and concrete structures, and the mechanical handling of materials.

O. S. Finnie, B.Sc., D.L.S., M.E.I.C., chairman of the Ottawa Branch, is director of the North West Territories and Yukon Branch of the Department of the Interior, which branch has recently issued an interesting booklet entitled "Manual for Operators under Oil and Gas Regulations."

H. S. Van Scoyoc, M.E.I.C., has been chosen first president of the newly formed Canadian Advertising and Sales Association. Mr. Van Scoyoc is president of the Association of Canadian Advertisers, the Montreal Publicity Association and vice-president of the Associated Advertising Clubs of the World.

L. Adrien Dubreuil, A.M.E.I.C., of the engineering department of the Quebec Streams Commission is located at Chicoutimi, Quebec. He graduated from the Laval University in '16, and was appointed assistant engineer with the Streams Commission on survey work of flooded lands in the upper St. Maurice storage reservoir district and was later transferred to construction work of the La Loutre dam on the St. Maurice river.

J. L. Busfield, M.E.I.C., of the firm of Beaubien, Busfield and Company, consulting engineers, Montreal, has left for Jamaica, British West Indies, in connection with the hydro-electric development work, undertaken by the firm for the West India Electric Company. F. E. Hawker, S.E.I.C., has also left for the south, having been appointed assistant engineer, in connection with the same work.

Lt.-Col. H. L. Trotter, M.E.I.C., and C. L. Cate, A.M.E.I.C., civil and electrical engineers, Montreal, have announced that they have associated themselves with Henry Holgate, M.E.I.C., consulting engineer. Lt.-Col. Trotter is a graduate of the Royal Military College of the class of '03 and has had extensive experience on construction work particularly in connection with power development. Mr. Cate graduated from the McGill University in '09 and has since been actively engaged in electrical engineering work.

O. M. Falls, A.M.E.I.C., of Toronto, was recently appointed assistant to the engineer of York township. Mr. Falls has, during the past year been secretary-treasurer of the Toronto Branch of *The Institute*, and was until his recent appointment on the engineering staff of Frank Barber & Associates, Limited. He is a graduate of the University of Toronto of the class of '14 and since graduating has had considerable experience on road construction and concrete bridge design.

J. A. S. King, A.M.E.I.C., until recently assistant engineer for the Ottawa Suburban Roads Commission, is now with the Dominion Development Corporation, Limited, at their Hamilton, Ont., office. Mr. King is a graduate of the school of Mining, Queen's University, of the class of '09, and the following year was assistant in the mineralogy department of that university. Subsequently he was engaged on topographical survey work for a number of years, having been commissioned a Dominion Land Surveyor.

F. C. Mechin, A.M.E.I.C., has been transferred from the Halifax refineries of the Imperial Oil, Limited, where he was superintendent for the company, to Montreal, and has assumed charge of the large refinery in Montreal East in the capacity of superintendent-in-charge. Mr. Mechin graduated with honours from the University of Toronto in 1914, and joined the staff of the Imperial Oil, Limited in April, 1916, as first assistant to the chief engineer and superintendent of construction on the construction of the refinery at Montreal East. Upon his return from overseas he was placed in charge at Halifax where he remained until his recent promotion.

The following appointments of interest to the members of *The Institute* have been announced by the Canadian National Railways:— S. J. Hungerford, M.E.I.C., vice-president of the Canadian National Railways, Montreal, Que. C. B. Brown, M.E.I.C., chief engineer operating department, all lines, Montreal, Que. F. L. C. Bond, M.E.I.C., regional chief engineer, central region, Toronto, Ont. W. R. Devenish, A.M.E.I.C., general superintendent, Northern Ontario district, central region, Toronto, Ont. M. H. McLeod, M.E.I.C., consulting officer to the executive, Montreal, Que. C. S. Gzowski, M.E.I.C., chief engineer construction department, all lines, Montreal, Que.

Thos. H. Fenner, A.M.E.I.C., has been appointed chief engineer and manager of the boiler department of the General Accident Assurance Company of Canada, with headquarters at Toronto. Mr. Fenner obtained his early training as an engineer in England, and later spent some seven years at sea as engineer on ocean going vessels, obtaining the Board of Trade certificate of extra first class engineer. He has had some sixteen years in Canada, eight of which were spent as engineer in charge of various industrial plants, four years as inspecting engineer for this company in the province of Quebec, and four years as editor of an engineering journal, the "Power House."

W. L. McFaul, A.M.E.I.C., deputy city engineer of Hamilton, Ontario was recently appointed city engineer of that city. In his former position he had charge of all the engineering work of the department including waterworks, bridges, roadways, sidewalks and sewers. On graduating from the University of Toronto in 1913, he became assistant engineer in the city engineers department at Port Arthur. A year later, as assistant city engineer of Sault Ste. Marie, he was placed in charge of all outside work on roadways, sewers, sidewalks and bridges. In September 1916, he was appointed city engineer at the Soo, which position he held until June 1921, except during the period of his overseas service.

C. E. MacDonald, A.M.E.I.C., has left Toronto for Morris Town, N.J., U.S.A., where he has been appointed sales manager of the Electric Alloy Co. Mr. Macdonald graduated with the mining class of '18 from the University of Toronto and was appointed vocational officer on the mining and metallurgical industry in Canada with the Department of Soldiers' Civil Re-establishment. Subsequently he was sales engineer with the International Nickel Company of Canada and later opened an office in Toronto as representative sales engineer. Mr. Macdonald was secretary of the University of Toronto Engineering Alumni Association and as such devoted a great deal of his time to the organizing of the Engineering Association's re-union for

the past few years. As an appreciation of his services he was recently tendered a complimentary banquet on the occasion of his departure from Toronto.

Appointed City Engineer, London, Ont.

W. P. Near, M.E.I.C., has been appointed city engineer of London, Ontario, having resigned his position as city engineer of St. Catharines, Ontario. Mr. Near is a graduate of the University of Toronto, from which he received his degrees of B.A., in 1903 and B.Sc., in 1907. Mr. Near's municipal engineering dates from 1909 when he joined the staff of the city engineer's department, Toronto, and for the following four years he was engaged chiefly on the construction of trunk sewers in that city. On January first, 1913 he was appointed city engineer of the city of St. Catharines, Ontario.

W. P. NEAR, M.E.I.C.

R. O. WYNNE-ROBERTS, M.E.I.C.

Institute Members Enter Consulting Practice

R. O. Wynne-Roberts. M.E.I.C., and his son L. W. Wynne-Roberts, A.M.E.I.C., recently opened an office at 88 Church street, Toronto, as consulting engineers in connection with municipal and general engineering.

Mr. R. O. Wynne-Roberts was originally trained as gas engineer, but in 1882, he accepted an opportunity to take work as a municipal engineer, and from that date on to the present he has continued to be associated with all kinds of municipal enterprises, including gas. In 1889, he was appointed as borough water and gas engineer in Carnavon; in 1894 he became borough water engineer of Oswestry, and in 1898 he was appointed city water engineer of Capetown. In 1907 he retired from the latter office to practise as consulting engineer in London, and later on he was appointed consulting engineer to the city of Regina, Sask. When the government put a restriction on capital expenditures in the country in 1915, he decided to move to Toronto, and since that date has been practising as consulting engineer in the city of Toronto. Part of the time he associated with Frank Barber, M.E.I.C., and with Horace L. Seymour, A.M.E.I.C.

In Oswestry Mr. Wynne-Roberts received considerable prominence owing to the interesting development which took place in connection with bacteriological treatment of sewage — over one hundred deputations waited upon him to study the experiments he had been conducting. In Capetown, in addition to other works he was engaged in the investigation of ten separate water schemes, having an aggregate estimated cost of one hundred million dollars. In London he was twice appointed by the British government to conduct important arbitrations connected with street railways. In Regina he was instrumental in placing the city in full water supply compared with a precarious limited supply which previously prevailed. He was also retained as consulting engineer by the Saskatchewan government to investigate and report on the development of power from the extensive lignite fields in that province. In Toronto Mr. Wynne-Roberts carried out a water scheme for the township of York involving an expenditure of over three million dollars. He also prepared a report on the preliminary design of sewage schemes by the same authority, which when undertaken will involve many millions of dollars. He was also engaged by the Ontario government to advise the Housing Commission in connection with the housing schemes in the various parts of the province. He is now engaged upon important appraisal of the Union Natural Gas Company's properties extending from Chatham to Windsor and Sarnia, and many other places. This appraisal is to be an independent one, conducted for the government.

Mr. Wynne-Roberts has been one of the founders of two or three engineers societies; is a member of *The Engineering Institute of Canada*, the American Society of Civil Engineers, the Institution of Civil Engineers, and other societies. He was chairman of the Toronto branch in the years 1919 to 1921 during which period the E.I.C. held its annual meeting in Toronto. He is also a councillor of *The Engineering Institute of Canada.*

L. W. Wynne-Roberts, A.M.E.I.C., was for a time connected with the board of Highway Commissioners of the Saskatchewan government as assistant engineer on the designing and constructing, timber, steel and reinforced concrete bridges and in 1916 he joined the Royal Engineers having served abroad in Mesopotamia, India and Persia. Mr. Wynne-Roberts received the degree of B.Sc., from the University of London, England.

EMPLOYMENT BUREAU AND MEMBERS' EXCHANGE

Situations Wanted

Electrical

Third-year student in electrical engineering at McGill University desires summer employment preferably on hydro-electric work; holds a Nova Scotia third class stationary engineer's certificate and has had four summers' experience on repair and construction work. Apply box 91-W.

Mechanical

Student member of *The Institute*, graduating in mechanical engineering from McGill this year, desires a position either on mechanical or general construction work. Experience on building construction. Apply box 99-W.

Civil Engineer

Civil engineer A.M.E.I.C., with long and varied experience in railroad work, building, municipal works, desires position. Speaks both English and French. Moderate salary. Apply box 106-W.

Situations Vacant

Civil Service of Canada

Assistant Superintendent of Forest Products Laboratories—$2,880

5239. An Assistant Superintendent of Forests Products Laboratories, Forestry Branch, Department of the Interior, Montreal, Que., at an initial salary of $2,880 per annum which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $3,360 has been reached.

Engineers, Mines Branch (Grade 2)—$2,100

5241. Two engineers, Mines Branch (Grade 2), Department of Mines, Ottawa, one in the Division of Mineral Resources, and one in the Division of Ceramics and Road Materials, at an initial salary of $2,100 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,580 has been reached. This salary will be supplemented by whatever bonus may be provided by law.

Engineers, Mines Branch (Grade 1)—$1,680

5242. Engineer, Mines Branch (Grade 1), Mineral Resources Division, Department of Mines, Ottawa, at an initial salary of $1,680 per annum, which will be increased upon recommendation for efficient service at the rate of $120 per annum, until a maximum of $2,040 has been reached. This salary will be supplemented by whatever bonus may be provided by law.

General Directions

Application forms properly filled in must be filed in the office of the Civil Service Commission *not later than May 10th.* Application forms, with full details as to duties and qualification required, may be obtained from the offices of the Employment Service of Canada, from the Postmasters at Prince Rupert, Vancouver, Victoria, Edmonton, Calgary, Regina, Winnipeg, Quebec, Charlottetown, Halifax, Fredericton and St. John, or from the secretary W. Foran, of the Civil Service Commission.

Mechanical Engineer

A firm in Ontario requires the services of a mechanical engineer with some experience in mechanical draughting and designing for a period of three or four months with a possibility of permanency. Apply with full qualifications to box 34-V.

Mechanical Draughtsman

An Ontario firm requires the services of a mechanical draughtsman with some knowledge of Interprovincial Boiler Regulations. Apply box 35-V.

Members' Exchange

Transit for Sale

Six-inch transit by Watts, London, fully equipped, good condition price one hundred and fifty dollars cash. Apply box No. 3-E.

Transit and Level for Sale

For sale, one Cooke Canadian patern transit, and one Wye-level in good condition; can be seen at Resident Engineer's office, 451 Lagauchetière St., Montreal.

BRANCH NEWS

Victoria Branch

Hugh Peters, A.M.E.I.C., Secretary.

"On Saturday afternoon, March 24th, about a dozen members of the branch visited the plant of the Victoria Gas Company at the invitation of F. H. Hewlings, the superintendent, who personally conducted the party over the works and explained the mechanical arrangements for the process of manufacture.

The coal is delivered on scows which are unloaded by derrick, delivering to an ingenious travelling buggy which permits the coal to be dumped over a long storage area. This area is served by an underground belt conveyor which carries the coal to the retort building, and transfers it to a bucket conveyor, which hoists it to the top floor of the building. Here it is fed to the vertical retorts and emerges as coke at the ground floor. the gas values having passed to the purifiers. The feeding and discharging of the retorts is thus a continuous process.

Those present were keenly interested in this method of operation which eliminates all heavy manual labour and expressed their appreciation of the opportunity to inspect this very modern plant. Mr. Hewlings was sincerely thanked by all for his courtesy and trouble in arranging so interesting an inspection of his plant."

St. John Branch

Harry F. Bennett, A.M.E.I.C., Secretary-Treasurer.

"Testing Laboratory Results and their Application to Practical Problems" was the subject of a paper read before the St. John Branch on March 15th, by Professor John Stephens, M.A.I., dean of the engineering faculty of the University of New Brunswick. Professor Stephens did not go into the details relating to the methods of testing and the making of standard specifications but rather discussed some points gleaned from his experience showing the natural limits in the condition of materials, the practical reasons for the recognition of these limits, and their importance in the rational evaluation of factors of safety.

Taking soft steel as a material for discussion, it was shown by results of tests that the method of manufacture, the composition, the heat treatment, the mechanical treatment, etc., all introduce so many variable factors that a complete, rational, and practical system of testing is still to be found. By the use of graphs and test pieces, the speaker showed the members how each of these factors gave a variable result in the tests. Speaking of the use of steel in moving machines, Professor Stephens said, — "It has been for some time the practice to design shafts for high speed machines, such as turbo-generators, on a basis of ratio of resilience to the maximum value of the work stored per unit volume in the material when in motion — a method which is excellent in that it leads to low stresses. However, anyone familiar with the above class of work will admit that a liberal use of well designed flexible couplings is to be preferred to any hypothesis about resilience no matter how well it may be backed by experimental results".

At the conclusion of the paper considerable discussion took place. A vote of thanks to the speaker was moved by Geoffrey Stead, M.E.I.C., and seconded by W. J. Johnston, A.M.E.I.C.

The following committee was appointed as a general committee, Maritime professional meeting 1923. — F. G. Goodspeed, M.E.I.C., (chairman), Alex. Gray, M.E.I.C., G. G. Hare, M.E.I.C., C. C. Kirby, M.E.I.C., S. R. Weston, A.M.E.I.C., W. R. Pearce, M.E.I.C., F. P. Vaughan, M.E.I.C., G. G. Murdoch, M.E.I.C., and D. L. Hutchinson.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

An interesting development that has come as a result of the branch's activities in regard to the coal situation is the fact that the recently formed Fuel Investigation Committee has been requested by the Senate and House of Commons of Canada to send a representative to Ottawa to give evidence before these bodies on the very important question of coal supply for this country. It is evident that the decision of the branch to take part in public affairs has been recognized as a worthy one if we are to judge by the immediate recognition given our body by those in a position to judge of the valuable service that engineers are in a position to give on many important subjects.

In furtherence to the adopted policy of the branch for this year, another important question is being considered and that is "Transportation Routes in Canada" concerning which a paper was read on the 19th instant by Frederick W. Cowie, M.E.I.C.

Automatic Telephony

A most important and timely lecture was given on March 15th by Messrs. C. D. Schnebly and N. Knight. The former dealt with the design and construction of automatic telephones and the latter made known the problems that were met with in their operation. It is interesting to note the history of the automatic phone and it was a surprise to many to learn that it was due to the exigency of an undertaker's business that automatic equipment came into being.

A glimpse into the future was given by Mr. Knight who predicted that the time is coming when an operator in a distant city will be able to dial direct into another city without the aid of an intervening operator. What would happen if two subscribers each called the other at the same instant, would be that each would find a "busy line". Rather, to use some of the information gleaned from Mr. Schnebly's paper, each would receive a "busy tone", it appearing that the present "dash-dot relay," which gives that signal will be replaced by apparatus giving a different sound. It also appears that there is no limit to the automatic and that exchanges can be located in proximity to each other. For instance, it was stated that while Toronto will eventually have twenty-five offices, only seven offices locations will be required, it being possible to place an average of four offices in each building. Many numbers will have to be changed under the new system. The dial cannot distinguish between units and hundreds so that all numbers below 1,000 will require cyphers in front. As an example 27 under the present system will become "0027," and 326 will become "0326."

The expenditure involved by the change was indicated by the statement that the transfer of a manual exchange to an automatic exchange of the type required in Montreal and Toronto will represent between $1,000,000 and $2,000,000 apart from land and building. The system now being installed in Montreal and Toronto is known as the "step-by-step" type which will take care of all the various forms of service now in use. Much equipment will have to be scrapped, but it was stated that extensive studies of the problems involved showed that by the adoption of the automatic service economies would be effected, although it would require some time before they will be felt. "The automatic service has come to stay until something better is invented," said Mr. Knight. However, it requires a staff of highly trained technicians to install and maintain the automatic service, the maintenance staff being a development of the new methods.

Electrical Construction Work

F. H. Farmer, M.E.I.C., construction superintendent of the Canadian Westinghouse Company gave a highly interesting address on March the 22nd accompanied by numerous lantern slides in connection with "The practice of engineering in the field". The speaker has been engaged for about twenty years in this line of work and his reminiscences of various large and small electrical installations proved amusing and instructive. He had a large number of slides dating back as far as 1900 and they proved very interesting as a comparison with work depicted on those of more recent date.

Engineering Features of the Rubber Industry

On April 5th, W. E. Henthorne of the Canadian Consolidated Rubber Company gave a talk on the above subject in which he made known the relation that engineering bears to this most important industry. At the outset Mr. Henthorne pointed out that rubber is not manufactured in a rubber factory, but the gum or crude rubber is imported from Ceylon, Straits Settlements and Brazil. Articles of rubber might be classified as tires, footwear, coats, druggists' sundries, mechanical goods and miscellaneous, this classification giving a general indication of the kind of rubber factories now operating in Canada. No single factory made all kinds or classes though a company operating a number of factories might. Manufacturing equipment was noticeably different, all such machinery being special. Little if any of it would be found elsewhere.

Illustrations of the heavy machinery used in a rubber plant, coupled with the details given by the speaker, emphasized what a large amount of power is required for the operation of such factories. Great strides has been made in the improvement of this machinery. For instance, the mill, which was described as the backbone of the plant, now carried a safety cross bar which, if a little more than touched, opened the clutch circuit, the brake automatically engaged and the mill came to rest almost instantaneouly. "Contrast this with the old days," suggested the speaker, "when the injured or another yelled and someone made a dash to engine or water wheel and closed the throttle or gates. In the meantime, another would throw a bar between the gears of the mill".

Manufacture of certain rubber goods is complicated, said Mr. Henthorne. Included among these are tires and footwear. Calling for schedule work there were Canadian footwear factories making as many as ten thousand pairs of shoes daily, with the same number of cartons in which to pack them. Something like a hundred kinds and sizes of tires would be made in a tire factory of any size or capacity.

These would be principally used for automobiles, but the complete range also covered those for bicycles and motor-cycles, all three having distinct inner tubes.

London Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.
E. I. Olmsted, A.M.E.I.C., Branch News Editor.

Two most excellent papers, one on "Rural Roads" and the other on "The Mechanical Engineer of To-day" were presented by Chas. Talbot, A.M.E.I.C., and Robt. Angus, M.E.I.C., respectively, at the regular monthly meeting of the London Branch, held Wednesday evening March 21st. Before these papers were presented the chairman, W. J. Forbes-Mitchell, A.M.E.I.C., put a motion to the members that a letter sympathy be sent Madame St. Laurent and family expressing sympathy in their bereavement in the death of A. St. Laurent, M.E.I.C., president of *The Engineering Institute of Canada.*

Rural Roads

"Road improvements in Middlesex county proceeded at the rate of over $800,000 a year for the past two years," stated Mr. Talbot who is county engineer for Middlesex, in the opening of his address. "During 1921 the sum of $780,000 was spent for better highways in the county, while in 1922 the expenditure was $880,000, a grand total of $1,660,000. for the past two years.

"In Middlesex county there are a 2,200 miles of highways outside of London. Five hundred units of this mileage are supported by the county council; 100 miles in Middlesex are provincial highways, which represent one-eighteenth of the total provincial highways in Ontario. That is to say, Middlesex has a greater mileage of highway directly under the administration of the Ontario department of highways, which pays eighty per cent of the initial cost and maintenance of such roads, than any other county in the province. Some 1,600 miles of roads in Middlesex are under the direct control of township councils concerned. During 1922 the townships paid $150,000; the county council expended $230,000 and the province and London contributed another $500,000, toward improved highways in Middlesex county. In 1907 Middlesex county expended only $106,000 on its road system.

"Government subsidies were generous and London was called for large amounts. The province pays thirty per cent of the building and maintenance costs of county roads; the county as a whole pays sixty per cent of the costs of the 500 odd miles under the direct supervision of the county council. The other forty per cent is borne by the government. On provincial-county roads, such as the Sarnia gravel and the Wyton-Thorndale-St. Mary's road, the portion is: government sixty per cent; county forty per cent. Suburban area roads are paid for on the basis of London twenty per cent, county twenty per cent and government sixty per cent. In the urban zone the proportion is London thirty per cent; county thirty per cent and the province forty per cent. Both the suburban area and the urban zone roads are under the direction of the suburban roads commission constituted as follows: two members are appointed by the city and county councils. These four, thus appointed, select a fifth. Despite country people saying that they contribute more than they can stand for good roads and similar complaints from the cities, I am convinced that the Ontario highway laws are equitable, that the charges are fairly equally distributed, and that on the whole we have what is probably the best road laws on this continent and possibly superior to any in Europe.

The old system of road building entirely at the instance of the township councils fell down. Farmers alone would never and could never have been brought to contemplate a road-building program such as this province has under way.

"Ontario's highway problem is different from that of any other section of the continent. Our population is sparse. Hardly one-eighth of the provincial area is developed that should be. Good roads is but one great step towards solving our general development problem.

Mr. Talbot concluded with a few remarks regarding the exodus of trained young men from Canada to the United States. "They go to the United States" he pointed out," taking their Canadian education with them, and it is the republic to the south that benefits and not Canada. This is probably our most serious national problem to-day and the best minds of the Dominion should be engaged now in seeking a solution."

The Mechanical Engineer of To-day

Upon conclusion of Mr. Talbot's paper the chairman called upon Robt. Angus, M.E., M.E.I.C., member A.S.M.E. to present his paper.

"Tapping the vast reservoir of electricity that has being in the upper strata of the earth's atmosphere is a job that the Canadian engineer may shortly be called upon to undertake," was the opinion of Mr. Angus who went on to point out that the engineer or the engineering mind is needed in politics. "Some have made the remark in criticism that engineers lack political intuition and ability; I would answer that a larger dose of logic and positiveness applied to politics would bring greater advantage to public affairs. "The engineer is really the troubleman" he continued in another part of his paper, pointing out the wide sphere of influence which they occupy. "He is appealed to in all cases of mechanical trouble". Referring to the part an engineer has to play, he said: "He may be called on for machinery

to tunnel mountains, build bridges, harness the rushing waters, collect the electricity in the air and make it subservient to man. In short, the engineer is supposed to be a magician to whom all things are possible. The successful engineer is he who does not know when he is conquered." In referring to the field of opportunities before the machanical engineer he said, "There are wonderful opportunities afforded by modern industry in its research laboratories, which are open to picked students who seek inspiration from the work and example of a few really great teachers."

In closing Mr. Angus read the Code of Ethics adopted by the American Society of Mechanical Engineers.

E. V. Buchanan, M.E.I.C., introduced W. P. Near, M.E.I.C., the newly appointed city engineer of London. Mr. Near responded with a few words in which he stated that he had always been actively connected with *The Institute* and that he had served as chairman and also on the executive of the Niagara Peninsula branch.

The chairman then drew the attention of the members to the apparent uneasiness of J. R. Rostron, A.M.E.I.C., chairman of the entertaining committee. This he explained was due to Mr. Rostron's fear that the excellent lunch which he had prepared might spoil if not attacked soon. The members therefore immediately proceeded to the dining room where a very sociable hour was spent.

Special Meeting

In order that Fraser S. Keith, M.E.I.C., secretary of *The Institute*, might meet the members of the London branch, a special meeting was called for Friday evening, April 6th. Preceding the general meeting, the executive of the London branch had Mr. Keith as guest to a dinner at the Tecumseh House. Here several matters of prime importance to the branch were discussed and the advice of Mr. Keith was sought on these matters.

The executive then conducted Mr. Keith to the board room of the Public Utilities Commission. Before calling upon Mr. Keith, W. J. Forbes-Mitchell, A.M.E.I.C., chairman, introduced several matters for consideration. He announced that Professor H. C. Boyden, B.S., C.E., would give an illustrated talk on "Recent Developments in Concrete," on Monday, May 7th. The matter of the visit to the city of St. Thomas upon the invitation of W. C. Miller, A.M.E.I.C., city engineer of that city, to inspect the water-works system, was discussed. It was decided to allow Mr. Miller to set the date for the later part of May, or the first part June. A proposed trip out to Western University to inspect the new buildings now under construction, was also discussed but nothing definite was decided upon. The question of the advisability of the purchase of a moving picture machine but as it developed during the discussion that there were several machines in the city which could be borrowed at almost any time for the mere asking, it was decided to take no action.

Three new members of the branch were called upon by the chairman to say a few words. These members were W. R. Garrett, A.M.E.I.C., of the city engineer's staff, recently admitted to *The Institute*, A. G. MacLachlan, S.E.I.C., recently returned from Smyrna, Turkey, and now with the city engineer of St. Thomas, and T. A. S. Munford, A.M.E.I.C., recently of Toronto but now with J. M. Moore, architect, on the Western University buildings.

The chairman then called upon Mr. Keith to address the meeting. As the local press had recently published a rather twisted announcement that he was coming to London to investigate the resignation of H. A. Brazier, M.E.I.C., past chairman of the branch, as city engineer of London, Mr. Keith said, "The reports made it appear that I was coming to this city to investigate Mr. Brazier's case, but such is not the case. I wish to make it very clear that I am visiting this branch in common with other branches on my annual trip. The matter of the engineer's resignation has not been brought officially to the attention of headquarters. As far as the local branch is concerned the matter rests there."

Mr. Keith then spoke on the history, the plans and objects of *The Institute* as a whole. He outlined the rapid growth during the last decade, when it grew from nine branches to twenty-three, and from a membership of 2,000 to 5,300. Although this showing was excellent and would compare well with that of any other organization, he did not think it was as great as might have been in view of what had been accomplished by the engineering profession during the war years. To elevate the profession to a higher standard so that it would hold its own against any other group in the world, certain changes, he said, were made in the by-laws, the changes taken as a whole would advance the individual member professionally, economically and socially.

Other points dwelt upon by the speaker by which it was hoped to elevate the standard both of the profession and the individual were classification and remuneration, a proper code of ethics rigidly enforced and strengthening the branches by making every member of *The Institute* a member of a branch.

Speaking of the future, Mr. Keith dwelt upon registration, which, to be effective, must be uniform and universal. He emphasized the necessity of public speaking as an asset, and of closer contact with the universities. He urged the branch to take a greater part in the welfare of the community not only as a means of strengthening the branch, but of giving the public a better appreciation of *The Institute*.

Mr. Keith was then thanked by A. J. Stevens, M.E.I.C., and F. M. Brickenden, A.M.E.I.C., for his splendid talk which contained so many points of general interest to the branch. The members then adjourned to the dining room where as usual the entertaining committee had prepared a luncheon which was the means of passing a most sociable hour.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

In accord with the suggestion of the Committee on Policy that *The Institute* co-operate with schools of engineering, the Moncton Branch has arranged to hold two of its regular meetings each year at Mount Allison University, Sackville, N.B., where the branch has thirty-four Students of *The Institute*. The first of these meetings was held on Wednesday evening, February 28th, after a previous date had been potsponed on account of trains being blocked by snow. About a dozen members from Moncton made the trip and it was no one-sided bargain. Mixing with the students recalled memories of their own happy student days and yarns flowed freely.

W. B. MacKenzie, M.E.I.C., the speaker of the evening, gave an address that exactly fitted the spirit of the evening. In treating of Halifax and its harbour, he not only gave broad engineering opinions on the subject of town and harbour planning, but intermingled a fund of humour in a historical sketch that traced the growth of Halifax from the date of its foundation down to the present day. From an engineering point of view he did not believe the proper site had been selected for the city and docks. He showed how at intervals of about ten years the harbour had been subject to terrific storm from the south-east, nearly always with loss of shipping and damage to the harbour front. In early days, too, the city suffered from lack of water as there was none to be obtained from wells on the rocky site of the town. Both of these defects would have been avoided had a site farther inland been chosen where Bedford Basin's ten square miles of deep water would have provided a water front safe from storms and the finest harbour in the world.

Mr. MacKenzie's paper had a special interest in that some of the historical data and many of the scientific facts brought out were obtained by him first hand from documents and plans which he had studied in his long engineering practice, of which forty-two years were spent with the Intercolonial Railway. Professor McKiel, A.M.E.I.C., of Mount Allison University moved the vote of thanks to the speaker and the meeting adjourned.

J. D. MacBeath, M.E.I.C., assistant city engineer of Moncton, and last year's chairman of the Moncton branch on Tuesday April 4th, delivered a lecture before the Engineering Society of Mount Allison University, on "The Improvement of the Street Surface of a Modern City."

Presentation to Messrs. Tapley and Gage

On the eve of their departure for Winnipeg and Montreal respectively, F. B. Tapley, M.E.I.C., chairman of the Moncton branch, and Ramsay Gage, M.E.I.C., past member of the Executive, were the recipients of tokens of fellowship and goodwill from their colleagues on the engineering staff of the Canadian National Railways. The presentation was made by A. F. Stewart, M.E.I.C., chief engineer of the atlantic region, who fittingly expressed the regrets of all at the parting, and wished Mr. Gage and Mr. Tapley all success in their new fields. Mr. Tapley was presented with a handsome smokers set, and Mr. Gage received a cane suitable engraved. In the evening the two were tendered a complimentary dinner at the Barker House under the joint auspices of *The Engineering Institute* and their business associates in the railway, about sixty of whom gathered to bid them farewell.

L. S. Brown, general manager of the atlantic region, presided. After the repast the chairman eulogized the guests of honour. They had proved their capabilities in their respective departments and while their departure was regretted, it was particularly gratifying to know that their removal was in the way of promotion. Mr. Tapley is to assume the duties of engineer of maintenance, western region, and Mr. Gage is to be electrical engineer for the entire system with headquarters at Montreal. Mr. Brown hoped that some day the East would again need their services and that so, they might return to Moncton.

The chairman then called upon A. F. Stewart, M.E.I.C., chief engineer of the atlantic region who made a most happy and witty speech, recalling the old fact that the wise men came from the east, and pointing out that this is as true now as then; it is just as true as that daylight comes from the east to drive out the dark. It is the good of the east that leavens the west. Now all civilization north and west of the St. Lawrence came from the east. Our good friends in the west say that the easterners go west for their own good, but this is not so; they go with the true missionary zeal. Such, Mr. Stewart said,

was the case with the guests of the evening, they were going as missionaries. He trusted one day to see them back home, and if they brought with them some of the spoils of the west, they would be that much the more welcome.

Many speakers followed. W. U. Appleton, general superintendent of the atlantic region, showed proper pride in the lines under his jurisdiction when he expressed the hope that Mr. Tapley would bring the road bed on western lines up to eastern standard.

Owen Cameron, general freight claims agent, who has the honour of fifty years service on the government railways indulged in pleasant reminiscences, recalling the fact that when he joined the present National railways there were but 253 miles in existence. In his long experience his relations with none had been pleasanter than with the departing guests, whom he wished God-speed, length of days, and an early return to their friends of Moncton.

Expressions of regret were also voiced by many others, F. O. Condon, M.E.I.C., who succeeds Mr. Tapley, E. G. Evans, M.E.I.C., district engineer, and G. C. Torrens, A.M.E.I.C., division engineer, representing the engineers present.

Mr. Tapley replied. There was no man with red blood in his veins he said, who would not be moved at the reception given. If it were a matter of inclination both would have preferred to remain in Moncton. Duty was duty however to like soldiers, when the call came it was theirs to obey. He thanked all his friends and associates who by their unfailing courtesy and splendid spirit of co-operation has helped to make his sojourn in Moncton one of the happiest periods of his life. Mr. Gage spoke in like vein. He would ever cherish the hospitality and friendly spirit shown him by Monctonians.

The guest present joined hands around the table and sang Auld Lang Syne, and the dinner was brought to an end with the National Anthem.

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

On Friday night, 6th April 1923, there was a meeting at the Westinghouse Auditorium which has become an annual affair. The meeting was a joint one with the Toronto branch of the A.I.E.E. and a large number came over by motors and a special motor bus. A spendid address was given by Stephen Q. Hayes, of the Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., illustrated with lantern slides and moving pictures, describing especially the remarkable electrical power developments in Japan. The speaker lead us rapidly over his Pacific wanderings which occupied 15 months travel in Australia, China and Japan, covering about 50,000 miles. In Australia there are 5.9 miles of electric railways per 1000 people, while Canada has 5.3 miles per 1000. The gauge of Australian railways varies all the way from 3 ft.-6 inches to 5 ft. 8½ inches. The union station in Melbourne is said to handle the largest traffic in the world. There is a six car electric train out of this station every ten minutes in quiet periods and every five minutes in the rush hours. They use 1500 V. direct current with catenary overhead construction and 25 cycle converters. In the substations they use 1500 k.w. converters with 22,000 V. circuit breakers and transformers in compartments which are locked when in operation. In the power house are 5 units of 12,500 k.w. capacity stepping to 122,000 volts. The rain-fall in Australia is deficient so that they depend chiefly on coal. There is a vein of coal at Morwell 200 feet deep under 70 ft. of earth, which is mined by simply digging it out. The coal is called brown coal, which has 40% of the heating value of American coal but costs only 45 cents per ton at the mine.

Japan

Going on to Japan, the speaker showed a picture of the famous bronze statue of Budda which was cast in the year 1225. It is hollow and of immense size cast in sections and reaches a height of about 75 ft. Visitors can go up on the inside and look out of the eyes. Japan, according to the speaker, is better electrified than any other country in the world. All villages have electric lights and if not on the main power lines have their own little power plants.

"Japan has enormously developed her electric power," said the speaker, "and now all the homes even in the little villages have lighting and all factories and mills are run by electricity. However, the country has not as yet developed sufficient power to use any for domestic purposes of cooking and heating. All companies are privately-owned and are run on a paying basis from the start. This for the reason that not only has the government of Japan refused to take over the companies, but instead sees that the companies operating have no competition. The companies, however, must give good service and make only reasonable charges or else they are severely checked up by the government. The charges are mostly on a flat rate for small domestic consumers, but for large consumers and industrial plants so much per kilowatt hour. Japan is now building practically all electrical equipment of a small nature, but the larger transformers and motors are being supplied by America."

Tokyo is remarkable for not having any rock beneath it for 1000 feet. Buildings are supported on piles with cement capping to distribute the pressure. A large steel office building sunk 18 inches during construction and a large substation has sunk 3 ft. in ten years.

The speaker, in discussing the railways of Japan, pointed out that in Tokyo all railway entrances to the city are elevated and no level crossings are therefore to be seen. Terminal facilities are the finest in the world and a twelve minute service is given between Tokyo and Yokohama. Almost all railways serving these two large centers are electrified. The standard railway gauge in Japan is 3 ft. 6 inches. 90% of the power is hydraulic. There is an available capacity of 7,500,000 k.w. Tokyo has the largest outdoor substation in the world.

Following the lantern slides a moving picture of various scenes in Japan was shown and proved exceptionally interesting. Not only the principal rivers and many of the natural beauty spots of the country were shown, but also the customs and industrial life of the people.

Following the address a number of questions were asked, in answer to which Mr. Hayes stated that electric power in Tokyo sold for eight to nine cents per k.w. hour for lighting, while industrial rates were two to three cents. Distribution is made at 3500 V. which is high voltage as in England anything above this being extra high.

The longest transmission system is about 187 miles, from Osaka, and 154,000 volts is the standard line voltage. The Tokyo system is at 50 cycles, while Osaka uses 60 cycle. Generators are built for 250 or 300 r.p.m. so as to be used on either system and by means of special interconnected star winding the voltage is maintained constant at either speed.

Japan has plenty of copper and zinc mines but no iron. They however, control iron mines in China from which electric steel is made. All small motors and distribution transformers are now made in Japan, and the General Electric Company has a lamp factory there.

The meeting closed with a hearty vote of thanks to the speaker, after which refreshments were served through the generosity of the Canadian Westinghouse Company. The meeting was presided over by F. W. Paulin, M.E.I.C., assisted by S. E. M. Henderson of the A.I.E.E., Toronto Branch.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.

A regular meeting of the branch was held on March 26th, 1923, in the Calgary Board of Trade rooms. The principal speaker of the evening was W. J. Gale, A.M.E.I.C., who gave a very interesting lecture on Street Railway Construction. This paper embraced a short history of street railway development up to the present and described methods now in use which are essential factors to the efficient and economical operation of a modern street railway system.

The Evolution of the Street Railway.

To the average person street railways were often regarded as being like Topsy, they simply "growed", but the growth has been the result of experimentation and careful calculation with knowledge gleaned from past mistakes.

The first street railways were started in the United States in 1832 between New York and Haarlem, 91 years ago. They proved unpopular, and for a time were suppressed, but were revived by a French engineer in 1852, who devised a new type of rail and flanges on the wheels. Rapid progress has been made since in and about New York, and much of the rapid growth of that city is largely due to the street railways.

Gradually, new systems of rails and wheels were evolved, which made the system usable in various parts of the civilized world. Street cars were introduced into England in 1857, when the same system was adopted as was being used in Philadelphia. This was started in London and a few of the provincial towns, but was largely removed later and changes made in later construction. Constantinople and Paris took on construction for street railways about the same time using their own conceptions of rails and ties.

In 1899, a very great impetus was given to street car construction in Great Britain, and one of the largest companies of Europe was formed and the lines were electrically run. Between 1899 and 1911, 64 car-lines were either converted to electric traction or freshly constructed.

The first point that an engineer must consider is the drainage of the surface water which may collect on the lines, and it is most important to drain the water from the switches. Before putting in concrete, the bottom of the excavation should be either strengthened by being pitched or covered with ashes, watered and rolled, which is recommended because it helps to keep the water from accumulating.

Most of the car lines constructed in Great Britain from about 1899 and the subsequent 10 years were bonded with what was known as the Chicago Bonds. These were of solid copper or stranded copper wire with solid forged heads and of 98 per cent conductivity. These were fastened to rails with steel pins, holes in the rails being punched

for their reception. About 1908 brased bonds came into use, but were not generally adopted. One can readily see that if the rails are not absolutely rigid this type of bonding would eventually be ineffective. Arc welding is now considered to be the best type and is being generally adopted on all new construction and as in Calgary this system is gradually replacing the old form of bonds.

Joints were of various types, the general form being either 4-hole or 6-hole fish plates for a standard length of girder rail 45'.0", the plates being made out of Bessemer steel tensile strength of 40-45 tons per square inch. In many cases sole plates fastened under the joints were inserted 2'6" long and 10" wide, also bedded in concrete. These are very efficacious but materially add to the cost of construction. The Diskkerr joint was used on Yorkshire car lines. It consisted of two rails which were half spliced, i.e. one rail carried the lip of rail and the other the table clamped together by means of the fish plate. This type of joint was also expensive.

Thermit jointing was used for about the first time in Britain on the South Shields and Jarrow car lines in 1904, and consisted of welding the webs and lower flange of the rails together, thereby doing away with the fish plates and bolts. The idea emanated from Germany and the patent was the property of a Professor of Munich. The method consisted of cramping the two rails together to an infinitesimal joint and after heating tails with blow torches, making a clay mould and pouring into same a mixture which was delivered in sealed bags each sufficient for only one joint. This mixture when ignited would generate heat over 3,000 degrees Farenheit in less than 15 seconds. When the mould was removed about one quarter of an hour later it would disclose a red hot mass of metal around flange and web. This was immediately hammered into a more compact form and the joint was allowed to cool off. In Jarrow the success of this form of joint was assured, but at the Croydon car lines which were by no means so level and had many heavy grades 314 of the joints were failures, the rails broke on the grades but never at the joints. The fracture usually occurred at 2.1 ft. from the centre of joint probably owing to the severe heat, applied at joint controling the steel, and throwing acute torsion into the fibres at about 34" away. The rails being cold 8' away. This thermit mixture is the same mixture which the Germans delivered to us in the Great War contained in their aerial bombs.

A discussion on street railways followed Mr. Gales paper and short addresses were given by Messrs R. A. Brown R.P.E., I. P. MacNab, M.E.I.C., and A. S. Chapman, A.M.E.I.C. These engineers pointed out some of the advantages of a lighter form of street car and discussed the type most suitable for Calgary and mentioned the result of tests on steel rails of various weights relative to their most efficient use under the conditions met with in the area.

Ottawa Branch

F. C. C. Lynch, Associate E.I.C., Secretary-Treasurer.

"Wood and its Possibilities" formed the subject for a highly interesting address given by W. Kynoch, B.Sc., F.E., F.R.S.A., at a meeting of the Ottawa Branch, at the Victoria Memorial Museum on the evening of March 15th. Mr. Kynoch, who is a graduate of Toronto University and a Fellow of the Royal Society of Arts, has been connected with the Forests Products' Laboratory of Canada for nine years. Prior to his appointment as superintendent of the laboratory, Mr. Kynoch was in charge of the division of wood preservation and more recently of research work in the division of timber physics. The lecture was illustrated by slides and also a moving picture of the manufacture, from start to finish, of a piano. O. S. Finnie, M.E.I.C., chairman of the local branch, was in the chair. There was a very good attendance.

Wood and its Possibilities

Mr. Kynoch, in opening, touched on the early use of woods by man. The form of the lecture involved a certain amount of technical data, but nevertheless a story, essentially romantic, resulted from Mr. Kynoch's relation of the early uses of wood and how man gradually evolved new schemes and ideas until in the present time, wood had a multitude of uses and scientists were only just beginning to learn that it had thousands of uses which were not yet discovered.

Another important branch of the work done by Mr. Kynoch's department was the identification of woods. He explained that woods differed greatly in their internal structure and that microscopic examination had rendered the identification of even the smallest piece possible by methods used in his laboratories. He told the audience that the laboratory had written to Lord Carnavon, discoverer of King Tutankhamen's tomb, to ask him if he wanted any of the chips of wood found in the tomb identified. They had not yet received an answer but hoped that the laboratory would have the honour. He stated that by the aid of an exhaustive filing system the Canada laboratory was one of the finest in the world in regard to the identification of woods.

The depletion of the forest resources, Mr. Kynoch regretted but said that Canadians should not be unduly exercised over the fact because the cure was easy to apply. Scientific reforestation, he said, would soon, if properly applied, together with government supervision of areas likely to be depleted, result in improved conditions.

The opportunity for research in wood of all kinds was great, said Mr. Kynoch, and the field was growing as new possibilities opened up before the investigators. As the industrial uses of wood multiplied, so would multiply the need of research.

The functions of the forest laboratories of Canada he described with the aid of slides. Among the work done there was the testing of woods as regards strength; impregnating of woods for preservation; ascertaining new commercial uses for woods; and chemical research in regard to woods.

Radio

A popular lecture on radio given by Commander C. P. Edwards, A.M.E.I.C., director of the Radio branch of the Department of Marine and Fisheries, at the Victoria Museum on the evening of March 20th was attended by more than 1,000. Practically half of that number were radio fans of the younger generation, and the speaker directed his lecture in simple language which was understood by all. He described the principle of wireless telegraphy and the manner in which it was developed into telephony.

Wireless telephony existed many years ago, he pointed out, but broadcasting was not developed until recently because of faulty transmitting equipment. There was a very close resemblance between wireless telegraphy and telephony. He explained that ether waves travelled at the rate of 186,000 miles a second. Several demonstrations were given with apparatus showing the action of the voice on ether when transmitted through the microphone, and also the sounds when received through an amplifier.

Commander Edwards said that there was room for much improvement toward perfecting the amplifiers so that the sound waves would sound more clearly and natural. Slides of various broadcasting equipment and stations were shown on the screen. The speaker explained their working and showed that it was not an easy matter to run a broadcasting station. There were also many problems connected with broadcasting. In explaining the transmitting of sound waves through ether the lecturer said that this transmission was the forerunner of talking moving pictures. He predicted that such an invention would be perfected in the near future.

At the conclusion of the address several musical selections were received on a magnavox receiving set from station "O.A." the Naval Department broadcasting station. A film "The Audion," showed the actual working of radio by means of animated drawings. The film "Radio" screened a broadcasting station in operation. The other film was "Wizardy of Wireless." The lecture was the annual popular one of the Ottawa branch, and was thoroughly enjoyed by the large crowd. Commander Edwards demonstrated a vast knowledge of radio and made his lecture very entertaining with his humorous remarks. The chairman was O. S. Finnie, M.E.I.C.

Joseph Keele's visit to Egypt

The wonders of engineering in Egypt, both ancient and modern were admirably demonstrated to the members of the Ottawa branch at their luncheon on April 5th in the palm room of the Chateau Laurier by Joseph Keele, B.Sc., M.A., of the Mines branch of the Dominion government. By means of excellent lantern slides the speaker was able the more clearly to illustrate his points and, incidentally, an excellent form of travelogue was provided also.

The speaker had the additional advantages of having recently returned from a tour of the valley of the Nile River as far as the great Assouan dam which latter has revolutionized social and economic conditions in Egypt, and as to which he was loud in praise of the enterprise and engineering achievement in the matter of its construction. The slides he displayed gave an admirable indication of the immensity of the achievement. As examples of ancient engineering the speaker illustrated by means of slides of ancient arches and other forms of architecture the remarkable engineering feats of the ancients and pointed in demonstration of this to the fact that, although many of the structures had been in existence for many centuries, there was no sign of cracking, an indication of their stability and the soundness of judgment in the builders in choosing proper foundations.

Mr. Keele described the contour of the valley of the Nile River and said that Egypt was a country with rich deposits of gypsum and alabaster. He said that large and perfect pieces of alabaster would be required to produce the vases which had recently been taken from the tomb of King Tutankhamen. There was no coal in Egypt, he said, but a little oil had been discovered, and a little gold in Nubia. There was much in evidence of large gold deposits in the gold creeks many years ago, he said. Copper and turquoise were to be found in Sinai. Limestone rock and shale formed the valley of the Nile. Examining some of the ruins, Mr. Keele said he had been surprised to find, sometimes 75 feet deep, layer upon layer of potteryware. Pottery was the mainstay, he claimed, for the determination of age, and he declared that some of these deposits might date back 50,000 years or so. To

him the famous Sphinx, whose origin has puzzled the ages, appeared to be carved out of the bedrock. Dealing with the Assouan Dam the speaker said it had practically eliminated the danger of famine in Egypt so far as the water supply was concerned.

Turquoise glaze, he said, was the only contribution Egypt had made to ceramics, but it was an important contribution, he claimed. Quoting from a letter by an ancient queen claiming certain obelisks had been made and erected within seven months, the speaker caused laughter by his emphatic declaration that he did not believe it. He did not profess to know the secret of the lighting of the inside of some of the ancient temples whose ruins showed evidences of intricate carvings and sculpture. Some of the designs on the stucco walls, too, were still intact, he said, after many centuries. He commented that cities had been buried and little traces left, but very fine monuments remained. He showed slides to demonstrate the serenity and dignity which the ancient sculptors attributed to their statues.

The address was listened to with keen attention by the large company of engineers present. O. S. Finnie, M.E.I.C., chairman of the branch, was in the chair and among those attending, many of whom were seated at the head table, were Admiral Sir Charles Kingsmill, Hon. Senator Bostock, A. H. Harkness, M.E.I.C., Toronto, G. J. Desbarats, M.E.I.C., Major D. L. McKeand, A.E.S.C., R. B. de Corriveau, M.E.I.C., John McLeish, M.E.I.C., George Mountain, M.E.I.C., C. A. Bowman, Noulan Cauchon, A.M.E.I.C., A. F. Macallum, M.E.I.C., Thomas Shanks, M.E.I.C., G. B. Dodge, M.E.I.C., Commander C. P. Edwards, A.M.E.I.C., O.B.E., N. G. Ogilvie, M.E.I.C., K. M. Cameron, M.E.I.C., and others.

Announcement was made by the president of the election of the following members of *The Institute:* Dr. Charles Camsell, John McLeish. A. M. Narraway and W. C. Way. The following had also been elected associate members: J. W. Anderson, H. Etches, E. H. Finlayson, J. A. Henderson, R. D. MacDonald, Jas. Alex. Wilson, Col. A. F. Duguid.

The president also announced the appointment of the following as chairmen of the committees named: Committee on proceedings, A. B. Lambe, A.M.E.I.C., sub-committee on publicity, F. V. Seibert, M.E.I.C., committee on membership, J. L. Rannie, M.E.I.C., advertising, C. McL. Pitts, A.M.E.I.C., rooms and library, L. H. Cole, M.E.I.C., branch librarian, M. F. Cochrane, A.M.E.I.C., reception committee and branch by-laws, K. M. Cameron M.E.I.C., representative on nominating committee, G. G. Gale, M.E.I.C., general committee for full meeting, January 1924, C. P. Edwards, A.M.E.I.C.

Chairman O. S. Finnie, M.E.I.C., took the opportunity, as the first he had had, he said, to thank the members for electing him to the presidency during his absence in the west, and he appealed for the same co-operation from the members as had been accorded to his predecessors. He introduced the speaker for the day as an expert in ceramics which was his specialty.

Quebec Branch

Hector Cimon, A.M.E.I.C., Secretary-Treasurer.

Although no news of the activities of this branch have been given in *The Journal* for some time past, meetings were held regularly at which very interesting addresses and papers were presented as will be noted in the following brief report.

Recent Advances in Water-Wheels Designs.

This was the subject of an illustrated lecture delivered at the Chateau Frontenac, on Monday evening, January 19th, by Julian C. Smith, M.E.I.C., vice-president and general manager of the Shawinigan Water and Power Company, of Montreal.

Mr. Smith traced the gradual development of the design of water wheels from the earliest horizontal type to the modern high speed vertical wheels of which the propeller type is the latest word in water-wheel design and was described at length by the lecturer. The electric steam boiler and the generating and transmission system of the Shawinigan Company were also briefly described.

At the close of the lecture, a vote of thanks to the eminent lecturer was proposed by J. E. Gibault, A.M.E.I.C., and heartily carried, after which A. R. Décary, M.E.I.C., who had presided over the meeting, added a few words saying how the Quebec members had been pleased to meet Mr. Smith and would enjoy hearing him again.

The Future of Engineering Profession.

Fraser S. Keith, M.E.I.C., general secreatry, was the speaker at the monthly luncheon-meeting, held at the Chateau Frontenac, on Monday February 12th.; he reviewed the history of the profession, and showed the importance of engineering work, depicting engineers as world builders.

He then dealt with the efforts made by *The Institute* for improving the status of the engineer in this country and gave some practical suggestions as to what the individual and the branches should do for the profession's welfare.

After Mr. Keith had concluded his address, S. L. de Carteret, A.M.E.I.C., proposed a vote of thanks which was given amidst cheers and E. A. Evans, M.E.I.C., at the request of chairman A. R. Décary, M.E.I.C., told some of his early experiences in the practice of engineering, in this country, and added that the profession had already made good steps towards proper recognition.

General Meeting for Free Discussion.

Quebec members were given an opportunity to discuss various matters pertaining to *The Institute* and the profession when a general meeting was called for Monday evening, February 19th.

Chairman A. R. Décary, M.E.I.C., presided over that meeting which was largely attended and proved quite useful.

The Manufacture of Brick, Old and New Methods.

On Monday evening, February 26th, at the Chateau Frontenac, P. A. Galarneau, general manager of the Citadel Brick & Paving Block Company, of Quebec, delivered a most instructive address on the brick throughout the ages and the modern method of production at the shops of his firm, at Boischatel, Quebec. Not less than twenty-two different operations were necessary to manufacture a brick, said the speaker, who went on to describe them, saying that it took three tons of materials to produce a thousand bricks.

At the conclusion of this very able lecture, J. E. Gibault, A.M.E.I.C., briefly expressed the feelings of the audience and moved a vote of thanks to the speaker, which was cordially accorded.

By courtesy of the president and directors of the Citadel Brick and Paving Block Company, the Quebec members were given the advantage of visiting on Saturday afternoon, March 10th, the important shops of that company which cover about seven square acres and measure 1,500 feet in length and have a daily production of 150,000 bricks per ten hours of labour. Hollow bricks and facade bricks of natural rich shades and colours are manufactured there and marketted especially in the eastern part of the province of Quebec and the whole of the Maritime provinces.

The Manufacture of Pulp Wood.

The address at the luncheon-meeting of March 12th., held at the Chateau Frontenac, was given by S. L. de Carteret, A.M.E.I.C., who said that pulp-wood was the principal product used in the manufacture of paper. Canada, on her part, he said, produced annually over a million tons of newsprint which represented 1,350,000 cords of timber. Touching on the subject of the depletion of the forests by choosing the best of the trees, using only the best parts of them and wasting the remainder, the speaker said that this condition of affairs did not exist at present and that the manufacturers were using parts of the trees which formerly were wasted.

The transportation, storage and protection against fire of pulp-wood were also dealt with at length and, at the conclusion of the lecture, E. A. Evans, M.E.I.C., and chairman A. R. Décary, M.E.I.C. heartily thanked the speaker on behalf of the Quebec members.

Our Forest Resources.

Another most attractive talk on forestry was given by Avila Bédard, Assistant Chief of the Provincial Forestry Service and Director of the Quebec Forestry School, on Monday evening, March 26th. Reviewing the forest situation in the province of Quebec, and after discussing the extent and effects of the various destructive agents which especially attract the attention of the forester and public men in charge of our natural resources, the speaker came to the conclusion that there were no reasons to be pessimistic and that our forests were a capital asset which did not depreciate but returned a regular income due to their natural growth.

A. G. Sabourin, A.M.E.I.C., and chairman A. R. Décary, M.E.I.C., both thanked the lecturer, pointing out that his address, besides being full of scientific and technical data, was of a high literary value.

Scientific and Industrial Researches.

Professor Augustin Frigon, M.E.I.C., of the Ecole Polytechnique, Montreal, who was recently honoured with the degree of D.Sc. (Paris), was the distinguished speaker at the luncheon-meeting held at the Chateau Frontenac, on Monday April 9th.

In his opening remarks, the speaker said that the object of the address was to try to interest the engineers in research work, both scientific and industrial. He went on to describe a few researches with which he had been connected at the Laboratoire Central d'Electricité, at Paris. He dwelt especially on the research work on dielectric losses in power cables and concluded with a general discussion as regards the economic value of researches.

The address was listened to with the greatest interest and, at its conclusion, the speaker was the recipient of a cordial vote of thanks moved by Gabriel Henry, A.M.E.I.C. Chairman A. R. Décary, M.E.I.C., also thanked the lecturer and congratulated him on his success at the French Universities.

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

On March 8th an instructive lecture on "Street Lighting," was given by R. M. Lowe, street lighting engineer for the Canadian General Electric Company, Toronto. He prefaced his remarks with a brief history of the art of street lighting from early times, when candles were used to light the streets of London in the fifteenth century until the present day with its highly efficient illumination. Great advances had been made, he said, in street lighting during the past two or three years, but owing to the Great War little improvement had been made in the years immediately previous to that time.

The phenomenal increase in automobile traffic had been responsible for the rapid strides recently made in street illumination. Proper lighting was one of the greatest safeguards to the public, a deterrent to crime, and a decided help to trade. He divided the lighting problems of a city into four sections: the down-town or business section, the residential section, the outlying districts and the highways. Each section presented its own special problems, which were covered in turn by Mr. Love.

The methods employed were described by the speaker and a number of excellent slides shown which depicted different designs of street lamps, schemes of lighting and the effects produced by various systems of illumination. This address proved very interesting and was attended by members of the Utilities Commission and the City Council

Toronto Branch

J. A. Knight, A.M.E.I.C., Secretary-Treasurer.
L. W. Wynne-Roberts, A.M.E.I.C., Branch News Editor.

On account of his removal to Montreal, W. A. Duff, M.E.I.C., has resigned from the executive, and A. C. Oxley, A.M.E.I.C., has been elected to take his place for the remainder of the term, one year.

Committee Chairmen.

The chairmen of the various committees functioning in the Toronto Branch have been appointed as follows:—

Finance Committee, J. M. Oxley, M.E.I.C.,; Publicity Committee L. W. Wynne-Roberts, A.M.E.I.C.; Students Relations Committee, Professor T. R. Louden, M.E.I.C.; Attendance Committee, A. G. Dalzell, A.M.E.I.C.; Reception Committee, R. O. Wynne-Roberts, M.E.I.C.; By-Laws Committee, N. D. Wilson, M.E.I.C.

Luncheon.

To do honour to Walter J. Francis, M.E.I.C., president of *The Engineering Institute of Canada*, a very representative gathering of the Toronto Branch, assembled at a luncheon meeting on Thursday, April 19th, in the King Edward hotel. More than 150 members were in attendance to personally signify their appreciation of the president's services to the engineering profession. Seated at the head table were Professor C. R. Young, M.E.I.C., chairman of the Toronto Branch, President Walter J. Francis, M.E.I.C., W. D. Gregory and the following members of *The Institute*:—Past-President Dr. R. A. Ross, M.E.I.C. Vice-President Gen. C. H. Mitchell, M.E.I.C., Past-President C. H. Rust, M.E.I.C., Fred. B. Brown, M.E.I.C., Past-President M. J. Butler, M.E.I.C., Lt.-Col. A. W. Gray, M.E.I.C., M.L.A., Willis Chipman, M.E.I.C., Edmund Wragge, M.E.I.C., G. T. Clark, A.M.E.I.C., J. Wainright, M.E.I.C. and J. M. Oxley, M.E.I.C.

In his opening remarks, the chairman expressed the sincere regret of the Toronto Branch at the death of the late president, Arthur St. Laurent, and extended to Mr. Francis the felicitations of the branch on succeeding to a post of such high honour.

C. H. Rust, M.E.I.C., past-president, 1911 M. J. Butler, M.E.I.C., past-president, 1914 and Dr. R. A. Ross, M.E.I.C., past-president 1920 who were called upon to make short speeches, each referred in eulogistic terms to the time and services rendered by Mr. Francis in the interests of the profession at large, and added their personal wishes that he should be blessed with health and strength to fullfil the duties of president of the E.I.C.

President Francis, who was most cordially received by the meeting, referred to his personal sorrow at the demise of Arthur St. Laurent, who, he said, had really reached the top of his profession.

He expressed his pleasure at having so many of his personal friends, — who were all engineers, — present, and particularly at the presence of Edmund Wragge, M.E.I.C., the oldest member of the branch, with whom he was associated in the early years of his life. The president recalled the fact that the Toronto Branch was formed thirty-three years ago last month, and that C. H. Rust, M.E.I.C., present to-day, was one of the signatories. He outlined the growth of *The Institute* from the stage of being a body organized solely for the reading of technical papers to its present position, where its organization provides for the research, study and conservation of the resources of the Dominion.

The Fuel Situation in Canada.

Taking as the subject of his address, "The Fuel Situation in Canada," Mr. Francis stated that at the first professional meeting of *The Institute* held in March 1918, all the papers read were in connection with the fuel situation, and the conclusions arrived at then with regard to fuel supply hold good now, but do not go far enough. Germany has been forced to use all low grade fuels, and Canada has to do the same, but is in a better position in as much as it is only in the middle area where there is no coal, and where the situation is acute: the problem being one of transportation. According to Mr. Francis we cannot again hope for six dollars slate-free anthracite, nor even for a plentiful supply of the poor grades with which we at present have to be content. There should be a thorough stock-taking of our national resources, and of the possible sources of supply from foreign countries.

Nova Scotia has deposits of bituminous coal; Saskatchewan immense lignite fields, and both Alberta and British Columbia have bituminous, semi-bituminous and anthracite coal. Quebec, Ontario and Manitoba have no coal deposits, but each has water powers, and Quebec and Ontario have peat bogs and forests. Nova Scotia bituminous coal, said Mr. Francis, is a potential source of fuel for eastern Canada, including a portion of Ontario. Although the supply to Quebec and Ontario is limited through the present desire of Nova Scotia producers to utilize their output for bunkering purposes at small cost and labour, the extraordinary needs of central Canada and the high prices established for fuel in this zone may bring about a radical adjustment of the Nova Scotia coal trade to the advantage of the central provinces. Particularly, if existing transport facilities are improved, some important relief may be expected from this quarter.

F. L. Wanklyn, M.E.I.C., Fuel Commissioner of Quebec, states that Canada uses three hundred million tons of coal yearly, one hundred and eighty million tons of which, come from the United States of America, and of this amount five million tons are anthracite. President Moore has said, that in five years' time no coal will be coming from the United States of America, the diminishing supplies of anthracite in the Pennsylvania fields and the upheaval in transport and labour following the war, accentuating the fuel situation to a very large degree. The use and supply of Alberta coal, said Mr. Francis, is entirely a matter of dollars and cents. Alberta coal is good for all purposes, but of the abundant supply, the kind best able to compete in the market of the central provinces, is the anthracite, or semi-anthracite. The bituminous coal from Alberta with present prices ruling at the pit mouth, and with transport rates as they are now quoted, cannot compete with Pennsylvania bituminous.

Mr. Francis suggested as a possible method by which the transportation feature of the problem could be met, the operation of some of our surplus parallel railway mileage for the exclusive handling of coal, as is done on some of the American railroads. If it should come about that Alberta anthracite or semi-anthracite becomes available to Ontario and Quebec, it would compete favourably with Pennsylvania anthracite and would be a very important source of relief in the fuel difficulty.

In an endeavour to relieve the situation, extensive experiments have been carried out by the Honorary Advisory Council, Industrial Research, in the briquetting of the waste products of the prairie lignites. It is understood that the carbonization difficulties which have caused a great deal of trouble and delay in bringing about a successful utilization of lignite, have now been overcome. The problem has been to secure plates of such quality as would obviate the leakage of retorts used in the securing of by-products, but plates capable of resisting the high temperature and retaining their form have at last been obtained. The value of peat was admitted by Mr. Francis and he predicted that it would yet form an important source of fuel for central Canada.

Mr. Francis pointed out that with electric power available at $30.00 per horsepower year, electric heating becomes a serious competitor with coal at over $18.00 per ton. He expressed the opinion that a very considerable part would be played in the future in the solution of our heating problems through the utilization of electric current. By reason of his position as consulting engineer to the Hydro-Electric Inquiry Commission, he could make no comment on the use of hydro-electric power in Ontario, further than to point out the obvious fact, that it has played an important part in relieving the fuel stringency during recent years.

A great deal of relief in our present difficulties may be experienced through more careful construction of buildings to minimize heat losses, and through the more scientific selection of heating equipment. Thus, the study of adequate insulation of walls of buildings through the use of air spaces and through proper treatment of windows by storm sash, weather stripping, and the like, may bring about developments of pronounced economic value. The use of two furnaces instead of one has been found by many householders to be a source of considerable fuel savings, a small furnace being employed in the spring and autumn and during mild weather, while a larger furnace, or perhaps both, is employed in severe weather.

In conclusion Mr. Francis pointed out that as engineers, we dealt with the whole community and our responsibilities were very great, as, upon the engineering profession depended the solution of the fuel and power problems and we should seek to render the greatest good to the greatest member.

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

The March dinner meeting of the branch held at the Inn, Niagara Falls was a very successful function. Hew Martin Scott, M.E.I.C., in charge of the Peter Lyall Construction Company work on the Welland Ship Canal gave a very interesting talk on the Esquimalt Dry Dock. Having been connected with the dry dock project for some time, the speaker was able to add to a pleasing delivery an intimate knowledge of his subject. It is expected that Mr. Scott's paper will be available for publication in *The Journal* in the near future. The speaker closed with a brief description on the ravages of marine pests, teredo and limnoria on the Pacific Coast. Due to the presence of two visiting engineers from Newfoundland, Messrs. McLelland and Patrick and members with experience in Atlantic waters this latter gave rise to an interesting and enlightening discussion.

Plans for the annual meeting in May are well under way. It is expected that the branch will be honoured by a visit from the President on that occasion.

W. P. Near, M.E.I.C., has been appointed city engineer of London, Ont. The Niagara Peninsula Branch lose thereby an active member. Mr. Near who had been city engineer of St. Catharines for ten years, was a past chairman of the branch.

The April dinner meeting was held at the Hotel Reeta, Welland, on the 10th instant being the first meeting held in that city. There were 83 members and guests present, with F. S. Lazier, M.E.I.C., in the chair and the principal speaker of the evening was Fraser S. Keith, M.E.I.C., general secretary.

After the dinner, which was enlivened by musical numbers from the branch song sheet, Mr. Keith reviewed the progress of *The Institute*, remarking on the large increase in the number of branches in the last five years, and stating that the strength of *The Institute* is in the loyalty of its branch members. He further took up the following questions which affect members of the engineering profession, legislation, ethics, university education and "the ability to speak in public." Each question was treated in a concise and effective manner and his address, interspersed with some telling anecdotes, was much enjoyed.

The meeting was favoured by the presence of two members of the Montreal Branch, J. T. Farmer, M.E.I.C., and H. D. Hunter, M.E.I.C., both of whom expressed their pleasure at being on the spot and wishing that they could have such merry meetings at their own branch.

Mr. Gordon Taylor proposed the health of the city of Welland and gave some particulars of the growth and industries of the city. This toast was responded to by L. B. Duff, editor of the Welland Times and Telegraph, who entertained the company with several humerous anecdotes and expressed the hope that further meetings of the branch would be held in their city.

Cape Breton Branch

D. W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

On account of the walkout of the employees of the Dominion Iron and Steel Co. Ltd., of Sydney, which tied up the steel plant for about one week and the unsettled conditions for some time afterwards, it was necessary to defer the regular meeting of the branch for the month of February.

On March 7th. the branch had the honour of hearing John T. Farmer, M.E.I.C., of Montreal, consulting mechanical engineer and chairman of the Montreal branch, deliver an address on "Mechanical Stokers." As the meeting was about to begin, Mr. Farmer received word of the death of our President, Mr. St. Laurent. On motion, a period of five minutes silence was observed in respect for Mr. St. Laurent, and a message of condolence sent to his family. Before beginning his paper, Mr. Farmer extended to the branch a message of goodwill from the Montreal branch. Mr. Farmer then proceeded to discuss many different types of mechanical stokers, illustrating his story well with lantern slides prepared by the Combustion Corporation. He also discussed briefly the domestic fuel problem of Montreal, and various means suggested for improvement. Many of the members being interested in recent proposals for changes in the by-laws, Mr. Farmer was asked to give some light on how the Montreal members were considering the subject. Mr. Farmer was then asked to convey a return message of goodwill to the Montreal branch.

On Tuesday, March 20th, a special dinner and presentation meeting was held in the Boscobel restaurant in honour of K. G. Cameron, A.M.E.I.C., who was leaving shortly to accept a position with a Montreal firm. Mr. Cameron has been in Sydney for nearly five years, in the employ of the Dominion Steel Corporation. He was the organizer of the Cape Breton branch, and was secretary of the branch for two years. The meeting was a very enjoyable one. After dinner the chairman, Mr. Marsh, presented Mr. Cameron with a pipe on behalf of the branch. Among the guests of the evening were E. C. Hanrahan, secretary of the Mining Society of Nova Soctia, and G. Morrison, of the Crocker Wheeler Company of St. Catharines. About twenty-five members were present.

The regular monthly meeting for April was held on Tuesday evening April 17th, E. C. Tonge, A.M.E.I.C., addressed the meeting, taking for his subject, "Coke Manufacture with By-Product Recovery." Mr. Tonge said that the object of his paper was to present the process of coke manufacture with by-product recovery in a simple manner, stressing the principles involved, particularly in the recovery process, rather than attempting a full description of all plant. It should be noted that the process of carbonization can be made to yield products varying in quality and quantity according to the methods employed to suit the requirements of any particular industry. Gas making, metallurgical coke manufacture and the coming process of low temperature carbonization to produce a clean domestic fuel, all involve the same general principles though applied in a different manner. The speaker took as an example the process of coke manufacture at the plant of the Dominion Iron and Steel Company at Sydney, and with which he is familiar, describing the processes involved. These may be conveniently grouped under the following headings:

1. Washing the Coal.
2. Carbonizing to produce Coke.
3. Condensation of Tar and Ammonia Liquor.
4. Recovery of Ammonia as Ammonium Sulphate.
5. Extraction and rectification of Benzols.
6. Manufacture of Sulphuric Acid.

The latter is hardly typical of coke plants on this side of the Atlantic, but mention is made of it to complete the cycle of operations as carried on at Sydney.

In closing Mr. Tonge said that it should be understood that an installation of the kind described, produces gas of suitable quality for city use, after some purification, and if the ovens are modified in design for heating with producer gas, the whole make of coke oven gas becomes available: whilst the by-product recovery process would be identical with that described in the paper.

Recent Visitors at Headquarters from out of town

Geoffrey Stead, M.E.I.C., St. John, N.B., W. R. Mount, A.M.E.I.C., Edmonton, Alta., A. J. M. Bowman, A.M.E.I.C., Windsor, Ont., Ernest Lavigne, A.M.E.I.C., Quebec, Que., G. G. Murdoch, M.E.I.C., St. John, N.B., R. B. Young, A.M.E.I.C., Toronto, Ont., C. C. Kirby, M.E.I.C., St. John, N.B., H. E. Bates, A.M.E.I.C., Grand Mere, Que., C. R. Young, M.E.I.C., Toronto, Ont., George F. Porter, M.E.I.C., Walkerville, Ont., G. H. Ferguson, M.E.I.C., Toronto, Ont., R. W. Leonard, M.E.I.C., St. Catharines, Ont., L. B. Copeland, A.M.E.I.C., Rouses Point, N.Y., A. G. Graham, A.M.E.I.C., Gold Coast Harbour, B.W. Africa, A. N. Shanly A.M.E.I.C., Chicoutimi, P. Q., C. E. Hogarth, A.M.E.I.C., Hamilton, Ont., J. H. Eastwood, Jr.E.I.C., Peterborough, Ont., C. E. Fraser, M.E.I.C., New York, N.Y., C. A. Norris, S.E.I.C., Toronto, Ont., E. M. Archibald, A.M.E.I.C., Annapolis, N.S.

Six-storey Office Building being moved

A work of considerable interest has been in progress for some time in Montreal, where the old Bell's Galleries building, a six-storey structure, located on Union Ave., immediately behind the store of Henry Morgan and Company, Limited, is being moved a distance of three hundred feet north from its original position. To date the building has been moved one hundred and seven feet. On April 19th, the third move of fifty-one feet was accomplished, the time taken being approximately three-quarters of an hour of continuous moving, the entire operation taking somewhat over one hour and including three stops.

G. D. MacKinnon, M.E.I.C., of the MacKinnon Steel Company Ltd., announces that the sales offices of the company now include the following:—

General Sales Office, 404 New Birks Building, Montreal, Que.
R. R. Power, Royal Bank Chambers, Halifax, N.S.
Lamoureux & Kelley Limited, 285 Beaver Hall Hill, Montreal, Que.
H. G. Evans, 58 Water Street, St. John, N.B.
J. J. MacKinnon, Charlottetown, P.E.I.
A. R. Woolridge & Co., 220 King St. West, Toronto, Ont.
E. N. & W. E. Soper, 63 Sparks Street, Ottawa, Ont.
Canadian General Agencies, Reg'd., 147 Mountain Hill, Quebec,

ELECTIONS AND TRANSFERS

At the meeting of Council held on March 27th, 1923, the following elections and transfers were effected: —

Members.

CLEATON, Reinallt Ewart, mgr. and pres., Cleaton Company (Canada) Limited, Montreal, Que.

EARDLEY-WILMOT, Vere Levinge, mineral technologist, Mines Branch, Dept. of Mines, Ottawa, Ont.

ETCHES, Harry, research engr., Natural Resources Intelligence Branch, Dept. of the Interior, Ottawa, Ont.

MACKENZIE, George Cleghorn, B.Sc., (Queen's Univ.), gen. secy., Canadian Institute of Mining and Metallurgy, Montreal, Que.

SPENCE, Hugh Sweyn, Mining Engr., (Freiberg Univ.), mining engr., Mines Branch, Dept. of Mines, Ottawa, Ont.

Associate Members.

GARRETT, Roy William, engr'g. asst., City Engr's. Office' London, Ont.

LOCKYER, Richard Henry Norman, asst. supt., West Kootenay Power and Light Co's. generating actions, Trail, B.C.

LORD, Ernest Ellis, asst. engr., Lower Lioo River Conservancy, Newchang, North China.

PRICE, Harold Newton, mgr., Central Combustion Co., and contractor, Moncton, N.B.

SIMPSON, Philip, mgr., Montreal Branch, Herbert Morris Crane and Hoist Co., Ltd., Niagara Falls, Ont.

TILSLEY, Richard Frank, asst. engr., City Engr's. Office, Moose Jaw, Sask.

Juniors.

BATES, Ralph Orville, B.Sc., (McGill Univ.), dftsman., on survey for K. S. Pickard, Sackville, N.B.

HEHN, John Aubrey, B.Sc., (Univ. of Man.), of Sault Ste. Marie, Ont.

KEARNS, Norman Henry, B.A.Sc., (Univ. of Tor.), in chg. drftng. room and constrn., Sao Paulo Elec. Co., Ltd., Sarocaba Falls, Estado de Sao Paulo, Liuha Sarocabana, Brazil, So. America.

Transferred from the class of Associate Member to that of Member.

CHANDLER, Ralph Borthwick, B.A.Sc., (Univ. of Tor.), design'g. and field engr., C. D. Howe and Co., Whalen Bldg., Port Arthur, Ont.

COTE, Louis E., C.E., B.A.Sc., (Laval Univ.), asst. ch. engr., Marine Dept., Ottawa, Ont.

COTTON, Miles Penner, engr. and contr., Vancouver, B.C.

COUSINS, Edward Lancelot, B.A.Sc., C.E., (Univ. of Tor.), ch. engr. and mgr., Toronto Harbour Commn., Toronto, Ont.

DIMSDALE, Henry George, Commissioner of Highways for Alberta, Edmonton, Alta.

DIXON, Leon Snell, B.S.M.E., (Maine Univ.), prin. asst. engr., Riordon Co., Ltd., Mattawa, Ont.

ELLS, Sidney Clarke, B.Sc., (McGill Univ.), mining engr., mines branch, Dept. of Mines, Ottawa, Ont.

HALL, Norman MacLeod, B.Sc., (McGill Univ.), Asst. Prof., Univ. of Man., and pvte. prtce., Winnipeg, Man.

JERMYN, Percy Vandeleur, B.A.Sc., (Univ. of Tor.), dept. engr'g. drawing, Faculty of Applied Science, Univ. of Toronto, Toronto, Ont.

NEWELL, Fred., mech. engr., Dominion Bridge Company, Limited, Montreal, Que.

ROBB, Charles Alexander, B.Sc., (McGill Univ.), Prof. of mech. engr'g., and res. engr., Univ. of Alberta, Edmonton, Alta.

RUTLEDGE, Michael Joseph, B.Sc., (Univ. of New Brunswick), first asst., Henry Holgate, consltg. engr., Montreal, Que.

WILSON, LeRoy Zimmerman, B.A.Sc., (Univ. of Tor.), asst. ch. engr., Dominion Bridge Co., Ltd., Montreal, Que.

Transferred from the class of Junior to that of Associate Member.

ALBERGA, George Frederick, B.Sc., (McGill Univ.), supt., parochial roads and wks., Clarendon, Jamaica, B.W.I.

CREASOR, John Alfred, B.Sc., (McGill Univ.), constrn. engr,. Canada Cement Co., Lakefield, Ont.

DIXON, Bruce Gilbert, inspr. of dykes and commnr. to Matzqui Drainage for Govt. of B.C., Victoria, B.C.

FEENEY, John Louis, B.S., (Univ. of New Brunswick), partner, Frechet and Feeney, arch'ts. and engrs., St. John, N.B.

GARDNER, William McGregor, B.Sc., (McGill Univ.), engr., Montreal Tramways Co., Montreal, Que.

McKENZIE, Reginald James, munic. engr., Rural Munic. of Albert, Man.

Transferred from the class of Student to that of Associate Member.

FOURNIER, Victor A., B.A., (Laval Univ.), asst. sanitary engr., Superior Bd. of Health, Prov. of Que., Outremont, Que.

PERRY, Brian Rhodes, B.Sc., (McGill Univ.), supt. on bldg. constrn., P. Lyall and Sons, Montreal, Que.

Transferred from the class of Student to that of Junior.

DEMERS, Paul Emile, B.Sc., (McGill Univ.), radio engr., Northern Electric Co., Montreal, Que.

JOHNSTON, Clifford Milton, B.Sc., (Queen's Univ.), partner, Welch and Johnston, Ottawa, Ont.

MACNICOL, Nicol, B.A.Sc., (Univ. of Tor.), res. engr., James, Proctor and Redfern, Ltd., consltg. engrs., Toronto, Ont.

MAY, Louis William, office asst. to divnl. engr., Niagara Falls, Ont.

SALE, Charles, B.A.Sc.. (Univ. of Toronto), of 172, Sandwich St., Ford City, Ont.

WHELEN, Morland Powers, M.A.Sc., (Univ. of Toronto), jr. engr., Toronto Hydro-Electric System, Toronto, Ont.

At the meeting of Council held on April 27th, 1923, the following elections and transfers were effected:—

Members.

HOPPER, Alfred Edward, principal inspectr., boilers and machinery, Dept. of Marine and Fisheries, Ottawa, Ont.

LIVINGSTONE, Robert, mine mgr., and engr., Galt Mines, Lethbridge, Alta.

PEARSE, William Worth, B.Sc., and C.E. (Cooper Union, N.Y.), business administrator and Sec.-Treas., Bd. of Education, Toronto, Ont.

VIPOND, William Stanley, B.Sc., and M.Sc., (McGill Univ.) cable engr., Northern Electric Company, Montreal, Que.

WORCESTER, Wolsey Grant, Ceramics (Ohio State Univ.), Prof. of Ceramics, Univ. of Sask., and Prov. Ceramic Engr., Saskatchewan Govt., Saskatoon, Sask.

Associate Members.

BAIN, James William, B.Sc. (McGill Univ.), Asst. Prof., Queen's Univ., Kingston, Ont.

BOWES, LeRoy Thorne, B.Sc., (Acadia Univ.), asst. Lower St. Lawrence survey, Hydrographic Survey of Canada, Ottawa, Ont.

CHISHOLM, Gilbert Gordon, (R.M.C. Kingston), of 289, Queen's Ave., London, Ont.

FORTIN, Eugene, of The Barrett Company, Ltd., St. Hubert St., Montreal, Que.

MEDFORTH, George Taylor, mng. engr., Canada Electric Co. Ltd., Amherst, N.S., and consltg. engr., Maritime Rly. and Power Co., Ltd., Foggins Mines, N.S.

PHILLIPS, Charles Silvester, hydrometric engr., ch. engr's. branch, Dept. of Rlys. and Canals, Ottawa, Ont.

POLYBLANK, Kenneth Grahame, engr. in chg. constrn., Long Lake Cut Off, C.N.R., of Hornepayne, Ont.

SANDWELL, Percy, engr. and dftsman., under R. Bell-Irving, Powell River Company, Ltd., Powell River, B.C.

SHEPPARD, Albert Campbell Tremain, B.A.Sc., (Univ. of Toronto), topog'l. engr., Geological Survey, Dept. of Mines, Ottawa, Ont.

Juniors.

BRIMER, Laurence Frederick, B.Sc., (Univ. of Man.), distribution dept., Winnipeg Hydro-Electric System, Winnipeg, Man.

CROOK, Wesley, leveller, C.P.R., Dept. Natural Resources, Brooks, Alta.

ELMSLIE, Gordon Alexander, in chg. dept. Dominion Bridge Co., Ltd., Montreal, Que.

JOHNSON, James Henry, dftsman., Canadian General Electric Co., Ltd., Peterborough, Ont.

RAMSAY, Ensley Moore, senr. dftsman., Reclamation Service Dept., of the Interior, Ottawa, Ont.

THOMPSON, Harold Morfin, mech. engr. and design'g. dftsman. Sawyer Massey Company, Ltd., Hamilton, Ont.

WADE, Norman Walter, telephone engr., Automatic Telephone Exchange, Regina, Sask.

Associate.

WRIGHT, George William Grant, inspectr., dept. of telephones, Saskatchewan Govt., Regina, Sask.

Transferred from the class of Associate Member to that of Member.

JACKSON, Walter, B.Sc., (Univ. of Toronto), divnl. engr., Queenston Plant of the Niagara Development for the Hydro-Electric Power Commn. of Ontario, Niagara Fal's, Ont.

LUMSDEN, Hugh Allan, B.Sc. (McGill Univ.), munic. engr., Dept. of Highways, Prov. of Ontario, Oakville, Ont.

McGINNIS, Thomas Alexander, B.Sc., (Queen's Univ.), senr. member of McGinnis & O'Connor, Kingston, Ont.

SIMMONS, Thomas Lockwood, B.A., (Univ. of N.B.), asst. ch. engr., Bd. of Rly. Commnrs., Ottawa, Ont.

Transferred from the class of Junior to that of Associate Member.

COLLINS, William Henry, B.Sc., (Queen's Univ.), res' engr., Kenilworth Ave., storm sewer, sect., City of Hamilton, Ont.

COLLINS, William Scott, B.C.E. (Univ. of Man.), in chg. field survey party, Manitoba Power Co., Great Falls Development, Man.

FLOOD, John Nash, B.Sc. (Univ. of N.B.), member of John Flood & Sons, Ltd., St. John, N.B.

Transferred from the class of Student to that of Junior.

HEWSON, John Henry, dftsman., O. R. Blandy & Co., O.L.S., Hamilton, Ont.

McCLELLAND, William Raymond, B.Sc., (McGill Univ.), post grad. work and research, Dept. of Metallurgy, McGill Univ., Montreal, Que.

WELCH, Henry Richard, B.Sc., (Queen's Univ.), partner, Welch & Johnston, Ottawa, Ont.

OTHER SOCIETIES NEWS

Members Urged to Join Ontario Association.

On June 13th, 1922, the "Professional Engineers' Act" of the Province of Ontario received the Royal Assent, but due to many circumstances which cannot be here explained, it was not until August 8th that the Provisional Council, as constituted by the Act, could be convened. At this first meeting, by-laws were drafted; policies discussed; amount of fees decided upon and committees appointed.

On August 31st., R. B. Wolsey was appointed registrar. During September much preparatory work was done by the committees and the secretary, and on October 1st the office was opened at 92 King St. West.

On October 19th the by-laws were approved by the Lieutenant-Governor-in-Council, and on October 26th circular letters over the signature of Brigadier-General C. H. Mitchell, Provisional President (and approved by Council) was mailed by the secretary to the professional engineers throughout the province. This circular set forth briefly the ground gained by the legislation secured and solicited the co-operation and support of the professional engineers. Copies of the Act, of the by-laws and of forms of application accompanied the circular.

About 2,235 of these circulars were then sent out, of which over 1500 were addressed to corporate members of *The Engineering Institute*. By the end of November, 300 applications had been received, which had increased to 593 on January 8th, 1923.

At the first general annual meeting on January 8th, 1923, councillors were elected and reports presented.

On February 15th, an order-in-council was passed, appointing five members of council, one for each branch.

On February 27th, the new council held its first meeting. An executive committee was appointed and a board of examiners. Applications for membership that had been accepted by the councillors of the several branches were presented and approved.

The following statement gives the number of applications received and dealt with to February 27th, 1923.

Branch	Application Forms sent out	Applications Received	Members Registered	Held Over
Civil	1875	431	392	39
Mechanical	112	75	46	29
Chemical	109	17	17	
Electrical	478	135	105	39
Mining	408	79	73	6
Totals	2982	737	633	104

An analysis of the registration to April 19th, 1923 shows the following distribution of the membership.

	Civil	Mechanical	Chemical	Electrical	Mining	Total
Toronto	148	22	10	77	25	282
Ottawa	51	3	1	4	6	65
Elsewhere in Province	193	21	6	24	42	286

The nine branches of the E.I.C. in the province of Ontario represent 1,077 corporate members. In Canada the total corporate membership is 3,462, of which number 2,593, or about 75 per cent, are members of the twenty-two branches. Assuming the branch membership in this province is in the same proportion to the total membership as in all of Canada, the total corporate membership in Ontario should be about 1,370.

Engineers, residents of the province who had been engaged in engineering for five or more years before June 13th, 1922, are eligible to membership without examination, upon submission of satisfactory evidence of employment, provided they apply for registration before June 13th, 1923. If an applicant has not been employed for five years, the council will determine the additional time of employment necessary before registration, the total period to be five years.

After June 13th, 1923, the act provides that applicants may be required to submit to examinations. Graduates in engineering are credited with the time spent at college, but not exceeding four years.

It would strengthen the position of the association materially if all corporate members of the E.I.C., would forward their applications to the secretary, R. B. Wolsey, 92 King St. West, before June 1st, in order that their names may appear in the register, which will probably be published in August next.

The council would prefer that applicants should not forward their fees and dues with their applications, but await notice from the secretary.

The next quarterly meeting of the council will be held in the month of July, by which date a large percentage of the corporate members of the E.I.C. should have applied for membership in the provincial association.

WILLIS CHIPMAN, M.E.I.C.,
President.

Canadian Institute of Chemistry extends Invitation to members of E.I.C., to attend Annual Meeting.

The Candian Institute of Chemistry has forwarded, through their secretary, the following invitation to all the members of *The Engineering Institute of Canada*, to attend their annual general meeting, which is being held at Toronto, during the last three days of May:—

Toronto, March 15th., 1923.

Dear Mr. Keith:—

I am writing at this time to state that the Annual General Meeting of the Canadian Institute of Chemistry will be held in Toronto May 29th, 30, and 31st. In this connection our Institute extends a very cordial invitation to all members of *The Engineering Institute of Canada*, that may find it convenient to do so, to attend our general sessions.

We feel that such co-operation among professional technical institutions is most beneficial for individual members and the industries they represent.

Yours very truly,
Canadian Institute of Chemistry,
L. E. WESTMAN, *Secretary.*

Association of Professional Engineers of Alberta.

The annual meeting of the Association of Professional Engineers of Alberta was held at the Palliser Hotel, Calgary, on Saturday the 31st March and was attended by members from all parts of the province. The morning and afternoon sessions were devoted to business and included the election of Professor Robb as president, S. G. Porter, M.E.I.C., as vice-president, and H. G. Muckleston, M.E.I.C., as civil councillor.

R. A. Brown acted as toast master at the evening banquet and the speakers included Mr. Justice Stewart, Dr. Tory, Dean Boyle, Professor Wilson, Mayor Webster, Mr. Marshall, M.L.A., Dr. Crawford, A. S. Dawson, M.E.I.C., F. E. Emery, A.M.E.I.C., P. L. Naismith and R. W. Brockington. The arrangements were made by a local committee of engineers and most of the Calgary members of *The Institute* availed themselves of the opportunity of meeting the members from Edmonton, Lethbridge and other parts of Alberta.

Canadian Engineering Standards Association

A meeting of the sectional committee on road materials was held in Ottawa on Monday, April 9th, A. W. Campbell, M.E.I.C., Dominion commissioner of highways, in the chair. Among those present were, Hon. Mr. Biggs, minister of highways, Ontario; W. A. McLean, M.E.I.C., deputy minister of highways, Ontario; D. L. McLean, A.M.E.I.C., deputy minister of public works, Manitoba, J. A. Duchastel, M.E.I.C., S. L. Squire, and W. A. Findley, representing the Canadian Good Roads Association; B. M. Hill, chief road engineer, province of New Brunswick, and D. A. McKinnon, representing the highway department, province of Prince Edward Island.

This committee has upon its membership representatives of all of the provincial highway authorities, and of *The Engineering Institute of Canada*, together with representatives of other bodies and organizations interested in highway work. At the meeting stress was laid upon the desirability of uniformity in standards of material and construction for roads of each type, such as earth roads, gravel roads, broken stone, bituminous and concrete roads. After considerable discussion sub-committee were appointed, each charged with the preparation of specifications for its particular class of material or work. When completed and approved, it is hoped that these specifications will receive general adoption as standards throughout the Dominion.

The chairman stated that the committee now convened was asked to continue work which had originally been undertaken by a committee of *The Engineering Institute of Canada*, and which it was understood the council of The Institute now wished to place in the hands of the Canadian Engineering Standards Association. He expressed appreciation of the work already accomplished and felt sure that it would prove an acceptable foundation on which the present committee could build.

A meeting of the sectional committee on Traffic Signals for Highways was held in Ottawa on Monday, April 9th, A. W. Campbell, Dominion commissioner of highways, in the chair. Among those present were A. F. Macallum M.E.I.C., and Chief Ross, city of Ottawa; J. A. Begin, provincial government, Quebec; A. C. McKenzie, of the Canadian Pacific Railway; J. A. Ellis, Canadian National Railways; G.Gordon Gale, M.E.I.C., representing the Canadian Electric Railway Association; J. H. King, Canadian Automobile Underwriters' Association; Hon. F. C. Biggs, minister of highways, Ontario; W. A. McLean, M.E.I.C., deputy minister of highways, Ontario; Dr. P. E. Doolittle, president, Canadian Automobile Association and J. A. Duchastel, M.E.I.C., representing the Canadian Good Roads Association.

In opening the meeting, the chairman explained that the committee had been formed with the view of obtaining agreement among the provincial governments, municipal, railway, automobile, and other authorities concerned in regard to traffic signals on highways and on motor vehicles, so as to get rid of the many local divergences which now exist. It was also hoped to work in co-operation with a similar committee which is being formed under the auspices of the American Engineering Standards committee and is dealing with similar problems in the United States. Mr. Biggs drew attention to the important nature of the work and described the progress which has already been made in the Province of Ontario, explaining the provisions of a revision of the Motor Vehicles act which is now before the provincial legislature Mr. Begin outlined the situation as at present existing in the province of Quebec and expressed the fullest sympathy with the movement for uniform requirements

After considerable discussion, it was decided to place the work in the hands of three working sub-committees, dealing respectively with highway signals at level crossings, signals on vehicles, and danger and direction signals on highways. It was further decided to co-operate as far as possible in each cause with the corresponding committee of the American Engineering Standards committee, with the view of obtaining as far as possible uniformity in practice between the two countries. The sub-committees were requested to report at the next meeting of the sectional committee, to be held at the time of the annual convention of the Canadian Good Roads Association in June in Hamilton.

Society of Terminal Engineers Elects New Official Organ

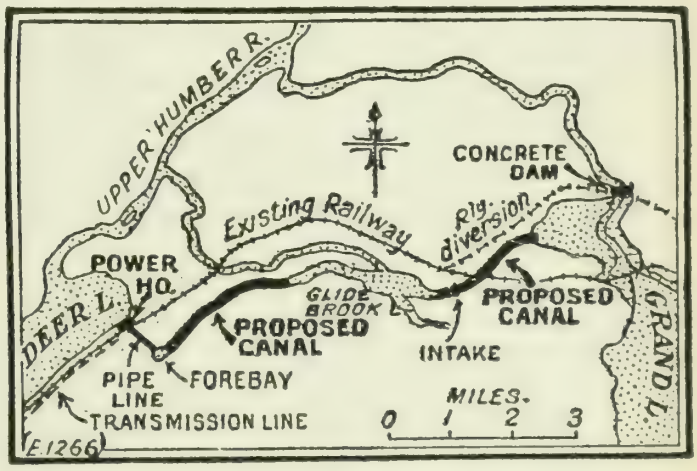
The board of Directors of the Society of Terminal Engineers of New York have announced the selection of "Port and Terminal" as the new official organ of the Society.

At the last meeting of the Society the President was authorized to close the deal and satisfactory arrangements have been made whereby "Port and Terminal" will publish in the future all the proceedings of the Society.

Water power and Pulp and Paper Development in Newfounland

A number of engineers of the Sir W. G. Armstrong, Whitworth Company have recently been on a visit to Montreal on their way to Newfoundland in connection with the scheme, known as the "Humber-arm proposition" for the developing of a large amount of hydro-electric power on the west side of Newfoundland and using it in connection with pulp and paper mills. These engineers have visited a number of developments in eastern Canada and expect shortly to proceed to the site of the new work.

Briefly, the proposal is to develop about 100,000 h.p. at a point on Deer Lake, and to erect pulp and paper mills with a daily output of 400 tons of newsprint. The amount of power available in the neighbourhood is 230,000 to 240,000 h.p., all of which would be developed in due course as a market can be found for it. The works at present planned for execution during the next two years include a concrete dam, 75 ft. high and 1,200 ft. long, across Junction Brook to retain the waters of Grand Lake, which, with its area of nearly 200 square miles, will permit the spring floods to be stored for use later in the year when the rivers are usually lower. From a point above the dam a canal will lead the water to Glide Brook Lake, which will be formed by utilizing the valley through which the brook runs and by constructing an earth bank which will maintain the water at a level 5ft. below that of Grand Lake. At the western end Glide Brook Lake will be



closed by another deep bank, and the water will be conveyed in an open canal to the forebay, whence it will flow under a head of 250 ft. in pipes down to the Francis turbines in the power house. The whole output of the station, which will generate at 6,000 volts, will be transmitted by high tension lines to the pulp and paper mills some distance away.

The necessary works, including also spillways, log chutes, sluices, ice racks, ice chutes, and devices for dealing with any hydraulic emergency that may arise, have already been put in hand by Sir. W. G. Armstrong, Whitworth and Co., who will execute the whole of the contract, and preliminary arrangements have been made at Elswick for the manufacture of the turbines. The papermaking machinery will be supplied by Messrs. Charles Walmsley and Co., of Bury, Lanes (members of the Armstrong group). The steam for cooking the pulp and drying the paper will be generated in electric boilers absorbing 60,000 h.p., and about 30,000 h.p. will be utilized in the mechanical operation of the mills.

Ten Storey Appartment Being Erected in Montreal

Excavation has been commenced on a ten storey apartment house being erected on Drummond Street, Montreal. The apartment will contain about one hundred and twenty-three apartments and is expected to be ready for occupation about May 1924. The general contractors are Anglin and Norcross, Limited, Montreal, and the architects Fetherstonhaugh and McDougall.

CORRESPONDENCE

Canada Fuel Problem

Coniston, Ont.
April 20th, 1923.

The Editor: *Journal*,
Dear Sir,

The April number of "*The Journal* of the *E.I.C.*" contains a paper by Mr. B. F. Haanel on the fuel problem, which affords very disappointing reading to those engineers who, like myself, regard the *transportation* of Canadian coal from where it exists to where it is needed, as the very core of the Canadian fuel problem. Such an expression of opinion by a member of the Fuel Board, appointed by the government to initiate means for finding the best lines of solution of our fuel problem, seems, at the early stage of the board's work at which this paper was read before the Ottawa branch of the *E.I.C.*, to have been rather unwise, indicating, as it appears to do, that this member of the board was not open-minded on the one aspect that some engineers at least regard as the crux of the problem.

Mr. Haanel's summarized conclusion, after some argument, that "This suggestion", (the haulage of western coal to points in Ontario east of Port Arthur) "therefore, may be eliminated", expresses precisely the attitude of mind which I tried to forestall in my presidential address to the annual western meeting of the C.I.M.M. at Edmonton, in September, 1921, from which, with your kind permission, I will presently quote. The attitude of mind with which Mr. Haanel faces this transportation problem never led to the solution of any great engineering problem; and this is admittedly great, though it presents only a fraction of the difficulty that would face us, had we not built the two national transcontinental lines. The recent letter of Mr. M. J. Butler, published in the Toronto "Globe" and read by Mr. Thos. W. Gibson at the last annual meeting of the C.I.M.M. in Montreal, coming, as it did, from an eminent engineer with experience in transportation, should have caused Mr. Haanel to hesitate before publishing his contrary opinion in your April number.

We were informed at the March meeting of the C.I.M.M., that the coal consumption of Canada is now about 3⅓ times our consumption twenty-five years ago and that about sixty per cent of our consumption is imported. It is therefore at least possible, if not probable, that by the middle of the present century Canadians may consume 100,000,000 tons of coal annually, of which 60,000,000 tons may be imported. It is also at least possible that by that time the coal consumption in the United States may increase from well over 500 million at present to a billion tons a year. Already American railways are admittedly inadequate to handle their existing traffic and there is but little disposition to put further large capital into railways. The pinch central Canada has felt for five or six years, we have been too much inclined to lay to the war and to strikes. These have served to cloud the greater and more permanent cause, which will rapidly become more operative, viz., that, whether we like to admit it or not, we are experiencing growing pains which will grow more and more acute, unless we adopt independent means for relieving them.

Let me repeat a part of my statement of the problem as it appeared to me a year and a half ago and as it still appears:

"The question, to what extent Canada can and should supply herself with fuel, is one, the importance of which can hardly be overemphasized. It reaches out in many directions, some of them quite unexpected to the person who is just beginning a study of it.

. . . . . .

"The chief *primary* elements of this problem appear to me to fall under three heads: (1) The engineering elements; (2) those considerations affecting the policy of the board of management of our National Railways; and (3) those affecting policy as to the wisest development of markets for distribution of coal from our eastern and western fields, respectively, having regard to the present status and probable future growth of population and industries in Canada.

"(1) *The Engineering Elements.*—The engineering aspect of the coal problem is quite simple to state and, though containing many difficulties, could be settled in a fairly straight-forward manner. It requires the careful attention of engineers with a wide and intimate knowledge and experience in coal handling and haulage, and in car and locomotive adaptation to special purposes, acting in consultation with those engineers who have an intimate knowledge of the roadbed, grades, curves, bridges, and other details of our National Railways. The problem before them would be very special — to find the most suitable design of cars and engines, and the best traffic organization, to secure the absolutely minimum cost per ton-mile for hauling western coal under the special existing conditions. The subject of equipment should be studied both theoretically and experimentally with a view solely to this end.

"Existing ton-mile rates for bulk freight cannot decide the matter. The duplicates of the engineering elements of this problem exist nowhere else. The conditions of the problem are not only special but very highly special. If water-carrying can reduce cost in some cases, this should be considered. Though railway engineering is not my specialty, I do not fear contradiction in saying that this particular problem in transportation has not been minutely studied, much less had its solution determinedly and thoroughly attacked.

. . . . . .

"It would, in my judgment, be advisable for our National Railway management to spend any reasonable sum of money in exhaustively examining these engineering features. There is only one way to solve a difficult engineering problem such as this, once we are convinced of the immense importance of finding a solution, and that is to set about it with the best procurable experience and ability of men in these special lines of engineering, to back them up with ample means, and to exercise determination to reach the highest success obtainable. If we start off half-heartedly, with the pre-conceived notion, that it can't be done, lurking in the back of our minds, we shall certainly be fore-doomed to failure.

"(2) *Railway Policy.*—We come now to the question of government, or public policy concerning our National Railways rendering this service. Is it sound policy, or is it not, in making a freight rate for this commodity, that we should allow wider considerations of national benefits, which would incidentally be rendered by our publicly owned railways, to enter into the question? — to consider their incidental service in reducing our economic dependence on the United States; in developing our resources and extending existing businesses; in keeping capital in the country, or bringing in fresh capital for development, and thus creating employment for increased population; in improving the rate of exchange and increasing the area from which national revenue may be derived? Or, in fixing a freight rate for this important business, should such questions of policy be entirely disregarded and the operation of our National Railways be looked upon as a business solely in and by itself? Those who decide the policies of the best managed railway system on this continent look farther ahead than this. Have you never heard of special rates on settlers' effects, on thorough-bred stock and other commodities, affecting other branches of this company's business, and favourably affecting transportation profits only indirectly or in the long run? If there can be shown sufficient advantages to give a favourable total, the only wise policy is to make a rate to create the traffic. But I do not ask consideration of the question of making a dead loss on the coal haul. I merely ask that, in view of the facts, that this traffic cannot otherwise originate and that it will bring the large indirect advantages referred to, including greatly increased traffic directly profitable to the railways themselves, we consider whether it would not be sound policy to make, where necessary, a rate on coal that will cover only actual additional expense arising from hauling the coal. This will indirectly lessen the annual railway deficit owing to freight received from profitable traffic incidentally created, and will bring to Canada these large indirect benefits in return for taxes we shall, for many years to come, have to pay in order to meet the annual railway deficits.

"If by following a far-sighted policy we can lead to the mining annually of ten or fifteen million tons of coal in the west, now imported from the United States, a tonnage that must steadily increase to unknown figures in future, it will lead to large extensions of other businesses and industries, including farming, as well as an unexpectedly large increase in population. In Sudbury district, I estimate the population directly and indirectly supported by the mines as about ten times the number of the mine payrolls; and this does not include any increase due to stimulation of business and industry outside the district, in Toronto and other cities, and in rural districts for the growth and preparation of food-products for the mining population. The demands of the coal mines themselves, as well as of the population incidentally brought in, will bring a large addition of profitable in-going freight as well as increased passenger service. I do not ask consideration of any policy whereby any one will be taxed for the benefit of some one else. The actual *additional* outlay for rendering the service must be paid by the consumer. Is this policy unsound? If so, what is the unsound spot in it?

. . . . . .

(3) "In seeking this solution, the relative extent of the two coal fields (as far as known), their natural opportunities for market expansion, and the bearing of these important factors on the future development of Canadian industries, are of the very first importance. Published estimates of the bituminous coal reserves of the two fields indicate that those of the maritime province are but a small fraction (not more than about five per cent, I believe), of the estimated reserves of our western field, even when the fact is allowed for, that probably less than twenty-five per cent of our total western coal is bituminous. This statement, however, should not be allowed to obscure the important fact that the eastern coal areas are reported to have the very large reserve of 8 or 10 thousand millions of tons of high grade bituminous coal. If this

reserve (and it may be somewhat under-estimated) is large enough to be practically inexhaustible, then we may view it as we do the salt in the sea, in which circumstance the relative estimate of the western reserve of coal will become a fact of no present significance. But is this true?

"Canada's eastern coal field is in a commercially strategic position. Its various parts face on, or lie close to, the ocean of greatest commerce. It has probably the largest single iron ore deposit in the world dependent upon it — a compact deposit said to contain the enormous figure of 3,500 millions of tons of ore. It has also easy access by water to parts of Canada as far inland as Montreal, and farther by use of existing canals. The known reserves of coal in the east seem to an outsider, like myself, not more than sufficient to provide reasonably for future iron and steel making, domestic consumption in the area eastward from Montreal, and a fair amount for export trade.

"There is no reason for drawing hard and fast lines in a discussion of broad policy; but there is every reason for looking far ahead in studying a question of such national importance as this. A few million tons of coal, more or less, sent annually into Ontario will not appreciably affect the broad question of policy either way. But Canada's population and industries are growing. If we have any historic sense, we must see that its population will probably amount to 50 or even 100 millions within a century or two, and Canada may, like the United States, then reach a coal output of half a billion tons or more annually. Sydney can probably look forward with some confidence to the time when it will be a combination of Sheffield and Liverpool, or of Pittsburgh and New York, in functional relation to the steel and shipping industries. What is left of the eastern coal reserve, when Canada's population reaches fifty millions, will look small enough in relation to these large eastern demands, which will increase concurrently with the inevitable growth in population.

"Are not such matters as these of the most vital importance to the problem we are discussing? Does the discussion of a pressing national problem by practical men preclude any attempt to make a forecast of the future? Surely not. The solution of every engineering problem is an attempt to make some adaptation to forecasted conditions. Since this is a national problem the forecast must be longer. The present conditions and coal reserves are where and what they are. Without being dreamers, without being over-optimistic as to Canada's future growth in population and industries, but with a reasonable and sane expectation as to her future place in industry and commerce, what is the bearing of these facts and reasonable forecasts on a sound coal policy? Will it be wiser for Canadians, in their effort to supply temselves to the utmost from their own coal reserves, and to realize the greatest possible value in these reserves, to spend their maximum effort to extend western shipments eastward, or, to stretch eastern shipments westward? Probably both will have to be done, if the "thousand-mile gap" is to be bridged. But when we consider the present urgent condition of our National Railways, and the many incidental advantages already pointed out, the bearing of these matters seems to point to the more immediate urgency, not to say major importance of concentrating as soon as possible on the problem of finding first the maximum extension eastward.

"There is, and can be, no room for dogmatic assertions in a problem of such magnitude and complexities as this. There is too great difficulty in weighting the almost innumerable facts and conditions bearing on it."

For the information regarding peat, etc., contained in the paper we have to thank Mr. Haanel. But when the utmost use of peat, wood, oil and electricity has been attained, the fuel problem will still be with us. In any case peat, wood and oil are very temporary expedients. I suppose that, before it was actually done we might have been told that transportation of Welsh coal to Sudbury was economically impossible. Yet we imported 1,000 tons last year for our staff and men and it cost us approximately $3.00 per ton less in our basements, after paying ocean freight for nearly 3,000 miles and rail freight for 450 miles, than Pennsylvania anthracite. There is no way of evading the transportation problem of carrying Alberta coal to Ontario consumers. If we don't attack this problem in earnest now, while we have time, we are simply drifting into a time when we shall be compelled to rush headlong into the solution of it, with possibly much suffering, and without time at our disposal to solve it in the best manner.

C. V. CORLESS, M.E.I.C.

Trade Publications

The Truscon Laboratories, Detroit, Michigan, have issued a reprint on an article on "Integral Water-Proofing" a practical discussion, which will be forwarded upon request to any members of *The Institute*.

The Asphalt Association of New York City, has issued a pamphlet entitled "Salvaging Old Pavements by Resurfacing with Asphalt" being brochure No. 14, which may be secured upon request.

Deterioration of Concrete in Alkali Soils

Toronto, Ontario
April 11, 1923.

The Editor, *Journal:*—
Dear Sir,

In the issue of *The Engineering Journal* of February 1923, page 57, there is published a report of *The Institute* committee on deterioration of concrete in alkali soils.

After carefully reading this report, one point particularly is set forth, which I think deserves further discussion, and it is the purpose of this letter to enquire for certain information, with reference to normal differences found in general laboratory tests on Portland cements.

References are made, and tables set forth of tests carried out on three makes of cement, viz.; Canada Cement, Super Cement and Commercial Cement. The difference in tests between Super and Canada cements are emphatically characterized in large type, as only "normal differences often found when comparing two Portland cements from different mills."

This statement is made very prominent, and one is apt to glance rather hurriedly over the details as outlined in Table I, of the above mentioned report. When these details are analyzed, certain marked differences in crushing strengths are shown, varying in different mixes from thirty to fifty per cent, as follows:

Table of differences compiled from report of the committee as published.

Source of Aggregate	Mix	Strengths Canada Portland	Super	Differences
Carsland, Alta.	1-1-2	2100 lbs.	3120 lbs.	1020....48.6%
" "	1-1.67-3.33	1802 "	2291 "	489....27.1%
Warman, Sask.	1-1.36-1.66	2520 "	3540 "	1020....40.5%
" "	1-2.3-2.8	1260 "	1825 "	625....49.6%
Winnipeg, Man.	1-1.28-1.84	2515 "	3505 "	990....39.4%
Neat Cement...		5988 "	8695 "	2707....45.2%

Is it to be inferred that the normal product of any two Portland cement mills, can normally be expected to differ in quality so that it may require three bags of cement from one mill, to do the work of two bags from the others? If this is so, I venture to suggest that it is a point of very material importance, not generally appreciated by engineers.

Yours truly,
E. C. GOLDIE, A.M.E.I.C.,

Chicoutimi Hydro-electric Development

Remarkable progress has been made on the million dollar hydro-electric development of Price Bros. and Company, Limited, at Chicoutimi, Quebec. The actual work dates from November 5th, 1922, when the contractors first appeared on the site. Concrete was first poured on January 18th of this year and to date 22,000 cubic yards of concrete have been placed out of a total of 26,000 cubic yards. The work has of necessity been pushed to the utmost in order to take advantage of the low-flow period of the river, so that until very recently the construction was carried on with night and day shifts, seven days in the week.

The south wing wall of the dam is connected to the gravity section connecting an Ambursen section 400 feet long which in turn is connected to a gravity section 150 feet long. The dam proper consists of a four tanker gate spillway section and a control sluice section, while for the intake, a gravity bulkhead dam approximately 100 feet in length with a short section of core wall on the north bank.

At present the sub-structure of the power house is completed the hydraulic equipment for which is being supplied by the Dominion Engineering Works, Limited, consisting of one 75,000 h.p., I. P. Morris, turbine. The electrical equipment is being supplied by the Canadian Westinghouse Company, Limited, while the headgates and the spillway gates are on order from the Dominion Bridge Company, Limited.

The consulting engineer on the work is Geo. F. Hardy, M.E.I.C., of New York; the general contractors are the Wm. I. Bishop, Limited, Montreal; and the resident engineer in charge of construction C. N. Shanly, A.M.E.I.C., with C. Ben Bate, A.M.E.I.C., as his chief assistant.

Trade Publication

The pumping equipment of the immense new refinery at Baltimore put in operation last year by the American Sugar Refining Co. is described in a leaflet published by the De Laval Steam Turbine Co., Trenton, N.J. The leaflet is copiously illustraced, and will doubtless be of interest to engineers confronted by similar pumping problems

Another pamphlet recently issued by this company illustrates the use of steam turbines for driving heavy machinery exposed to carbon dust and grit.

Preliminary Notice

of Application for Admission and for Transfer

19th April, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in May, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV and VI.), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ARMSON—HAROLD PERCIVAL, of Newtonbrook, Ont. Born at Leicester, Eng., Nov. 16th, 1887. Educ., Northampton and County Tech. Sch., and I.C.S. course mech. engr'g., London, Eng., and Scranton, Pa.; 1906-10, mech. dftsman., detail'g. for industr'l. mchy. and plant layouts, Standard Rotary Machine Co., Rushden, Eng.; 1910-11 (6 mos.), ch. dftsman., design'g. oil-burning furnaces for industr'l. plants, Francis Hyde & Co., Montreal, Que.; 1911 (8 mos.), elec'l dftsman., Nor. Elec. and Mf. Ltd., Montreal, 1911 and 12, (11½ mos.), designer and dftsman., Schofield-Holden Machine Coy. Ltd., Toronto, 1912 (1 mo.), Russell Motor Co. Ltd., W. Toronto, 5 mos., Pease Foundry Co. Ltd., Toronto and 1911-13 (14 mos.) Holden-Morgan Co. Ltd., Toronto; 1912 (4 mos.), plant layout dftsman., Acadia Sugar Refining Co., Halifax; 1913-14 (1 mo.), elec'l. dftsman., Automatic Elec. Cook Co.; 1913-14 (16 mos.), str'l dftsman and checker, McGregor & McIntyre, Ltd., and 1914 (5 mos.), Canadian Allis Chalmers Co. Ltd., Toronto; 1915-19, ch. engr., Holden-Morgan Thread Miller, Ltd., Toronto; 1917-18 (5 mos.), mech. asst. to ch. engr., British Forgings, Ltd., Toronto; 1919 (Aug.-Oct.), str'l dftsman. and checker, Toronto Steel Constrn. Co., Ltd., and 4 mos., Bernard H. Prack, industrial engr., Toronto; 1920-21 (5 mos.), plant layout dftsman., American Cyanamid Co. Ltd., Niagara Falls, Ont.; 1921 (7 mos.), partner, Harold P. Armson Engr'g. Co., and 1921-22 (9 mos.), sen. partner, Armson & Nock, machine and specialty design, Toronto; May 1922 to date, asst. engr., Walter J. Francis & Co., Toronto, Ont.

References: W. J. Francis, F. B. Brown, H. G. Acres, T. H. Hogg, D. S. Ellis, W. P. Wilgar, J. L. Busfield, E. T. Bridges, F. M. Byam.

BURGESS—GEORGE JAMES, of Windsor, Ont. Born at London, England, Mar. 1st, 1869. Educ., Classical and Science Philolog. at Sch. Lond. U., drawing and steam Sc. Kensington Science and Art Dept. specials, Kings Coll., London, England; 1910-11, design and reconstrn. of elevator at Neebutt, Man., for Manitoba Grain Commn.; 1911-13, design and constrn., street cleaning machinery for Motor Street Cleaning Co., Regina, Sask., and Windsor, Ont.; 1914-17, high tension operator, H.E.P.C., of Ont.; 1918-20, design'g. dftsman., Canadian Steel Corpn., Ojibway, Ont.; 1920 to date, dftsman., Canadian Steel Corpn., at present with Canadian Bridge Co., Windsor, Ont.

References: H. Thorne, J. E. Porter, J. S. Nelles, G. V. Davies, J. H. Bradley, O. M. Perry, J. C. Keith.

DICKSON—GEORGE LESLIE, of Moncton, N.B. Born at Truro, N.S., Dec. 24th, 1878. Educ., M.A., Acadia Univ., 1900, 1905-10, chief elect'n., Pictou County electric Company; 1910-16, chief elect'n., Nova Scotia Steel and Coal Company, Wabana, Nfld.; 1916-17, mgr., Chambers Electric Light and Power Co., Truro; 1919-23, gen. power plant inspr., eastern lines, C.N.R.; at present elec. and signal engr., Atlantic region, C.N.R., Moncton, N.B.

References: R. G. Gage, M. J. Murphy, H. J. Crudge, F. O. Condon, K. Gordon.

JAMES—HAROLD H., of 191 Vermont Str., Montreal, Que. Born at Toronto, Ont., Aug. 3rd, 1889. 1906-09, engr'g. appr'tce., Canada Foundry Co., Toronto; 1909-12, mech. drftng., General Electric Co., Schnectady; 1912-14, structrl. detailing, National Bridge Co., and Structural Steel Co., Montreal; 1915-16, genrl. plant engr'g., N.S. Steel and Coal Co., New Glasgow, N.S.; 1916 to date, engr'g. dftsman., office of maintenance engr., Montreal Locomotive Works, Montreal, Que.

References: C. A. Mullen, F. J. Di Benga, A. F. Hanly, J. M. Robertson, S. D. MacNab.

KNAPP—EDWARD WINSLOW, of 107, Hutchison Str., Montreal, Que. Born at Sackville, N.B., Oct. 31st, 1894. Educ., McGill Univ. (graduating this year); 1920, surveying during summer.

References: L. A. Herdt, C. V. Christie, C. M. McKergow, A. R. Roberts, E. Brown.

LANGLOIS—WILLIAM LAWRENCE, of Toronto, Ont. Born at Toronto, Dec. 14th, 1900. Educ., 4th. yr., civil engr'g., S.P.S., Toronto; 1921 (Apr.-Aug.), rodman and instr'man. on survey party for H.E.P.C., on Chippawa Power Canal; 1922 (summer), survey and timekeeping for Dept. of Colonization of Roads, Ont.

References: C. R. Young, P. Gillespie, W. J. Smither, A. Harkness, T. R. Loudon.

LESLIE—JAMES, of 2103 Mance Street, Montreal, Que. Born at Montreal, June 1st, 1865. Educ., private tuition under Prof. Whyte, and dfting. tuition under J. Dyer, J. McDougall Iron Works, Montreal, 1879-84, and tech. school, San Francisco, Calif., 1894; 1882-86, W. P. Bartley & Co., St. Lawrence Engine Works, and J. C. and R. S. Weir, marine engrs., Montreal; 1886-98, loco. dept., C.P.R.; 1889-94, Vancouver Electric Rly. and Lighting Co.; 1895-98, mech. supt., Berners Bay Mining and Milling Co., Juneau, Alaska; 1899-1904, erecting and supervising engr., Dawson Elec. Light & Power Co., Dawson, Y.T.; 1904-07, Jas. Leslie & Co., engrs., Dawson, Y.T.; 1907-11, erecting engr., last two years supt., Cobalt Central Mining Co., Cobalt, Ont.; 1912 to date, inspr., munic. waterworks and fire preventive appliances, Canadian Fire Underwriters' Association, Montreal, Que.

References: A. Surveyer, T. W. Lesage, H. A Terrault, W. H. Sutherland, W. S. Lea.

LOCKWOOD—WALTER HOLMES, of 2317 Ottawa Street, Regina, Sask. Born at Leeds, England, Feb. 9th, 1883. Educ., Leeds Technical School, 1899; 1907-19, foreman on bldgs. including Kings Hotel, Kitchener Hotel, Queens Hotel, International Harvester Bldg., several schools, Regina Parliament Bldgs., Saskatoon Telephone Exchange, etc.; 1919 to date, dfting, designing and estimating, Waterman Waterbury Mfg. Co. Ltd., Regina, Sask.

References: J. N. De Stein, J. H. Puntin, R. J. Lecky, F. W. Townsend, K. N. Crowther, R. W. Allen.

MACKLIN—FREDERICK CHARLES ARTHUR, of Montreal, Que. Born at Peterborough, Ont., Aug. 28th, 1889; Educ., St. Johns School, Lower Canada College, Montreal, 1900-07; 1907-08, chainman and rodman, St. Mary's Branch, C.P.R.; 1908-09, C.P.R. fire claim survey, New Brunswick, and survey, Windsor Station, Montreal; 1909-12, instr'man., location and constrn., Alberta Central Rly.; 1912-14, res. engr., constrn., Edmonton, Dunvegan and B.C. Rly.; 1914, engr., real estate improvement, Equity Trust Co.; 1914-17, Lieut., Royal Highlanders of Canada and Royal Engrs., and 1917-19, Capt., Royal Engrs., rly. location and constrn.; At present res. engr., Interprovincial and James Bay Rly., extension of C.P.R., Fabre, Que.

References: J. M. R. Fairbairn, D. Hillman, E. S. M. Lovelace, T. Turnbull, E. C. Goldie, J. M. Silliman, G. Marryat, H. M. Fletcher.

McINNES—HAROLD LAUGHLAN, of Thorold, Ont. Born at Lyons Brook, N.S., Sept. 19th, 1890. Educ., Dalhousie Univ., Halifax, 1908-10; 1911-12, chainman, Halifax and So. Western Rly.; 1912-13, rodman and dftsman., Dartmouth to Deans Rly.; 1913-15, dftsman, and instr'man., Port Nelson Harbour Develop'mt.; 1916-19 overseas with C.E.F.; 1922 to date, instr'man., Welland Ship Canal Constrn. Thorold, Ont.

References: D. W. McLachlan, C. B. Daubney, W. A. Hendry, F. S. Lazier, C. W. West, W. B. McLean.

McDIARMID—FERGUS ARCHIE, of Ottawa, Ont. Born at Fingal, Ont., Mar. 29th, 1880. Educ., B.A., Univ. of Toronto, '02; 1902, astronomical computer, staff chief astronomer, Dept. of Interior; 1905, promoted to observer, and 1908 to asst. astronomer; 1905-13, chg. field observations, Dominion Observatory; 1906-07, chg. of party observing at 141st meridian Yukon-Alaska Boundary; 1914-16, gravity campaign establishing 42 stations across Canada; 1917 to date, supervisor of Standards, standardization invar base line tapes, measurement of base lines and geodetic astronomy, Geodetic Survey of Canada, Dept. of the Interior, Ottawa, Ont.

References: J. J. McArthur, N. J. Ogilvie, J. L. Rannie, J. D. Craig, J. B. Challies, H. L. Seymour.

MERTON—HAROLD A., of London, Ont. Born at London, Ont., Mar. 27th, 1900. Educ., evening classes, London Tech. Sch.; 1916-19, dftsman. appr'tce., Yeates Machinery Coy.; 1920, dftsman., Whitehead & Kales Iron Works, Detroit; 1921, dftsman., and to date, instr'man. and asst. to engr., London and Port Stanley Rly., London Ont.

References: H. B. R. Craig, H. L. Bucke, E. V. Buchanan, F. W. Farncomb, H. A. Brazier.

MORRISON—DAVID MONTROSE, of London, Ont. Born at Owen Sound, Ont., Sept. 5th, 1885. 1903-04, chainman and topogr., land survey; 1905-07, chainman and rodman, rly. survey and constrn.; 1908-11, dftsman. and instr'man., rly. construction, dist. "F", div. 3 and 4, 1912, res. engr., div. 3, and 1913, in chg. final track work on same, Nat. Transc. Rly.; 1914-15, in chg. re-constrn., and electrification, and 1916 to date, engr. in chg. design and constrn., terminals, grading, tracklaying etc., London and Port Stanley Rly., London, Ont.

References: H. B. R. Craig, H. L. Bucke, E. V. Buchanan, J. A. Bell, F. A. Bell, W. P. Wilgar, H. A. Brazier, F. W. Farncomb.

MUMMERY—CHARLES RUTHERFORD, of 413 Langside Str., Winnipeg, Man. Born at Hamilton, Ont., Jan. 14th, 1901. Educ., B.A.Sc., Univ. of Toronto, '22. 1920 and 1921, (vacations), employed as millwright; at present, demonstrator in elec'l. and mech'l., laboratories, Univ. of Manitoba, Winnipeg, Man.

References: J. N. Finlayson, R. W. Angus, C. R. Young, E. P. Fetherstonhaugh N. M. Hall, R. W. Moffatt.

PAWSON—HERBERT EDWIN, of Sherbrooke, Que. Born at Brandesburton, Eng., July 23rd, 1883. Educ., Univ. of Cambridge local exams., 3rd yr. sci., City and Guilds of London, Inst., '06; 5 yrs., articled pupil Prosling, Appleby & Finn, elecl. and mech. engrs., England; 1 yr., dftsman., Phœnix Dynamo and Mfg. Co.; 5 yrs., asst. engr., Middlesborough Corpn. Electricity Works; 1 yr., supt. of constrn., General Electric Co., New York; 2 yr. divnl. supt., New River divn., Appalachian Power Co., Va., U.S.A.; 1913-20, mgr. and elecl. engr., City of Prince Albert, Sask., except 1915-19, overseas C.E.F., pte. to Capt.; 1920 to date, mgr., gas and electricity dept., City of Sherbrooke, Que.

References: H. E. M. Kensit, J. B. Woodyatt, J. M. Robertson, S. R. Newton, R. E. Chadwick.

POUNDER—JOHN ALLAN, of Ottawa, Ont. Born at Co. of Renfrew, Ont., May 13th, 1892. Educ., B.A., Univ. of Toronto, '12. D.L.S.; 1909-12, articled pupil to D.L.S., on surveys of Internat. Boundary Commn.; 1912-15 (Winter seasons), engag'd, on computations of triangulation and precise traverses, etc.; 1913-15, (field seasons), in chg. parties, triangulation and base line work, etc., also 1919, Internat. Boundary Commn.; 1920, Canadian attaché with U.S. Boundary survey party on Unuk River, Alaska, and 1921, in similar capacity on St. Croix River; 1921, ch. of party, making topog'l. map of position of Campbell's Island; 1922 (summer), ch. of party on survey of S.W. branch of St. John River; 1922 (Fall), ch. of party, making topogr. map of St. Andrews, N.B., and vicinity; 1919-22 incl. (winters), adjustment of precise and other traverses to fit control geodetic positions; at present, engr. on staff, Internat. Boundary Commn., Ottawa, Ont.

References: J. J. McArthur, J. D. Craig, N. J. Ogilvie, W. M. Tobey, J. L. Rannie.

RAINBOTH—GEORGE LOUIS, of Ottawa, Ont. Born at Aylmer, Que., Aug. 17th, 1884. Educ., D.L.S., O.L.S.; Member, Assoc. of Prof. Engrs. of Ont.; 1903-04, asst. to late G. C. Rainboth, M. Can. Soc. C.E., D. and P.L.S., subdivn. contract in Saskatchewan; 1905-06, power and timber limit surveys in Que. and Ont.; 1907, plane table re-survey of Que.-Vermont Internat. Bdry; 1908, similar work, Maine, N.B.; 1909-10, reconnaissance and topography on triangulation survey of St. John and St. Francis Rivers for Internat. Bdry. Commn., and 1911, on St. Francis River, 1912, similar work on S.W. line, Maine-Que., and 1913-14, on S.W. branch St. John river; 1915-18, re-survey of "height of land" bdry., Que.-Maine, 1911-18, in gen. chg. field work summer seasons, compiling maps winter seasons, 1916, survey at Smiths Falls, Ont.; Dept. of the Interior; 1919, subdivn. survey in Ottawa, Dept. of Int.; at present, dftng., computation and compilation plans of bdry. surveys.

References: J. J. McArthur, J. D. Craig, N. Ogilvie, F. B. Reid, J. L. Rannie, G. F. Dalton.

ROBB—ROLAND WENTWORTH TUPPER, of Montreal, Que. Born at Amherst, N.S., May 29th, 1883. Educ., McGill Univ., 1905-06; appr'tce., machine shop and testing dept., Robb Engineering Works, Ltd., Amherst; 2 yrs. constrn. work, erecting steam power plant and testing, design'g. power plants; 15 yrs. in chg. various branches, Robb Engineering Works, Ltd., design'g., supervising, testing steam power plants and heating installns., Toronto Elec. Co., Ltd., Canadian Copper Co., Copper Cliff, Ont., T. Eaton Co., Winnipeg, C.P.R. Co., Fort William, Ont., Calgary Water Power Co., Alta., Town of Moose Jaw, Sask., Town of Cardston, Alta.; at present, district mgr., for Prov. of Quebec, Robb Engineering Works, Ltd., Montreal, Que.

References: F. B. Brown, G. E. Newill, D. W. Robb, H. H. Vaughan, E. A. Ryan, F. A. Combe, G. H. Duggan.

ROBERTSON—RANDAL KILLALY, of Cooksville, Ont. Born at Dickinson's Landing, Ont., July 16th, 1892. Educ., B.Sc., McGill Univ., '14. R.M.C., Kingston, 1909-12. 1910, instr'man., and chainman, O.L.S. work with Tyrell & McKay, Hamilton, Ont.; 1913 (4 mos.), levelman, City of Toronto, Sewer Dept.; 1914, (8 mos.), asst. engr., Chipman and Power of Toronto, stationed at London, Ont., on sewer constrn.; 1915-18, with infantry, and 1919 transferred to Engrs., in France, rank of Capt.; 1919-21, in chg. engr.'g. dept., and 1921 to date, works manager, Cooksville Shale Brick Company of Canada, Ltd., Cooksville, Ont.

References: W. Chipman, R. D. Sutherland, H. Dwight, E. S. Malloch, C. J. Swift, A. B. McEwen, E. Brown.

ROBINSON—CHRISTOPHER M., of 533, Aylmer Str., Peterborough, Ont. Born at Kingston, Ont., Dec. 1st, 1882. Educ., Queen's Univ., 1st and 2nd yr., sci., in one year, 1909-10; 1908-09, rodman, and 1909-11, transitman and inspectr., C.P.R.; 1911-12 (9 mos.), asst. bridge engr., C.N.R., Sudbury; 1912-13, asst. bridge engr., Ontario Divn., C.P.R.; 1913-15, asst. res. engr., C.P.R., Lake Superior Divn.; Can. Engrs., France; 1921 (9 mos.), res. engr., Dominion Park's Branch, Dept. of Interior, Banff, Windermere Highway; to date, in chg. constrn., Port Hope — Peterborough Provincial Highway, Provincial Highways Dept., Peterborough, Ont.

References: J. M. Wardle, D. W. Bewa, D. S. Ellis, A. A. Richardson, R. B. Rogers, R. L. Dobbin.

SMITH—WALTER A., of Sydney, N.S. Born at Aberdeen, Scotland, Oct. 9th, 1880. Educ., Gordon's Tech. Coll., 1896-1900; 1901-03, surveying and field work on harbour, Aberdeen Harbour Engineers; 1903-04, constrn., J. G. Joicey & Co., mining engrs., Newcastle-on-Tyne, drawing office and shop work, 1904-14, Nova Scotia Steel and Coal Co., Ltd., in chg. field work during Furnace and O.H. constrn.; 3 yrs., drawing office, 2 yrs. in chg. constrn. no. 3 colliery, install'g B. & W. boilers, etc., 2 yrs., genrl. work, colliery and blast furnace work and drawing office 3 yrs.; 1919-23, engr. mgr., Foster Construction Co., Ltd., Plaiston, London, E. 13, in chg. tech. staff shops and construction staff; at present, drawing office, Dominion Coal Co., Ltd., Glace Bay, N.S.

References: K. H. Marsh, J. G. H. Purvis, A. S. Dawes, T. J. Brown, H. C. Chipman.

SUTHERLAND—LUTHER HOLTON DUNBAR, of Montreal, P.Q. Born at Montreal, Que., Sept. 1st, 1886. Educ., B.Sc., McGill Univ., '09; 1909-11, inspectn on Caisson foundations for addition to Windsor Stn., and clerk on constrn., additions to several hotels, 1911-12, timekeeper and engr., in chg. rock excavation, 1912 and 13, quantity surveyor and estimator, and 1913-14, engr. in chg. constrn. shipbldg. plant, Canadian Vickers Ltd., for E. G. M. Cape & Co. Ltd., Montreal, 1915-18, overseas Canadian Engrs., and Canadian Rly. troops; 1918 to date, engr. in chg. various bldg. contracts, E. G. M. Cape & Co., Ltd., Montreal, Que.

References: E. G. M. Cape, F. S. Mattice, J. B. Porter, P. F. Sise.

TAYLOR—ALFRED JAMES TOWLE, of Toronto, Ont. Born at Victoria, B.C. Aug. 4th, 1887. Educ., 4 yrs. pvte. tuition; 1906-07, inspectr., mech. dept., Canadian General Electric Co.; 1907-08, asst. supt., Hamilton Powder Works; 1908-09, works engr., Canadian Explosives, Ltd.; 1909-10, asst. to consltg. engr., industrial power plant design; 1910-11, asst. mgr., Shaake Machine Works; 1911-12, asst. mgr., H. W. Petrie & Co., engrs., and machinery dealers; 1912-14, Pres. and Mng. Dir., Taylor & Young Ltd., consltg. and contr. engrs.; 1914-22, Pres. and Mng. Dir., Taylor Engr'g. Co., B.C.; Member — A.S.M.E., A.I.E.E., A.I.M.M., C.I.M.M.; to date, Pres. and Managing Director, Combustion Engineering Corporation, Ltd., Toronto, Ont.

References: J. T. Farmer, A. G. Dalzell, W. Young, A. E. Foreman, E. A. Cleveland, A. K. Robertson, A. C. R. Yuill.

TREMPE—J. C. LUCIEN, of Quebec, P.Q. Born at Montreal, Que., April 27th, 1900. Educ., B.A.Sc., and C.E., Ecole Polytech., '22; 1918 (June-Sept.), elecl. repair work, Henry Morgan Co.; 1919, (June-Sept.), survey work in connection with location of dam site, Quebec Streams Commn.; 1920 and 21, (June-Sept.), design'g., genrl. drftng., and estimating, ch. engrs. office, Public Works and Labour Dept.; 1922 (May-Nov.), design'g., dftng., and estimating, and inspectn. of bridges, and to date, asst. mtce. engr., of highway bridges, Public Works and Labour Dept. Quebec, P.Q.

References: I. E. Vallee, J. G. O'Donnell, M. L. Guimont, T. J. Lafrenière, E. T. Lavigne, C. C. Leluau.

VINEBERG—SAMUEL SULIM, of Winnipeg, Man. Born at Winnipeg, Jan. 12th, 1898. Educ., B.Sc., McGill Univ., '21. 5 mos., clerk, Greater Winnipeg Water District constrn.; 4 mos., rodman, railway mtce., G.T.P. Rly.; 4 mos., topogr., C.P.R., prelim. survey; 5 mos., C.N.R., prelim. and location survey; 12 mos. dftsman., Winnipeg Hydro-Electric System, and operator at Point du Bois; 1917(summer), leveller, D.L.S.; 1919-20, instr'man., on rly. mtce., and transitman in chg. of track centring party, G.T.P. Rly.; 1921 to date, industrial heating engr., and staff engr., Winnipeg Hydro-Electric System, at present on design or stand-by plant on City of Winnipeg Hydro-Electric System, Winnipeg, Man.

References: J. G. Glassco, J. A. MacGillivray, E. V. Caton, L. A. Herdt, N. M. Hall.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

FRIEDMAN—FERDINAND J., of Montreal, Que. Born at New York, N.Y., May 19th, 1887. Educ., B.Sc., Mass. Inst. of Tech., '08. 1908-13, engr. in chg., engr'g. work, Power heating and ventilating plants, Walker & Chambers, New York; 1913-17, private prctce. on same work; 1917-19, Capt., Ordnance Dept., U.S. Army; 1920 to date, consulting engr. and partner, McDougall, Pease and Friedman, Toronto, Ont.

References: G. K. McDougall, F. S. Keith, G. R. Heckle, H. G. Hunter, E. R. Pease, J. C. McDougall.

HARVIE—THOMAS WHITE, of Montreal, Que. Born at Coatbridge, Scotland, Aug. 5th, 1877. Educ., Glasgow and West of Scotland Tech. Coll., 1894-1900. 1894-99, pupilage, sewage and waterworks, road constrn., town planning and surveying, and 1899-00, asst. engr., Kyle Dennison & Frew, C.E., and L.S., Scotland; 1900-02, asst. res. engr., on rly. constrn., Caledonian Rly. Co., Scotland; 1902-04, asst. engr., design and constrn., harbour works, etc., Clyde Navigation Trust, Glasgow, and 1904-07, res. engr., on constrn., Merklands Quay, Shield Hall wharf etc., and 1907-10, agent and ch. engr. on constrn. Yorkhill basins and quays, etc., carried out by Sir Robert McAlpine & Sons for Navigation Trust; 1910-13, res. engr., on constrn., New Victoria Pier, shore wharves etc., Montreal Harbour Commnrs.; 1913-22, asst. ch. engr., in genrl. chg., under ch. engr., on scheme for harbour improvements inaugurated in 1910, mtce. of harbour works etc., and 1922 to date, ch. engr., of the Port of Montreal.

References: G. H. Duggan, J. M. R. Fairbairn, R. S. Lea, R. M. Wilson, F. W Cowie, R. M. Hannaford, H. Rolph, F. P. Shearwood, A. D. Swan. G. R. MacLeod. J. H. Hunter.

MACDONALD—JAMES CAMPBELL, of Kelowna, B.C. Born at Londonderry, N.S., Oct. 11th, 1880. Educ., B.A., B.E., Dalhousie Univ., '04, '06; 1905 (summer), transitman, prelim. rly. survey; 1906-07, transitman, rly. constrn., Virginia; 1907-08, transitman, mtce., C.P.R.; 1908 (Apr.-Dec.), transitman, constrn., G.T.P. Rly.; 1909, foreman, rly. constrn., New Brunswick and Nor. Ontario; 1910-11, in chg. installn., Richmond municipality, domestic water system; 1911-13, in chg. design and installn., Burnaby Munic. Water system; 1913-14, genrl. prtce., includ'g. develop't Coalmont Mining Property, with Cleveland and Cameron, Vancouver; 1914-18, overseas, Canadian Engrs., Lieut. and Major; 1919 (Jan.-May), O.C., Canadian Engrs. Depot, Vancouver; 1919 to date, in chg. locally of reorganization and reconstrn., irrig. systems in the interior of the Province for Dept. of Lands, Govt. of British Columbia.

References: E. A. Cleveland, D. Cameron, F. W. Groves, A. Macphail, C. O. C. Donnelly, E. E. Brydone-Jack. J. R. Grant, E. Davis, G. B. Hughes, J. C. Dufresne, F. H. Latimer.

McCALLUM—GEORGE HUGH, of Ottawa, Ont. Born at Smiths Falls, Ont., April 8th, 1882. Educ., B.Sc., McGill Univ., '07; D.L.S., B.C.L.S.; 1906 (summer), drafting office, and instr'man. on location, C.N.R., Winnipeg, Man.; 1907 (summer), asst. to J. E. Ross, D.L.S., Kamloops; 1908, staff, Geodetic survey, and for 3 yrs. in chg. reconnaissance or observing parties in Ontario, Quebec, and Maritime Provinces; 1911 and 12, in chg. reconnaissance and observing in B.C.; 1915-19, overseas, Can. Engrs., Major and M.C. and bar; 1913 and 14, and 1920 to date, in full chg. operations of survey on Pacific coast, Geodetic Survey of Canada, Ottawa, Ont.

References: N. J. Ogilvie, D. W. McLachlan, R. L. Dobbin, F. S. Keith, J. R. Grant, J. D. Craig.

SCHLEMM—LEONARD E., of Montreal, Que. Born at Brooklyn, N.Y., Sept. 16th, 1878. Educ., Mass. Inst. of Tech., 1900-03; 1903-05, topogr. and instr'man., location surveys, Gulf Colorado and Santa Fe Rly., 1905-08, Chicago Nor. Western Rly. reconnaissance, location, surveys, etc.; 1908-10, responsible chg. all constrn., Brett & Hall, landscape archts., Boston, Mass.; 1910 to date, in pvte. practice, landscape archt're, 1912 to date, consltg. engr., Town of Hampstead, P.Q., and 1917 to date for Towns of Mt. Royal and Beaconsfield, 1918 to date, town planning consultant for town of Iroquois Falls, Ont., in chg. all development work, at present, private practice, 43 St. François Xavier Str., Montreal, Que.

References: F. S. Keith, W. J. Francis, F. B. Brown, G. E. MacLeod, G. M. McKergow, A. H. Ross, A. Surveyer.

SEYMOUR—HORACE LLEWELLYN, of Weston, Ont. Born at Burford, Ont., June 11th, 1882. Educ., B.A.Sc., Univ. of Toronto, '13, (grad. S.P.S. '03), C.E. '21; D.L.S., O.L.S., S.L.S., N.S.L.S., 1902 (summers), rodman, Niagara Falls, Canadian Niagara Power Co., 1903-07, dftsman., and first asst., 15th base line west, 5th meridian, surveys branch, Dept. of Interior, 1907-08, asst., B. J. Saunder, M.L.I.C., Edmonton; 1908-10, Saunders & Seymour, civil Engrs., genrl. practice; 1910-12, pvte. prtce., includ'g. surveys for Alberta Central Rly.; 1912-14, senr. partner, Seymour & Dawe, Ltd., engrs. for City of Red Deer; 1915-20, Dominion Govt., town planning engr'g., Banff, Halifax (devasted area), St. John, Niagara Regional area, etc.; 1920-23, Barber, Wynne-Roberts & Seymour, director, Frank Barber and Associates, Ltd., consltg. engrs., munic. and town planning engr'g., consultant, City of Niagara Falls, 1921, Hadleybury, 1922; at present, consltg., munic. and town planning engr., associated in city planning surveys for City of Kitchener, special lecturer, Easter term, Univ. of Toronto, in town planning, Toronto, Ont.

References: R. O. Wynne-Roberts, C. H. Mitchell, W. H. Breithaupt, C. R. Young, N. J. Ogilvie, D. H. Nelles, J. C. Keith, P. Gillespie, F. S. Keith.

SHUPE—STANLEY, of Kitchener, Ont. Born at Bridgeburg, Ont., Feb. 24th, 1890. Educ., B.A.Sc., Univ. of Toronto, '14. 2 yrs. study fire prevention, Canadian Fire Underwriters Assocn.; 1904-14 (summers), office and field asst. to munic. engrs., and D.L.S. work in Manitoba; 1915, engr. in chg. roads, bridges and drainage work; 1916-20, town engr., Dunville, township engr., Moulton, Canborough, Seneca, Walpole, North & South Cayuga etc.; to date, town engr., Oshawa and at present, city engr. in chg. city planning, etc., Kitchener, Ont.

References: W. H. Breithaupt, A. G. Dalzell, P. Gillespie, W. A. McLean, W. Storrie, W. Gore.

TAIT—ISAAC JOSEPH, of Montreal, Que. Born at Aberdeen, Scotland, June 9th, 1876. Educ., Stewart's Coll., and Heriot Watt Engr.g. Coll., Edinburgh, Scotland appr'tceship., mech. engr'g.; 1898, steam, hyraulic and genrl. engr'g., Brown Bros., Ltd., Edinburgh; six mos. elec'l. engr'g., Cribbes & Ross, Edinburgh; 1899-06, marine engr'g., on various ships, 18 mos. ch. engr.; 1907 (9 mos.), special training, marine turbine constrn., Fairfield Shipbuiling Co., Ltd., Glasgow; 1907-11, 2nd. and ch. engr., T.T.S.S., "Eskside" and "Royal George"; 1921 (6 mos.), asst. mgr., Jeffries & Son, Avonmouth and Bristol; 1913, testing engr., Calorolac Ltd., Liverpool; 1914-16, ch. engr., chg. mech. equip'mt., Windsor Str. Stn. bldg., C.P.R.; 1917-19, associated with J. T. Farmer, Montreal; 1919 to date, supt. engr., C.G.M.M. Ltd., Montreal, Que.

References: J. T. Farmer, E. A. Ryan, F. A. Combe, F. B. Brown, K. B. Thornton.

YOUNG—RODERICK BEARCE, of 168, Quebec Ave., Toronto, Ont. Born at Minneapolis, Minn., April 24th, 1891. Educ., B.A.Sc., Univ. of Toronto, '13, C.E., '19; 1907-10, (summers), rly. constrn., C.P.R.; 1911-13, (summers), engr'g. appr'tce., Canadian Westinghouse Co.; 1913-16, asst. laboratory engr., H.E.P.C., of Ont., engag'd. on genrl. testing; 1916 to date, senr. asst. laboratory engr. in chg. engr'g. materials and chemical sections of the laboratories, 1918-21, directed extensive researches in properties of concrete and methods of concreting, Hydro-Electric Power Commission of Ontario, Toronto, Ont.

References: H. G. Acres, A. C. D. Blanchard, P. Gillespie, F. A. Gaby, W. P. Dobson, W. J. Francis.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

DOULL—GEORGE ROY, of Montreal, Que. Born at New Glasgow, N.S., Jan. 26th, 1891. Educ., I.C.S. course, struct'l engrg.; 1909-13, designing and detailing struct'l steel work, W. P. MacNeil & Co., New Glasgow, N.S.; 1913-14, designing and detailing bldgs., N.S. Car Works, Halifax, N.S.; 1914-16, dftsman., Can. Govt. Rlys., Halifax Ocean Terminals; 1916-18, dftsman., Can. Govt. Rlys., Moncton, N.B.; 1918, 6 mos., sewer and water system layout, Can. Govt. Rlys., Halifax; 1918-21, asst. engr., C.N.R., bridge dept., Moncton, 1921-23, asst. engr., C.N.R., engr. of standards office, Toronto, Ont.; Mar. 1923 to date, asst. engr., chief engrs' office, C.N.R., Montreal, Que.

References: W. A. Duff, R. O. Stewart, A. W. Smith, J. A. Ellis, F. I. C. Goodman, A. H. Jones.

McDONALD—WILLIAM SUTHERLAND, of Calgary, Alta. Born at West Zorra township, Ont., April 28th, 1890. Educ., B.Sc., Univ. of Alberta, '15, 1912 and 13, (summers), chainman and transitman, townsite subdivn. in Alberta; 1915 (summer), 2nd asst. on D.L.S. in Alberta; 1915-19, overseas; 1919 to date, junr. hydrometric engr., Dept. of the Interior, Calgary, Alta.

References: A. L. Ford, G. H. Whyte, P. M. Sauder, F. K. Beach, O. H. Hoover, P. J. Jennings, J. A. Spreckley, C. A. Robb.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

ALLEN—WILFRED JOSEPH, of Beauport, Que. Born at St. Zacharie, Que., Sept. 3rd, 1898. Educ; I. C. S., Surveying and mapping course; 1916-19, C. E. F.; Nov. 1919-July 1920, business college; 1920-21, freight biller, C. N. R.; 1921-22, clerk, Dept. of Immigration, Quebec; 1922 to date, asst. engr., computing and checking field notes, plotting and checking center lines, topography, profiles and cross-sections, Department of Roads, Quebec, P. Q.

References; J. A. Lefebvre, P. Savary, J. E. Roy, S. Amiot, A. Paradis.

CREALOCK—ARCHIE BURGESS, of Toronto, Ont. Born at Toronto, Ont., Jan. 9th, 1893. Educ., B.A.Sc., Univ. of Toronto, '15. 1912-13, (summer), survey staff, Toronto Harbour Commn.; 1915, drftng. and estimating on radial rly. entrances with the civic Transportation Committee, Toronto; 1916, Imperial Ministry of Munitions on brass inspectn.; 1917, ch. inspectr. on same work at Toronto, Detroit and Montreal, short periods to 1918; 1918-19, metallurgist, aeronautical engine divn., Willys-Overland, Ltd., West Toronto; 1919 to date, bridge engr., Provincial Highways, Ontario Dept. of Highways, Toronto, Ont.

References: W. A. McLean, G. Hogarth, F. B. Goedike, C. R. Young, E. V. Deverall, C. E. Bush, N. D. Wilson.

MACLACHLAN—ALEXANDER GRANT, of St. Thomas, Ont. Born at Smyrna, Asia Minor, June 21st, 1896. Educ., B.Sc., Queen's Univ., '22; 1920 (May-Oct.), labourer, reinf. concrete, timber trestle bridge, macadam roads, drainage genrl. bldgs., and repair work; 1921 (May-Oct.), timekeeper and instr'man., engr'g. dept., laying steel pipe lines install'g. pumps and foundations, erect'g. steel tanks, etc., Union Oil Co., Los Angeles, Cal.; 1922 (June-July), in chg. constrn. dept., Standard Oil Co. of New York in Smyrna, Asia Minor, location and supervis'g., laying out of moorings in Smyrna Harbour, also commenced operations for erection of 90' x 30' (approx.) steel tank, work discontinued; Nov. 1922 to date, asst. city engr. design and constrn., storm sewers etc., St. Thomas, Ont.

References: W. C. Miller, G. C. Wright, W. P. Wilgar, A. Macphail, L. T. Rutledge.

Relative Durability of Native Woods

In response to numerous requests for information on the relative durability, or resistance to decay, of untreated woods, the U.S. Forest Products Laboratory, Madison, Wis., has prepared the following table from the service records and information it has collected. There are not enough records in existence on some of the woods to be conclusive and the durability figures given should be accepted only because they are based on the most complete service data anywhere obtainable, supplemented by observation and expert opinion from many sources. They are subject to correction whenever authentic service data show the necessity.

No attempt has been made to translate the relative durability given here in percent into years of life, since the variety of climate, soil, and moisture conditions to which timber might be exposed would make such data worthless. Individual timbers of the same species may differ considerably in durability, too, according to the amount of heartwood and sapwood they contain and to their state of preservation when placed in service. Under any given set of conditions, however, the average service life of timbers of the different species will probably vary in proportion to the percentages given.

Relative Durability (Resistance to Decay.) of Untreated Woods.

— Durability of commercial while oak taken as 100 per cent. —

Conifers	
Cedar, eastern red (juniper)	150-200
" southern white	80-100
" other species	125-175
Cypress, bald	125-175
Douglas, fir. (dense.)	75-100
" " (ave. mill run.)	75-85
Fir, (the true firs.)	25-35
Hemlock	35-55
Larch, western	75-85
Pine, jack	35-45
" longleaf, slash. (Cuban.)	75-10
" Norway	45-60
" pitch, sugar	45-55
Pipe, short leaf	60-80
" So. yellow (dense)	80-100
" western white	65-80
" white	70-90
" western yellow, pond loblolly, lodgepole	35-50
Redwood	125-175
Spruce, Engelmann, red, Sitka, white	35-50
Tamarack	75-85
Yew, Pacific (western.)	170-
Hardwoods	
Ash	40-55
Aspen	25-35
Basswood	30-40
Beech	40-50
Birch	35-50
Butternut	50-70
Catalpa	125-175
Chestnut	100-120
Cottonwood	30-40
Elder, pale	25-35
Elm, cork (rock.), slippery	65-75
Elm, white	50-70
Gum, black, cotton, (tupelo.)	30-50
Gum, red	65-75
Hickory	40-55
Locust, black	150-250
Locust, honey	80-100
Magnolia, evergreen	40-50
Maple	40-50
Mulberry, red	150-200
Oaks, red oak, group	40-55
Oaks, white oak group	100
Oak, chestnut	70-90
Osage, orange	200-300
Poplar, yellow	40-55
Sycamore	35-45
Walnut, black	100-120
Willow	30-40

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Engineering Index

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A

AERIAL PHOTOGRAPHY

EQUIPMENT AND METHODS. Aerial Photography (La photographie aérienne), Alphonse Landry. Revue Trimestrielle Canadienne, vol. 8, no. 32, Dec. 1922, pp. 455-465. Discusses lenses, focus, exposure, best types of cameras, enlargements, transportation and use of photographs made.

AERONAUTICAL INSTRUMENTS

TENSION METER. An Acoustic Tension Meter, A. H. Stuart. Roy. Aeronautical Soc.—Jl., vol. 27, no. 146, Feb. 1923, pp. 73-78, 6 figs. Describes instrument used with marked success for checking tensions in internal bracing wires of airplane wings and fuselages, and for other work.

AERONAUTICS

STANDARDIZATION. Aeronautical Standardization. Aviation, vol. 14, no. 10, Mar. 5, 1923, pp. 269-270. Practical suggestions for standardizing materials used in airplane construction.

AIR

POLLUTION FROM INDUSTRIAL WASTES. Atmospheric Pollution by Industrial Wastes, Robert E. Swain. Jl. Indus. and Eng. Chem., vol. 15, no. 3, Mar. 1923, pp. 296-301. Coal as source of pollution sulphur-dioxide problem; absorption from air.

AIRPLANE ENGINES

HIGH-COMPRESSION, FUELS FOR. Testing Fuels for High-Compression Engines, Stephen M. Lee and Stanwood W. Sparrow. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 11-16. 8 figs. Methods used and results obtained in two investigations made by Bur. of Standards relating to fuels for use in high-compression aircraft engines, fuels in question are benzol and ethyl alcohol, alone or blended with gasoline.

AIRPLANE PROPELLERS

SPEED VARIATION. Variation in the Number of Revolutions of Air Propellers, W. Achenbach. Nat. Advisory Committee for Aeronautics, Tech. Notes, no. 131, Mar. 1923. 7 pp. Gives simple formulas permitting advanced calculation to be made of variation of propeller speed with variation of one or more dimensions of propeller, and allowing necessary corrections to be applied. Translated from Technische Berichte, vol. 3, part 2.

AIRPLANES

METAL. The Design of Metal Airplanes, Roy G. Miller and F. E. Seiler, Jr. Aviation, vol. 14, no. 8, Feb. 19, 1923, pp. 210-214, 11 figs. Outstanding features of metal construction as illustrated by its principal exponents.

MILITARY. Military-Airplane Development and Construction in Peacetime, J. H. Russell. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 296-298. Suggestion is made that experimental work and subsequent developments be continued to some organization, with provision for production in large quantities in time of war.

SPECIFICATIONS. American and Foreign Airplane Specifications. Automotive Industries, vol. 48, no. 8, Feb. 22, 1923, pp. 454-459. American, British, Dutch, French, German, Italian, Japanese, Czechoslovakian and Swiss specifications.

ALLOYS

THERMAL CONDUCTIVITY. Thermal Conductivity of Some Industrial Alloys, H. M. Williams and V. W. Bihlman. Am. Inst. Min. and Met. Engrs.—Trans., no. 1229-N, Mar. 1923, 5 pp., 2 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, p. 149. Apparatus for determination of thermal conductivity of metals with accuracy within 2 per cent; thermal conductivities of number of commercial alloys as determined with this apparatus, are given.

See also Babbitt Metals; Duralumin; Iron Alloys; Magnesium Alloys.

ALLOY STEELS

TOOL. Tool Steel (Verktbistaalet), Leif Lindemann. Technik Ukeblad, vol. 70, no. 5, Feb. 2, 1923, pp. 43-45, 7 figs. Developments: microstructure; alloy steels; tempering, hardening and annealing.

ALUMINUM

FOUNDRY PRACTICE. Aluminum Foundry Practice, E. H. Tyson. Foundry Trade Jl., vol. 27, no. 339, Feb. 5, 1923, pp. 129-132, 10 figs. Discovery and use of aluminum; furnaces; molding machines; American practice; contraction; hand molding; blowholes, porosity and unsoundness.

ALUMINUM ALLOYS.

See Duralumin.

AMMONIA

PURIFICATION. Composition, Purification and Certain Constants of Ammonia, E. C. McKelvy and C. S. Taylor. Refrig. Eng., vol. 9, no. 7, Jan. 1923, pp. 213-225 and 227, 6 figs. Describes methods of purification and tests for purity of samples used in investigations of Bur. of Standards.

SATURATED VAPOR, SPECIFIC VOLUME OF. Specific Volume of Saturated Ammonia Vapor, C. S. Cragoe, E. C. McKelvy and G. F. O'Connor. Refrig. Eng., vol. 9, no. 8, Feb. 1923, pp. 239-248, 4 figs. Specific volume of saturated ammonia vapor was measured in temperature interval −50 deg. to +50 deg. cent. by two methods; one involving direct determination of mass of vapor contained in known volume and other, an optical method, involving measurements of index of refraction of vapor.

SYNTHETIC. Synthetic Ammonia By the Claude Process. Chem. & Met. Eng., vol. 28, no. 11, Mar. 14, 1923, pp. 498-501, 10 figs. Outline of Claude's claims as to advantages in installation and operation of plants using superpressure method as compared with Haber-Bosch process for fixation of atmospheric nitrogen. Translated and abstracted from Memoires et Comptes Rendus de la Société des Ingéneurs Civils de France. Bul., Apr.-June, 1922.

AMMONIA COMPRESSORS

OSCILLATING. An Oscillating Ammonia Compressor, H. J. Macintire. Refrig. Eng., vol. 9, no. 8, Feb. 1923, pp. 252-253, 2 figs. Action of machine, advantages and objections.

AMONIUM SULPHATE

PRODUCTION. Production of Amonium Sulphate in Gas Works (La fabrication du sulphate d'ammoniaque dans les usines à gaz), A. Grebel. Chimie et Industrie, vol. 9, no. 1, Jan. 1923, pp. 26-42, 18 figs. Coal distillation and by-product recovery; recovery of ammonia.

APPRENTICES, TRAINING OF

FOUNDRY TRADES. Apprenticeship and the Foundry Trades, T. Makemson. Foundry Trade Jl., vol. 27, nos. 336 and 338, Jan. 25 and Feb. 8, 1923, pp. 71-73 and 117-118. Selection of apprentices; admission requirements; practical training, instruction and supervision; works schools; training schemes in operation; summary of selected training schemes, American and continental schemes.

AUTOMOBILE ENGINES

AIR-COOLED. Aircraft Engine Practice as Applied to Air-Cooled Passenger-Car Engines, S. D. Heron. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 31-56, 37 figs. Wherein automobile designer and builder can profit by use of practice developed for air-cooled aircraft engines, cylinder design and performance, valve location and type of timing, form of cylinder head, cylinder material, cooling surface, port arrangement for in-line engines, camshaft and valve-gear arrangement; temperature; exhaust-valve cooling; quantity of air; fans; pistons; etc. Foundry production of air-cooled engines.

AMERICAN SPECIFICATIONS. American Stock Engine Specifications. Automotive Industries, vol. 48, no. 8, Feb. 22, 1923, pp. 428-431.

DEVELOPMENTS. Recent Novelties in Engine Construction. Automotive Manufacturer, vol. 64, nos. 9 and 10, Dec. 1922 and Jan. 1923, pp. 21-24 and 10-12, 8 figs. Improved forms of cylinder construction and arrangement, new valve forms, modifying stroke to suit power demand, eliminating mystical single-sleeve valve engine.

HEAVY OIL VS. GASOLINE. A Comparative Test. Autocar, vol. 50, pp. 142-144, Feb. 16, 1923, pp. 252-255, 4 figs. Details of comparative test of two Peugeot cars, identical, but one fitted with normal 4-stroke 4-cylinder engine of 2560 cu. cm., and other with Peugeot-Lattuada 2-stroke 2-cylinder engine of 1190 cu. cm., in efforts to develop type of car engine capable of using heavy oils

AUTOMOBILE FUELS

ALCOHOL MIXTURES. Alcohol Fuel Mixtures. H. R. Adam. Chem. Met. & Min. Soc. of S. Africa—Jl. vol. 23, no. 6, Dec. 1922, pp. 112-118, 3 figs. Examination of typical mixtures with some reference to economic conditions in S. Africa.

ALCOHOL AND BENZOL. Benzol and Alcohol as Automobile Fuels (El uso del benzol i del alcohol como combustible en los automoviles). O. Navarro. Sociedad de Fomento Fabril—Boletin, vol. 39, nos. 8 and 9, Aug. and Oct. 1922, pp. 487-497 and 634-641, 6 figs. Discusses motor fuels in various countries; gives table showing work done per liter of pure benzol, alcohol and various mixtures of the two; tables of test data with Mercedes motors and carburetors.

VOLATILITY. Further Data on the Effective Volatility of Motor Fuels. Robert E. Wilson and Daniel P. Barnard. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 287-292, 9 figs. Test results of 14 fuels; improvements made in manner of preparation of equilibrium solution and in apparatus used for measurement of vapor pressures; data on fuels; table showing comparison of more important properties of fuels.

Society's Research Sheds New Light on Fuel Problem. V. H. Gottschalk. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 3-9, 4 figs. Describes series of road-service tests made of stock cars, by automotive and petroleum industries jointly, to determine effect of changes in fuel volatility on gasoline mileage for respective make of car, and best fuel as regards volatility.

See also Gasoline.

AUTOMOBILES

AMERICAN. American Passenger Car Chassis Design Shows Refinement of Detail. Automotive Industries, vol. 48, no. 8, Feb. 22, 1923, pp. 377-386, 12 figs. Six-cylinder models increase with corresponding decrease in fours; semi-floating type rear axle makes big gain; multiple-disk clutch leads over single-plate type; chain-driven camshafts in greater favor; number of different makes declines. Specifications of American chassis.

AXLES. Torbensen Passenger Car Axles Have Numerous Refinements in Design. Automotive Industries, vol. 48, no. 9, Mar. 1, 1923, pp. 514-515, 3 figs. Rear axle is semi-floating banjo type with pressed-steel housing; Elliott-type front axle said to have dust-proof parts.

DESIGN. British Engineering Trends shown at Olympia Exhibit, M. W. Bourdon. Automotive Industries, vol. 47, no. 21, Nov. 23, 1922, pp. 1025-1032, 12 figs. Overland valves, unit power plant and aluminum pistons increase in popularity; more cars equipped with four speeds; aluminum axles; most new engines have less than 120-cu. in. piston displacement.

HEADLIGHTS. A Double-Reflector Type of Head. Lamp, Bruno Heymann. Soc. Automotive Engrs.— Jl., vol. 12, no. 1, Jan. 1923, pp. 100-104, 9 figs. Glare problem in Europe; describes new anti-glare head-lamp involving entirely new principle in light projection using two reflectors, a 6-in. paraboloid reflector with an oblique projecting reflector.

STARTING MOTOR. Remy-Starter with Right Angle Drive Used on Copper Cooled Chevrolet. Automotive Industries, vol. 48, no. 10, Mar. 8, 1923, pp. 557-558, 4 figs. New type of gearing has teeth on face of flywheel instead of on rim, yet sides of teeth are not convergent as in bevel gearing.

WHEEL WOBBLE. Correct Steering System Layout Prevents Wheel Wobble, Cornelius T. Myers. Automotive Industries, vol. 48, no. 10, Mar. 8, 1923, pp. 575-577, 7 figs. Slack brought on by wear one cause of wobbling; study of influence of unbalanced forces set up in front wheels.

AVIATION

AERIAL FOREST PATROL. Operations of the Aerial Forest Patrol, 1922. Aviation, vol. 14, no. 9, Feb. 26, 1923, pp. 241-244, 1 fig. Air-Service report shows that aerial patrols offer unparalleled means for suppressing forest fires.

CIVIL. Air Transport, F. Handley Page Inst. Transport—Jl., vol. 4, no. 4, Feb. Feb. 1923, pp. 126-134 and (discussion) 134-139, 1 fig. Development in civil aviation between England and Continent since its beginning in 1919 and actual results achieved; probable future developments.

COMMERCIAL. Immediate Possibilities of Commercial Airplane Service, C. G. Peterson. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 263-264. How commercial airplanes can be used and what they will be used for; what Aerial Mail Service has demonstrated; estimate of equipping and operating night flying line between New York City and Chicago.

B

BABBITT METALS

CHARACTER AND USES. Babbitt Metals—Their Character and Uses, L. D. Allen. Raw material, vol. 6, no. 2, Feb. 1923, p. 56. Classifications of babbitt metals as to metals from which they are made and as to mechanical uses for which they are employed.

BARITE

OCCURRENCE AND USES. Barytes: Occurrence, Mining, Uses, Raymond B. Ladoo. Eng. & Min, Jl.—Press vol. 115, no. 7, Feb. 17, 1923, pp. 319-324, 7 figs. Mineralogical characteristics; typical deposits; geographical distribution of world's supply; statistics of production and consumption; methods of mining and washing; chemical manufactures.

BAROMETERS

ANEROID. The Aneroid Barometer and Barograph in Engineering, R. H. L. Lee. Instn. Min. & Metallurgy—Bul., no. 221, Feb. 1923, 17 pp. Author seeks to make difficulties connected with aneroid barometer less ambiguous and to define use of its recording form, the barograph. Gives main dimensions of three sizes of barographs in common use; proposed

BEAMS

REINFORCED-CONCRETE. Tests of I-Beams Encased in Concrete. Can. Engr., vol. 44, No. 9, Feb. 27, 1923, pp. 267-269, 2 figs. Describes tests undertaken by Steel Fabricators' Section of Can. Manufacturers' Assn.; steel beams haunched with concrete sustain, after encasing, dead lead and twice normal live load with smaller flexural stress than developed in unencased beams under dead and normal live load only.

Diagrams for Reviewing Doubly Reinforced Concrete Beams, Chas. E. O'Rourke. Cornell Civ. Engr., vol. 31, no. 6, Jan. 1923, pp. 40-43 and 49, 7 figs. Presents diagrams which will give values of extreme fiber stress in concrete and maximum unit stress in tension steel in beam with compressive reinforcement.

BEARING METALS

CALCIUM LEAD. Calcium-Lead Bearing Alloy. Leonid Filipoff. Metal Industry (Lond.), vol. 22, no. 7, Feb. 16, 1923, pp. 145-147, 3 figs. Advantages and disadvantages, particularly in respect to progress made in development of its uses in Continental railway work; metallographical and metallurgical examinations carried out by E. Pewoworsky, of Breslau.

BEARINGS

BABBITTING. The Science of Babbitting Bearings. Elec. Ry. Jl., vol. 61, no. 8, Feb. 24, 1923, pp. 321-322, 5 figs. Methods of United Elec. Rys., formerly Rhode Island Co., in babbitting of journal and axle bearings.

MANUFACTURE. Making Bearings by Unit System. Herbert R. Simonds. Iron Trade Rev., vol. 72, no. 11, Mar. 15, 1923, pp. 801-806, 9 figs. New one-floor-level plant at Plainville, Conn., of Standard Steel & Bearings Inc., Philadelphia; process described.

RESEARCH. Bearings, Bearing Metals and Lubrication (Neuere Untersuchungen über Lager, Lagermetalle und Lagerschmierung), Erich Schulze and Vogt Verkehrstechnik, vol. 39, nos. 48 and 49, Dec. 1 and 8, 1923, pp. 577-580 and 585-589, 16 figs. Mistakes in construction of bearings; rules for casting bearings; oils; load and temperature; bending strength of various alloys and tests carried out.

BEARINGS, BALL

ROLLER AND. Ball and Roller Bearings. Times Trade and Eng. Supp., vol. 11, no. 237, Jan. 20, 1923, p. 21, 1 fig. Recent advances; fatigue effects; bearings for railway rolling stock and rolling mills.

BELT DRIVE

TYPES. Belt Drives (Flach- oder Hochkanttreibriemen-), Walter. Werkstattstechnik, vol. 17, no. 2, Jan. 15, 1923, pp. 37-39, 8 figs. Leather belting; flat and zigzag compound glued leather strips; pulleys and diameters; width of belts; efficiency.

BENDING MACHINES

PLATE. The Sedgwick Plate-Bending Machine. Engineering, vol. 115, no. 2984, Mar. 9, 1923, p. 300, 6 figs. partly on p. 301. Describes machine which will produce wide range of work of varying angles and corner radii without use of any change parts whatever; main feature is pair of rocking tables which fold upward and bend plate, which is held in position by upper beam.

BLAST FURNACES

COKE COMBUSTION IN. Combustion of Coke in Blast-Furnace Hearth, G. St. J. Perrott and S. P. Kinney. Am. Inst. Min. & Met. Engrs.—Trans., no. 1222-S, Mar. 1923, 43 pp., 14 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, pp. 145-146, 1 fig. Combustion zone of number of blast furnaces, operating on cokes varying widely in physical characteristics, was explored by means of water-cooled gas sampling tubes driven into hearth through tuyeres; results show that combustion of coke by blast is complete 32 to 40 in. from tuyeres.

BLAST-FURNACES GAS

AIR-HEATERS. The Storage of Gas Excesses in Air Heaters (Die Speicherung von Gasüberschüssen in den Winderhitzern), K. Rummel. Stahl u. Eisen, vol. 43, no. 7, Feb. 15, 1923, pp. 225-233, 11 figs. Storage capacity of air heaters and their efficiency; storage methods.

BLOWERS

GAS-DRIVEN. Practical Tests on a Gas-Driven Blower, (Betriebsversuche an einer Gasgebläsemaschine), Marcel Steffes. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 7, Feb. 17, 1923, pp. 151-153, 9 figs. Results of 4-day tests for determining, among other things, quality and heat balance of whole installation.

BOILERS

WASTE-HEAT. Test of Unique Waste Heat Boiler, Warren D. Stewart. Gas Age-Rec., vol. 51, no. 8, Feb. 24, 1923, pp. 235-237, 6 figs. Report on vertical coal-gas benches of Fall River Gas Works Co., giving results

ELECTRIC. Electric Steam Generation (Elektrische Dampferzeugung), Edgar Zeulmann. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 1, Jan. 6, 1923, pp. 7-12, 26 figs. Notes on generation of steam through electric resistance and particularly through electrode heating; structural features of electrode steam boilers.

FLUE-SHEET DESIGN. The Design and Proportioning of Flue Sheets, C. E. Lester. Boiler Maker, vol. 23, no. 2, Feb. 1923, p. 47, 3 figs. Spacing of flues; free circulation of water of more importance in design than providing maximum flue-heating surface.

GAS-FIRED. Gas Fired Steam Boiler Calculations, J. P. Leinroth. Gas Age-Rec., vol. 51, no. 5, Feb. 10, 1923, pp. 169-172, 1 fig. Uses for steam; steam problems; heating calculations; steam-heating coils; heating surfaces; size of boiler.

HEAT STORAGE. The Storage Problem in Steam Economics (Das Speicherproblem in der Dampfwirtschaft), C. Kiesselbach. Stahl u. Eisen, vol. 43, no. 8, Feb. 22, 1923, pp. 265-273. Steam-chamber, water-chamber and feed-chamber accumulators; superiority of feed-chamber system; applicability of storage systems for low-, medium- and high-pressure steam systems; large feed-chamber boilers.

LOCOMOTIVE. *See Locomotive Boilers.*

BOILER FURNACES

WOOD-REFUSE-BURNING. Furnace for Burning Dry Wood Refuse, E. Winholt. Southern Engr., vol. 38, no. 6, Feb. 1923, pp. 52-53, 3 figs. Proper furnace construction for burning dry wood shavings and refuse.

BOILER TUBES

FAILURES. Boiler-Tube Failures, Haylett O'Neil, Power, vol. 56, no. 23, Dec. 5, 1922, pp. 876-878, 7 figs. In an eight-boiler plant employing single-pass horizontal baffling, tube failures to the number of 140 occurred in 60 days. Careful study revealed cause, and remedy applied reduced loss to less than five tubes per year.

BOILERS, WATER-TUBE

OPERATION. Effect of Operating Conditions on Temperature of Water and Metal of Water-Tube Boilers (Der Einfluss der Betriebsverhältnisse auf Wasser- und Blechtemperatur im Wasserrohrkessel, P. Rönne. Zeit. des Baver. Revisions-Vereins, vol. 27, nos. 2 and 3, Jan. 31 and Feb. 15, 1923, pp. 12-14 and 18-20, 7 figs. Experiments with Babcock & Wilcox boilers showing deformation and raising and lowering of upper boilers at various conditions of operation, to draw conclusions as to loads to be allowed in upper boiler.

BORING MACHINES

RAILWAY-TIRE. Tyre Boring Mill Design. Machy. (Lond.), vol. 21, no. 541, Feb. 8, 1923, pp. 582-584, 6 figs. Recent developments that have taken place in Germany; details of tire-turning mill especially designed for inside machining of tires.

BRIDGES HIGHWAY

IMPACT. Progress Report of the Special Committee on Impact in Highway Bridges. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 457-487, 9 figs. Preliminary report on impact studies on Skunk River Bridge, on Lincoln Highway, near Ames, Ia.

INFLUENCE LINES. Plotting of Influence Lines (Vom Auftragen der Einflusslinien), Aug. Kroitzsch. Zeit. des Osterr. Ingenieur- u. Architekten-Vereines, vol. 75, nos. 3-4, Jan. 26, 1923, p. 20, 1 fig. Gives examples.

SPECIFICATIONS. General Specifications for Steel Highway Bridges. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 252, Dec. 1922, pp. 157-202, 13 figs. For fixed spans less than 300 ft. in length—1923.

BRIDGES, RAILWAY

CASTLETON, NEW YORK. The Castleton Bridge of the New York Central Railroad, Sidney Mornington. Compressed Air Mag., vol. 28, no. 11, Feb. 1923, pp. 401-404, 8 figs. To span Hudson River about 12 miles south of Albany, New York, entailing outlay of $4,000,000; expected to effect tremendous betterment in traffic conditions; to be finished in 1924.

IMPACT TESTS. Impact Effects on Steel Railway Bridges (Stosswirkungen bei eisernen Eisenbahnbrücken), A. Bühler. Schweizerische Bauzeitung, vol. 81, no. 1, Jan. 6, 1923, pp. 1-5, 4 figs. Review of various tests carried out in different parts of the world and conclusions therefrom.

SPECIFICATIONS. General Specifications for the Erection of Steel Railway Bridges. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 252, Dec. 1922, pp. 149-153. For fixed spans less than 300 ft. in length.

STEEL ARCH. Long-Span Steel Arch Bridge Over Niagara Gorge for Michigan Central R.R. Eng. News-Rec., vol. 90, no. 9, Mar. 1, 1923, pp. 380-386, 9 figs. Cantilever bridge will be replaced by 2-hinged spandrel-braced arch of 640-ft. span, carrying solid-floor independent deck; advanced methods of design.

STEEL TRUSS. Bridging the Tanana River on the Alaska Railroad, Frederick Mears. Eng. News-Rec., vol. 90, no. 11, Mar. 15, 1923, pp. 476-482, 11 figs. Ice conditions influence location and design; alloy-steel pin-connected 700-ft. main span; pile foundations in deep gravel; winter erection program.

WOODEN. Report of Committee VII on Wooden Bridges and Trestles. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 254, Feb. 1923, pp. 751-775, 6 figs., on supp. plates. Strength of new, old and treated timber; classification of uses of lumber under A.R.E.A. specification; basic rules for structural timber; plans for open-deck pile and frame trestles, multiple-story trestle, and ballast deck pile and frame trestles.

BUILDINGS

MECHANICAL EQUIPMENT. Meeting De Luxe Service Requirements. Power Plant Eng., vol. 27, no. 5, Mar. 1, 1923, pp. 255-265, 12 figs. Mechanical features of General Motors Building in Detroit, largest office building of its kind in world. Details of coal handling, boilers, refrigerating equipment, water systems, drinking-water sterilization, steam for heating, lighting and power distribution, elevators, etc.

C

CABLES, ELECTRIC

STEEL-ALUMINUM. Steel-Aluminum Cables for High-Tension Overhead lines (Stahlaluminiumseile für Hochspannungsfreileitungen), Hanns Krautt. Elektrotechnik u. Maschinenbau, vol. 41, no. 7, Feb. 18, 1923, pp. 113-121. Reviews literature; safety factor, load temperature effect, distance between poles; calculations.

UNDERGROUND. The Possibilities of Transmission by Underground Cables at 100,000/150,000 Volts, A. M. Taylor. Instn. Elec. Engrs.—Jl., vol. 61, no. 315, Feb. 1923, pp. 220-238 and (discussion) 239-252, 20 figs. Plea for use of single-phase cables. Effect of separating cores; gain effected by employing "intersheaths". Actual transmission of 50,000 kw. at 100,000 volts over distance of 30 mi. is worked out in details and compared with similar transmission at 30,000 volts.

CABLES, HOISTING

DESIGN. Are Hoisting Ropes Too Light for Economy? George P. Boomshiter. Coal Mine Management, vol. 2, no. 1, Jan. 1923, pp. 17-22, 3 figs. Results of mathematical study, verified by experimental investigations. Describes new method of design.

EUROPEAN VS. AMERICAN PRACTICE. European vs. American Hoisting Practice—Hoisting Ropes, Graham Bright. Coal Mine Management, vol. 2, no. 1, Jan. 1923, pp. 37-40, 3 figs. Information regarding hoisting practice in Europe and comparison with American standards.

CABLEWAYS

RIO DE JANEIRO. The Sugar-Loaf Rope Way, Charles Mehringer. Eng. Progress, vol. 3, no. 11, Nov. 1922, pp. 248-249, 3 figs. General arrangement of ropeway connecting steep rock in harbor of Rio de Janeiro with main land. Plant was constructed by A. Pohlig Corp., Cologne, Germany, and consists of two independent lines, for conduction of passengers up to summit.

CAR CONSTRUCTION

TENDENCIES IN. Present Day Tendencies in Car Construction, E. R. Viberg. Can. Ry. Club, vol. 21, no. 9, Dec. 1922, pp. 29-42 and (discussion) 42-48, 5 figs. Review of early history, improvement of present construction, elimination of parts, lightening of equipment, reduction of friction, use of commercial run of steel, use of rust-resisting material, improvement of insulations, standardization of component parts, preservation of equipment by improved painting.

CAR WHEELS

CHILLED-IRON. Properties of Chilled-Iron Car Wheels, Ry. Mech. Engr., vol. 97, no. 3, Mar. 1923, pp. 166-168, 4 figs. Investigation by University of Illinois of stresses due to mounting, static load and flange pressure; advantages from increased flange thickness.

CARS, FREIGHT

FRAMELESS STEEL. Railway Rolling-Stock Developments. Ry. Engr., vol. 44, no. 517, Feb. 1923, pp. 64-67, 9 figs. Details of frameless steel car, spring-frame truck, and mild-steel axle boxes, constructed by Gloucester Ry. Carriage & Wagon Co.

CAST IRON

GRAPHITIZATION. Experiments on the Rapid Graphitization of White Cast Iron and a Theory for the Mechanism of Graphitization, Anson Hayes, W. J. Diederichs and W. M. Dunlap. Am. Soc. for Steel Treating—Trans., vol. 3, no. 6, Mar. 1923, pp. 624-637 and (discussion) 637-639, 19 figs. Results of experiments; photomicrographs showing typical structures obtained in investigation; physical properties of specimens tested.

PROPERTIES. The Properties of Cast-Iron. Eng. Production, vol. 6, no. 124, Feb. 15, 1923, pp. 164-165, 3 figs. Characteristics of principal constituents.

CATALYSIS

OXIDATION. Preferential Oxidation in Presence of Catalysis, Rex Furness. Chem. & Industry, vol. 42, no. 9, Mar. 23, 1923, pp. 196-199. Discusses two processes, namely, oxidation of sulphuretted hydrogen to free sulphur, and oxidation of hydrocarbon oils.

CEMENT

HARDENING AND SETTING. The Setting and Hardening of Cements, S. N. Brown. Chem. Trade Jl. & Chem. Engr., vol. 72, no. 1863, Feb. 2, 1923, pp. 127-128. Hardening by crystallization; action of soluble salts on cements; hardening by colloidal desiccation and by chemical reaction; setting and hardening of Portland and hydraulic cements; chemical action and effect of setting; effect of water.

CEMENT MANUFACTURE

POWER EXPENDITURE IN. Power Absorbed in Making a Barrel of Portland Cement, S. H. Harrison. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 3, Mar. 1923, pp. 254-257, 2 figs. Analyses show that barrel of cement in made with expenditure of power amounting to about 16 kw. hr.; 80 per cent of energy required to make Portland cement can be obtained by utilizing heat in waste gases from rotary kilns.

CENTRAL STATIONS

ADDITIONS 1923. Additions and Extensions During 1923 Estimated at $602,143,000. Elec. World, vol. 81, no. 10, Mar. 10, 1923, pp. 569-570, 1 fig. Survey indicates that 2,890,400 kw. will be added to generating plants by central-station companies.

OIL-FUEL VS. STEAM-ENGINE. Fuel Oil Engines versus Steam Engines for Small Municipal Plants, George T. Prince. Am. City, vol. 28, no. 1, Jan. 1923, pp. 33-34, 1 fig. Deals with plants which supply electric current and pump water for communities of 10,000 population or less. Comparisons. States that for towns of less than 10,000 population it is advisable to install steam-driven power plants.

SMALL DIESEL-ENGINED. Operating a Small Oil-Engined Central Station. Oil Engine Power, vol. 1, no. 2, Feb. 1923, pp. 66-68 and 100, 2 figs. Describes equipment of Holstein Service Co., Inc., Holstein, Iowa, which serves requirements of domestic and municipal load, consisting of two vertical 4-cylinder 4-cycle Busch-Sulzer Diesel engines; record of operating costs of Diesel engines for 1921 and 1922.

CHAINS

MALLEABLE, CASTING LINKS FOR. Casts Malleable Chain Links, Herbert R. Simonds. Foundry, vol. 51, no. 5, Mar. 1, 1923, pp. 185-187, 4 figs. Chain assembled from individual links molded on power squeeze machine from metal-gated pattern; annealed in pots packed with mill scale.

CHARTS

GRAPHIC, CONSTRUCTION OF. Method of Constructing Charts from Standardized Materials, John D. East. Management Eng. (Summary Sheet), vol. 4, no. 3, Mar. 1923, pp. 203-208, 12 figs. Method for facilitating construction of graphic charts and materially reducing cost of their preparation.

CHIMNEYS

ACID GASES, FOR. Chimneys Subjected to Acid Gases, Thomas S. Clark. Indus. & Eng. Chem., vol. 15, no. 3, Mar. 1923, pp. 227-230, 5 figs. Details of chimney construction worked out to overcome difficulties in connection with noxious fumes from chemical industries.

STEEL. Considerations in Designing Steel Stacks. Boiler Maker, vol. 22, no. 10, Oct. 1922, pp. 288-289, 3 figs. Amount of draft required, allowable wind pressure on given size stacks and method of staying. Reprinted from Locomotive.

WIND PRESSURE IN DESIGN. Wind Pressure in Chimney Design, W. Wallace Christie. Power, vol. 57, no. 12, Mar. 20, 1923, pp. 438-439. Formation compared; what wind velocity and base pressure to choose; live load produced by wind conditions.

CHROME-NICKEL STEEL

STRUCTURE. Structure of Chromium-Nickel Steel, H. B. Pulsifer and O. V. Greene. Chem. & Met. Eng., vol. 28, no. 8, Feb. 21, 1923, pp. 354-356, 6 figs. Series of micrographs fail to show any change in structure in quenched Cr.-Ni steel after various draws, despite large difference in physical properties; precautions needed in etching and photographing.

CHROME-VANADIUM STEEL

THERMAL TRANSFORMATIONS. Thermal Transformations in Some Chrome-Vanadium Steels, J. S. Vanick and W. W. Sveshnikoff. Am. Soc. for Steel Treating—Trans., vol. 3, no. 5, Feb. 1923, pp. 542-553, 34 figs. Study of movement with changes in composition, initial temperature and rate of cooling of thermal transformations in series of chrome-vanadium steels was made and correlated with difference in hardness and microstructure, to indicate possible changes in constitution.

CITY PLANNING

REGIONAL. City Planning. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 553-565. Contains following papers: Regional Planning, Nelson P. Lewis; The Engineer and City Planning, George H. Norton.

COAL

SPONTANEOUS COMBUSTION. The Possibility of Spontaneous Combustion Being Initiated by the Heat Produced in Crushing. Henry Briggs. Instn. Min. Engrs.—Trans., vol. 64, part 5, Feb. 1923, pp. 227-237 and (discussion) 238-248. Production of heat by act of crushing or grinding coal or carbonaceous shale is one of causes leading to spontaneous combustion in mines. Bibliography.

COAL HANDLING

PLANTS. Coaling and Storage Plant at Panama, J. W. McFarlane. Coal Industry, vol. 6, no. 2, Feb. 1923, pp. 133-135, 4 figs. Methods used in storing and handling large quantities of coal; subaqueous storage used; spontaneous combustion controlled, despite climatic conditions.

PNEUMATIC PLANTS. Coal Handling by Suction. Elec. Times, vol. 63, nos. 1632 and 1635, Jan. 25, and Feb. 15, 1923, pp. 81-82, 3 figs., and 155-156, 4 figs. Jan. 25: Pneumatic plant for dealing with coal clinker and ashes at cocoa factory in York, England with capacity of 25 tons per hr. when handling coal and 18 tons per hr. when dealing with ashes. Feb. 15: Installation at North Metropolitan power station, Brimsdown.

COAL MINING

BITUMINOUS. Mining an Upper Bituminous Seam After a Lower One Has been Extracted. Howard N. Eavenson. Am. Inst. Min. and Met. Engrs.—Trans., no. 1231-C, Mar. 1923, 8 p., 2 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, pp. 154-155. Results of mining upper seam after lower one has been extracted in bituminous coal mines of Pennsylvania, Maryland and West Virginia; experience in two foreign mines.

COAL MINES

SUBSIDENCES. A Contribution to the Theory of Subsidences, Henry Louis. Instn. Min. Engrs.—Trans., vol. 64, part 5, Feb. 1923, pp. 257-262 and (discussion) 262-273, 3 figs. Author suggests theory, based upon Coulomb's theory of earth pressure, which appears to agree fairly well with many of generally admitted facts.

COMBUSTION

CONTROL. Combustion Control for Steam Boilers, Charles H. Smoot. Power, vol. 57, no. 10, Mar. 6, 1923, pp. 354-356. Author visualizes what is going on when burning coal on grate and gives reasons for difference in thickness of fuel bed required, when burning different kinds of coal.

TEMPERATURE OF. Determination of Temperature of Combustion (Zur Ermittlung von Verbrennungs-temperaturen), F. Pollitzer. Zeit. für angewandte chemie, vol. 35, no. 97, Dec. 5, 1922, pp. 683-684, 1 fig. New Method for graphic determination; values found are considerably lower than those of previous determinations.

COKE OVENS

KOPPERS. Heat Distribution in New Type Koppers Coke Oven, Jos. Van Ackeren. Am. Inst. Min. and Met. Engrs.—Trans., no. 1236-C, Mar. 1923, 13 pp., 6 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, pp. 146-147. Construction and operation of older types of Koppers regenerating oven; formulas for use in computing flow of gases in several parts of flue system; details and advantages of new-type Koppers coke oven.

REGENERATOR. Thermal Operation of Modern Regenerator Coke Ovens, D. W. Wilson, H. O. Forrest and C. H. Herty, Jr. Indus. and Eng. Chem., vol. 15, no. 3, Mar. 1923, pp. 251-254. Account of tests for obtaining comprehensive heat balance on ovens; to determine from this thermal efficiency of battery; and to obtain information regarding heat effect of coking coal mixture used.

ROBERTS. Design and Operation of the Roberts Coke Oven, M. W. Ditto. Am. Inst. Min. and Met. Engrs.—Trans., no. 1223-C, Mar. 1923, 25 pp., 9 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, pp. 148-149, 1 fig. Method of heat generation and application in Roberts coke-oven wall and apparent different results; description covers recuperative type of oven in actual operation, comparison being made with operating conditions in other types; general operating results from use of Illinois type of coal.

CONCRETE

WATERPROOFINGS FOR. Integral Waterproofings for Concrete, Alfred H. White. Indus. and Eng. Chem., vol. 15, no. 2, Feb. 1923, pp. 150-153, 8 figs. Discusses rate of absorption of water by capillar action and effect of integral waterproofings on rate of water absorption. Test results.

CONCRETE MIXERS

CENTRAL MIXING PLANT. Ideal Layout for Central Mixing Plant, R. Franklin Imler. Highway Engr. and Contractors vol. 8, no. 1, Jan. 1923, pp. 47-50, 6 figs. Design and operation records of central mixing motor truck haulage plant established by Powell-Gauen Co., at Coxeyville, Ill., which was designed for construction of 7¼ miles of 7-in. 18-ft. concrete highway.

CONCRETE, REINFORCED

REINFORCING STEEL. Specifications for Reinforcing Steel. Am. Architects and Architectural Rev., vol. 123, no. 2411, Jan. 17, 1923, pp. 76-78. Points out that specifications may be divided into three major portions, namely, scope of contract, quality of materials, and shop fabrication and field installation.

CONDENSERS, STEAM

AUXILIARY EQUIPMENT. Auxiliary Equipment for Condensers, Charles L. Hubbard. Southern Engr., vol. 39, no. 1, Mar. 1923, pp. 50-55, 21 figs. Various types of pumps and other devices employed in connection with condensers for circulating cooling water and removing condensate and air, also piping arrangement for steam and water.

JET AND BAROMETRIC. Jet and Barometric Condensers, Charles L. Hubbard. Southern Engr., vol. 38, no. 6, Feb. 1923, pp. 47-51, 15 figs. How various designs operate, especially with reference to water distribution.

SURFACE. Large Surface Condensing Plant. Beama, vol. 12, no. 58, Feb. 1923, pp. 122-124, 9 figs. Mirrlees-Watson 3000-kw., 6000-kw. and 12,000-kw. surface condensers installed at Leeds Corp. Electricity Works.

CONNECTING RODS

LOCOMOTIVE. New Type of Connecting Rod for Electric Locomotives (Nouveau type de transmission par bielles pour locomotives électriques), Joseph Bianchi. Revue Générale des Chemins de Fer et des Tramways, vol. 42, no. 2, Feb. 1923, pp. 105-112, 9 figs. Describes new type of articulated connecting rod which has been recently tried on Italian high-speed three-phase locomotive E 330-14 and proved satisfactory; advantages of triangular types used hitherto; weight of articulated system; counterweights.

CONVERTERS

SYNCHRONOUS. Operation of Synchronous Converters. Frank A. Eastman. Southern Engr., vol. 38, no. 6, Feb. 1923, pp. 44-46, 2 figs. Theory of operation; current relations, reactance in line; voltage regulators, synchronous booster.

CONVEYORS

BEARINGS FOR, ANTI-FRICTION. Anti-Friction Bearings for Conveyors. Iron and Coal Trades Rev., vol. 106, no. 2869, Feb. 23, 1923, p. 267, 3 figs. Results of series of tests on 48-in. conveyor. Discusses power costs, belting and lubrication costs. See also Colliery Guardian, vol. 125, no. 3243, Feb. 23, 1923, p. 452, 2 figs.

CORROSION

BLUE LEAD AS PREVENTIVE. Blue Lead as a Rust Preventive. Gas Age-Rec., vol. 51, no. 10, Mar. 10, 1923, pp. 301-303 and 314, 8 figs. Sublimed blue lead, a fume product made from galena, is said to hold nearly all quantities of perfect rust preventive; its manufacture.

CORROSION

IRON AND STEEL. The Mechanism of the Corrosion of Iron and Steel in Natural Waters and the Calculation of Specific Rates of Corrosion, Robert E. Wilson. Jl. Indus. and Eng. Chem., vol. 15, no. 2, Feb. 1923, pp. 127-133, 3 figs. Fundamental reactions in corrosion of iron and steel are discussed.

MEASUREMENT IN WATER. A New Method of Measuring Corrosion in Water, F. N. Speller and V. V. Kendall. Jl. Indus. and Eng. Chem., vol. 15, no. 2, Feb. 1923, pp. 134-139, 7 figs. Gives data confirming previous work that corrosion is directly proportional to dissolved oxygen concentration, and develops new measuring method.

COST ACCOUNTING

FOUNDRIES. Figuring Costs from Material to Product, A. Luenberg. Can. Foundryman, vol. 13, no. 12, Dec. 1922 and vol. 14, no. 1, Jan. 1923, pp. 18 and 21, and 32-34, 8 figs. How to find cost of rough castings; prime cost and how to find it; accurate and practical way to record foundry operation; timekeeping methods.

MANUFACTURING COSTS. Manufacturing Costs, F. C. Lawrence. Indus. Management (Lond.), vol. 9, nos. 1 and 2, Jan. 11 and 25, 1923, pp. 11-14 and 42-44. Example of methods of calculating job costs; use of mechanical appliances in various calculations; functions of work-in-progress account; effect of inaccuracy is traced through costs to show delay and unreliability caused thereby. (Abstract.)

TIME STUDY AND. The Relation of Time Study to Cost Accounting, R. W. Darnell. Indus. Management (N.Y.), vol. 64, nos. 5 and 6, Nov. and Dec. 1922, pp. 272-278 and 341-345, 4 figs. Nov.: Practical considerations in rate setting. Dec.: Premium plan of wage payment.

COUPLINGS

FLEXIBLE. The Wellman-Bibley Compensating Shaft Coupling. Mar. Engr. and Naval Architect, vol. 46, no. 546, Mar. 1923, pp. 91-92, 4 figs. Details of design of flexible coupling developed by Wellman-Bibby Co., and its application to Diesel-engine-driven ships.

CRANES

ELECTRIC. Electric Cranes, F. H. Woodhull. Assn. Iron and Steel Elec. Engrs., vol. 5, no. 2, Feb. 1923, pp. 41-44. Problems of design of electric cranes used in steel works.

Mobility in Loading. Motor Transport, vol. 36, no. 937, Feb. 12, 1922, pp. 193-194, 3 figs. Constructional details and performance of Ransome electric runabout crane.

The "Ransome" Electric Runabout Crane. Ry. Gaz. vol. 38, no. 6, Feb. 9, 1923, p. 193, 2 figs. Development of "Orwell" electric truck designed to expedite and facilitate handling operations in workshops, warehouses, goods sheds, etc. See also Elec. Times, vol. 63, no. 1635, Feb. 15, 1923, pp. 159-160, 5 figs. and Elec. Rev., vol. 92, no. 2360, Feb. 16, 1923, pp. 250-251, 1 fig.

STEEL-MILL. Some Steel Mill Crane Problems, A. J. Standing. Assn. Iron and Steel Elec. Engrs., vol. 5, no. 2, Feb. 1923, pp. 33-36. Notes on operation and maintenance.

CRANKPINS

BEARING DESIGN. An Analytical Study of Crank-Pin Bearing Design and Lubrication, G. D. Angle. Automotive Industries, vol. 48, nos. 9, 10 and 11, Mar. 1, 8 and 15, 1923, pp. 520-523, 571-574, 12 figs. and 623-626, 11 figs. Rigidity said to be factor of prime importance; polar diagrams used to determine magnitude and direction of bearing loads. Fundamentals of lubrication; necessity of perfect lubrication. Recommends that oil hole be located in low-pressure region as shown by comparative wear diagrams; relation between oil-hole diameter, pressure-bearing clearance and oil flow are experimentally established.

CUPOLAS

BLAST-PIPE LAYOUT. Method of Laying Out a Cupola Blast Pipe, C. B. Lindstrom. Boiler Maker, vol. 23, no. 2, Feb. 1923, pp. 40-41, 7 figs. Development of sections of pipe with details of the various section patterns.

CUTTING TOOLS

DIAMOND FOR VULCANITE. Diamond cutting Tools for Vulcanite, W. Richards. Machy. (Lond.), vol. 21, no. 541, Feb. 8, 1923, pp. 598-599, 2 figs. Manufacture of vulcanite pen section.

D

DAMS

EARTH. The World's Highest Earth Dam. Excavating Engr., vol. 17, no. 2, Feb. 1923, pp. 43-45, 4 figs. Description of construction of Tieton Dam, by U.S. Reclamation Service, to store water for irrigation purposes in Yakima Valley, Washington; height 321 ft., involving 1,850,000 cu. yd. of earth and rock fill; $5,000,000 undertaking.

Percolation Through and Hydraulic Pressure Under Earth Dams. A. L. Fellows. Eng. News-Rec., vol. 90, no. 9, Mar. 1, 1923, p. 399. Discussion and co-operation of engineers solicited in investigation of design of earth dams undertaken by U.S. Bur. of Pub. Roads and U.S. Reclamation Service.

MULTIPLE-ARCH. Melby Multiple-Arch Barrage Dam (Serievaldvdamm vid Melby), Vo. Hellström. Teknisk Tidskrift, vol. 53, no. 8, Feb. 24, 1923, pp. (Väg- och vattenbyggnadskonst Section) 13-19, 19 figs. For Forsaströms hydro-electric power plant; design and calculations; details of construction.

DIES

UNIVERSALLY ADJUSTABLE. The Turk's Head, C. E. Davies. Metal Industry (Lond) vol. 22, no. 5, Feb. 2, 1923, pp. 99-100, 4 figs. Describes universally adjustable die head for square and rectangular sections, known as "Turk's Head," which is especially valuable in cases where good finish, accuracy and square corners are required.

DIELECTRICS

LOSSES. Dielectric Losses: Some Theoretical Considerations, G. Allsop. Beama, vol. 12, no. 58, Feb. 1923, pp. 105-108, 6 figs. Discussion of article on dielectric loss curves with respect to influence of temperature and pressure, by Höchstädter, published in Elektrotechnische Zeit., Apr. and May 1922.

DIESEL ENGINES

CARE AND MAINTENANCE. Care and Maintenance of Diesel Engines, Geo. E. Windeler. Oil Engine Power, vol. 1, nos. 1 and 2, Jan. and Feb. 1923, pp. 28 and 33-34, and 76-80, 6 figs. River or canal water for cooling; crankshafts; fuel or injection valve; packing of fuel valves; fuel pumps; valve adjustments; exhaust valves and casings; starting; treatment and storage of lubricating oil; etc. Read before Diesel Engine Users Assn.

FORGE PLANTS. Diesel Engines for Forge-Plant Power. Oil Engine Power, vol. 1, no. 1, Jan. 1923, pp. 18-21, 6 figs. Installation and operation of four Nordberg-Carels 2-cycle sets at Oklahoma Iron Works, Tulsa, Okla., for providing power for forge hammer and general plant electric service, results in great economies.

LUBRICATION. Lubrication of Diesel Engines, Harold Moore. Oil Engine Power, vol. 1, no. 1, Jan. 1923, pp. 15-16. Résumé of past international experiences. Requirements of engine as regards lubrication; recommendations of specifications published by Diesel Engine Users' Assn., England, which investigated entire subject of stationary oil-engine lubrication.

STEAM POWER VS. Oil-Engine or Steam Power, Stanley Wright. Oil Engine Power, vol. 1, no. 2, Feb. 1923, pp. 58-63, 4 figs. Comparison of simplicity of Diesel plant with typical steam station, with observations on relative costs of operation and on results obtained in combined steam and Diesel plants; advantages of Diesels for stations up to 5000 kw. capacity.

DRILLING MACHINES

RADIAL. The "Right Line" Radial Drilling Machine. Machy. (Lond.), vol. 21, no. 543, Feb. 22, 1923, pp. 646-648, 6 figs. New type developed by Niles-Bement-Pont Co., London.

DRYING

THERMODYNAMICS OF. Contribution to the Thermodynamics of Drying (Beitrag zur Thermodynamik des Trocknens), F. Merkel. Zeit. des Vereines deutscher Ingenieure, vol. 67, nos. 4 and 5, Jan. 27 and Feb. 3, 1923, pp. 81-84 and 106-108, 9 figs. Laws of heat consumption with drying; dependence of heat consumption on working conditions; temperatures of hot air; drying of air through cooling off.

DURALUMIN

PROPERTIES AND HEAT TREATMENT. Duralumin—A Digest of Information, Horace C. Knerr. Am. Soc. for Steel Treating, vol. 3, no. 1, Oct. 1922, pp. 13-42, 18 figs. Composition; chemical and physical constitution; manufacture; casting; forging; heat treating; resistance to corrosion; industrial applications. Bibliography and references.

E

ECONOMIZERS

WATER-SPRAY CLEANING. Economizer Cleaned by Washing While Operating. Power Plant Eng., vol. 27, no. 6, Mar. 15, 1923, pp. 326-327, 3 figs. New type of steel tube economizer, known as Foster economizer has water spray for cleaning; steel tubes are enclosed by cast-iron gilled rings.

EDUCATION, ENGINEERING

PROGRESS. Engineering Education. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 491-523. Contains following papers: The New Project for the Society for the Promotion of Engineering Education, Charles F. Scott; The Outlook for the Engineering Schools of the Middle West, William G. Raymond; Co-operation of National Engineering Societies in Engineering Education, John L. Harrington.

ELECTRIC CIRCUITS, A.C.

POWER MEASUREMENT IN POLYPHASE. The Measurement of Power in Polyphase Circuits, Charles Fortescue. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 3, Mar. 1923, pp. 205-218, 7 figs. Points out that existing methods of measuring power when applied to unbalanced 3-phase systems are not equitable for symmetrical polyphase machinery; factors entering into question of equitable rates when polyphase system is subject to unbalance.

ELECTRIC FURNACES

ELECTRODES. The Sörderberg Continuous Electrode and Its Use in Italy (L'elettrodo continuo Sörderberg e le sue prime applicazioni in Italia), Livio Cambi. Giornale di Chimica Industriale ed Applicata, vol. 5, no. 1, Jan. 1923, pp. 7-9, 2 figs. Advantages; some Italian furnaces where they are used with satisfaction.

FERROVANADIUM. Electric Furnace Makes Ferro-Vanadium, B. D. Saklatwalla and A. N. Anderson. Elec. World, vol. 81, no. 8, Feb. 24, 1923, pp. 452-456, 6 figs. New electro-metallurgical process for reduction of ferrovanadium by carbon; operation made possible by development of type of electric furnace different from those previously designed

HARDENING. Electric Hardening Furnaces (Der elektrische Härteofen), Wintermeyer. Elektrotechnischer Anzeiger, vol. 40, no. 24, Feb 10, 1923, pp. 178-181, 1 fig. Hardening and annealing of tool steels; Lorenz, Tioga Iron & Steel Co., and A. E. G. types of resistance furnaces

INDUCTION. The Induction Furnace for Brasses and Bronzes (Le four à induction pour la préparation des laitons, bronzes, etc.), Industrie Electrique, vol. 32, no. 734, Jan. 25, 1923, pp. 25-26, 3 figs. Design and operation.

METAL-MELTING AND HEAT-TREATMENT. Electrical Melting and Heat Treatment, Verdon O. Cutts. Metal Industry (Lond.), vol. 22, no. 6, Feb. 9, 1923, pp. 123-125, 3 figs. General principles of electro thermics, particularly in respect to melting of non-ferrous metals, and with special reference to Baily resistance furnace, electrical furnaces for heat treatment.

The Electric Furnace in Metallurgy, J. Kent Smith. Metal Industry (Lond.), vol. 22, no. 9, Mar. 2, 1923, pp. 193-194. Importance of furnace atmosphere, discusses induction, direct arc, radiation, and crucible furnaces, melting in vacuo.

STEEL. New Electric Furnace for Making Steel (Novo forno electrico para a fabricação do aço). Revista Brasileira de Engenharia, vol. 5, no. 1, Jan. 1923, pp. 37-40, 4 figs. Describes Italian Fiat furnace, manufactured by A.E.G. and Deutsche Maschinen Fabrik A.G.; consumption of current and electrodes.

ELECTRIC GENERATORS, A.C.

PARALLEL OPERATION. Operating Alternating-Current Generators in Parallel, Ralph Brown. Power, vol. 57, no. 12, Mar. 20, 1923, pp. 435-437, 4 figs. After discussing operation of single alternator, two or more machines operating in parallel are dealt with, showing effects of changing field current and speed of machines.

ELECTRIC GENERATORS, D.C.

PARALLEL OPERATION. Parallel Operation of Direct-Current Generators, Scott Hancock. Elec. Jl., vol. 20, no. 3, Mar. 1923, pp. 90-94, 8 figs. Study of problem; requisites for generators in parallel operation.

ELECTRIC LOCOMOTIVES

BALDWIN-WESTINGHOUSE. All-Electric Passenger Service for New Haven, W. J. Clardy. Ry. Age, vol. 74, no. 15, Mar. 17, 1923, pp. 767-769, 3 figs. Twelve new 180-ton Baldwin-Westinghouse passenger locomotives under construction, of 2—6—2 + 2—6—2 type equipped with 6 twin motors and will operate from 11,000-volt, single-phase trolley, or 650-volt, d.c. third rail.

CONTROL OF A.C. A.-C. Locomotive Control, Ivan Döry. Elec. Ry. Jl., vol. 61, no. 5, Feb. 3, 1923, pp. 199-200, 4 figs. Review of plans used for varying voltage in European single-phase locomotives, leading up to account of inductive regulator with brush shift. From Elektrotechnische Zeit.

NARROW-GAGE. Recent Improvements in Electric Narrow-Gage Locomotives (Perfectionnements récents dans les locomotives électriques à voie étroite), Helde. Revue Générale de l'Electricité, vol. 13, no. 7, Feb. 17, 1923, pp. 257-261, 5 figs. General Electric. Gottwald-Muller, Bernina, and Brown-Boveri types.

STORAGE-BATTERY. The Radius of Action of Storage-Battery Cars and Locomotives (Der Aktionsradius der Akkumulatoren-Eisenbahnfahrzeuge), F. Christen. Schweizerische Bauzeitung, vol. 81, nos. 4 and 5, Jan. 27 and Feb. 3, 1923, pp. 35-38 and 54-56, 7 figs. Discusses feasibility in comparison with other drives. Includes tabular data on storage-battery locomotives and railway motor cars of the Swiss Fed. Rys., Prussian-Hessian State Ry., Brown, Boveri & Cie., and Westinghouse Elec. & Mfg. Co.

ELECTRIC MOTORS, A.C.

CONTROL. Automatic Control for Synchronous Industrial Motor-Generator Sets. Power, vol. 57, no. 7, Feb. 13, 1923, pp. 242-244, 2 figs. Full automatic-control equipment for 2300-volt synchronous motor driving d.c. generator, which is also automatically controlled by standard apparatus.

INDUCTION. The Operation of Induction Motors in Cascade, H. Cotton. Instn. Elec. Engrs.—Jl., vol. 61, no. 315, Feb. 1923, pp. 284-293, 11 figs. Method of deriving circle diagram of cascade motor.

ELECTRIC TRANSMISSION LINES

CHANGING FROM D.C. TO A.C. Some Notes on Changing Over a Network from D.C. to A.C., M. Farber. Elec. Rev., vol. 92, nos. 2360 and ...., Feb. 16 and ..... 1923, pp. 246-247 and..... 2 figs. Procedure followed in making change and to figures as to costs.

DEVELOPMENT. Progress in the Development of the Large-Scale Electrical Industry During Last Ten Years (Fortschritte in der Entwicklung zur elektrischen Grosswirtschaft während der Letzten 10 Jahre), Ludwig Kallir. Elektrotechnik u. Maschinenbau, vol. 41, nos. 1 and 2, Jan. 1 and 14, 1923, pp. 1-9 and 46-52, 18 figs. Discusses large-scale electric power transmission, 44,000, 60,000 and 110,000 volts; transmission lines, poles and insulators; voltage regulation; transformer substations; switchboard arrangement.

ECONOMICAL DESIGN. The Economical Design of Transmission Systems, P. O. Reyneau and H.P. Seelye. Elec. World, vol. 81, no. 11, Mar. 17, 1923, pp. 623-624, 2 figs. Notes on determination of most economical design for backbone lines.

ELECTRIC WELDING, ARC

APPARATUS AND EQUIPMENT. Electric Arc Welding Apparatus and Equipment, J. Caldwell. Instn. Elec. Engrs.—Jl., vol. 61, no. 315, Feb. 1923, pp. 253-268 and (discussion) 268-277, 21 figs. Deals with physical features of iron arc as used for welding ferrous metals; general types of apparatus and equipment developed, with examples of each type. Bibliography. Experimental results.

IRON AND STEEL. Notes on the Welding of Iron and Steel with the Electric Arc, Fred. H. Williams. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 131, Mar. 1923, pp. 149-169, 16 figs. Notes on welding of steel plates, steel castings, shafting and welding of cast iron; tests show that flux-coated electrodes permit obtaining highest tensile strength. Tabulated results of tests.

STEEL STRUCTURES. Arc Welding of Steel Structures, F. P. McKibben. Am. Welding Soc.—Jl., vol. 2, no. 2, Feb. 1923, pp. 24-52, 23 figs. Effect of welding on design; practice in steel-bridge construction; steps in building steel structure, welding of steel; test data on arc welding; examples of electrically welded steel structures.

ELECTRIC WELDING, RESISTANCE

DEVELOPMENTS. Some Recent Developments and Uses for Resistance Welding, H. A. Wooffter. Am. Welding Soc.—Jl., vol. 1, no. 10, Oct. 1922, pp. 38-40. Discusses developments in seam welding, spot welding, and butt welding.

ELEVATORS

ELECTRIC, INSPECTION OF. Electric Elevator Inspection, J. M. Walsh. Indus. Engr., vol. 81, no. 2, Feb. 1923, pp. 72-80, 9 figs. Outlines inspection schedule; what inspector should look for, and how to make adjustments that are necessary.

EMPLOYEES

EXPLAINING FINANCES TO. Company Finances Brought Home to Employees, Charles M. Ripley. Management Eng., vol. 4, no. 3, Mar. 1923, pp. 153-156, 5 figs. Way to explain division of income into wages, salaries and dividends. Plan of Gen. Elec. Co.

EMPLOYEES' REPRESENTATION

BETHLEHEM STEEL CO. Employee Representation at the Bethlehem Steel Co., J. M. Larkin. Min. and Metallurgy, vol. 4, no. 194, Feb. 1923, pp. 81-82. Describes plan which has been in operation since October, 1918, and its success, advantages claimed to outweigh criticisms, compensation and relief measures.

EMPLOYMENT MANAGEMENT

PSYCHOTECHNICAL TESTS. The Systematic Collection of Psychotechnical Adaptability Tests and Their Importance (Die systematische Sammlung psychotechnischer Eignungsproben und ihre Bedeutung), Hans Rupp. Maschinenbau (Betrieb), vol. 2, no. 8, Jan. 26, 1923, pp. M65-B70. Discusses system of tests arranged by Committee on Economic Production, involving eye and hand tests; technical comprehension; and general ability.

ENAMELING

IRON AND STEEL PLATE. Enamels and Enameling on Iron and Steel Plate. Can. Foundryman, vol. 14, no. 1, Jan. 1923, pp. 28-29. Raw materials, coloring matters, enamel manufacture treatment of metal, process of applying; ovens, furnaces, etc.

ENGINEERING

ECONOMICS OF. Economics of Engineering, Charles C. Garrard. Eng. Rev. & Trader, vol. 36, no. 7, Jan. 1923, pp. 205-210. Social and economic problems; investigation by engineer; unemployment; curve of prosperity; private and public enterprise; commercial training; industrial organization; public-utility undertakings. Based on presidential address before Junior Instn. Engrs.

EVAPORATORS

FLASH. Operating Characteristics of Flash Evaporators, John Forbes. Power Plant Eng., vol. 27, no. 6, Mar. 15, 1923, pp. 311-313, 2 figs. High- and low- pressure and single- and multiple-effect evaporators are compared.

LOW-PRESSURE. Savings Effected by Evaporator, John Forbes. Power Plant Eng., vol. 27, no. 5, Mar. 1, 1923, pp. 269-270, 1 fig. Low-pressure evaporator for make-up water introduces saving in plant operation.

EXCAVATION, ROCK

BUILDING FOUNDATION. A Big Excavation for Deep Rock Foundation, Frank W. Skinner. Compressed Air Mag., vol. 28, no. 3, Mar. 1923, pp. 451-453, 4 figs. Describes excavation work in preparation of site of $7,000,000 building in New York City for Equitable Life Insurance Co.,; total excavation consists of about 40,000 cu. yd. earth and 60,000 cu. yd. rock; pneumatic drills, a battery of air compressors, four steam shovels, and a fleet of 50 motor trucks employed.

EXPLOSIVES

LIQUID OXYGEN. Liquid Oxygen in Mining, Alfred James. Instn. Min. and Metallurgy,—Bul., no. 221, Feb. 1923, pp. 13. Advantages claimed to result from employment of liquid oxygen in place of other explosives; experience at Real Del Monte mines, Mexico; European practice; precautions against accidents.

Industrial Use of Liquid-Oxygen Explosives, Robert G. Skerrett. Compressed Air Mag., vol. 28, no. 3, Mar. 1923, pp. 427-430, 6 figs. What has been done in manufacturing liquid oxygen in developing explosives from liquid air; adaptation for blasting in mines and quarries.

F

FATIGUE

INDUSTRIAL. The Relation of Fatigue and Accuracy to Speed and Duration of Work, B. Muscio. Indus. Management (Lond.), vol. 9, no. 4, Feb. 22, 1923, pp. 112-114, 1 fig. Experimental data bearing upon question whether rate of movement (speed of production) of "fatigue" is chief factor in hourly variations in numbers of industrial accidents. Summary of report of Indus. Fatigue Research Board.

FERROMANGANESE

MOLTEN. Molten Manganese, Frank Hodson. Iron Age, vol. 111, no. 10, Mar. 8, 1923, p. 667. Advantages from use of electrically melted alloy in steel making; savings possible; use of manganese ore.

FLIGHT

EXPERIMENTAL WORK. The Practical Importance of the Free Flight Work of the National Advisory Committee for Aeronautics. Thomas Carroll. Aerial Age, vol. 16, no. 3, Mar. 1923, pp. 112-114 and 119, 7 figs. Discusses flight work of aerodynamic section.

FLOW OF WATER

RIVETED STEEL PIPES. Flow of Water Through Spiral Riveted Steel Pipes, E. Parry. Engineering, vol. 115, no. 2983, Mar. 2, 1923, pp. 255-256, 3 figs. Results of experiments carried out at Engineering Experimental Station of Purdue University.

FLYWHEELS

ROLLING-MILL MOTORS. Fly-Wheels on Rolling Mill Drives, F. R. Burt. Blast Furnace and Steel Plant, vol. 21, no. 3, Mar. 1923, pp. 201-204, 3 figs. Discusses various mill power loads and rolling characteristics which determine advisability of flywheels for such service.

FORGING

PROBLEMS. Forging. Maschinenbau (Betrieb), vol. 2, no. 9, Feb. 8, 1923. Three articles, as follows: Investigations of Deformation with Special Regard to Forging (Untersuchungen über die bildsame Formänderung unter besonderer Berücksichtigung des Schmiedens), E. Siebel, pp. B75-B80, 15 figs. Steel Casting vs. Forging. (Stahlformguss gegen Schmieden), Richard Krieger, pp. B80-B82, 9 figs. The Cause of Excessive Wear of Swages in the Hot Forging of Brass (Die Ursache grossen Gesenkverschleisses beim Warmschmieden von Messing), C. Boye, pp. B83-B84, 5 figs.

FOUNDRIES

ALUMINUM. Aluminum Foundry Practice. Eng. Production, vol. 6, no. 120, Jan. 18, 1923, pp. 61-63, 10 figs. Procedure of Dayton Eng. Laboratories Co., Dayton, Ohio.

FUELS

CANADA, SITUATION IN. The Fuel Situation in Canada, B. F. Haanel. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 131, Mar. 1923, p. 75-82. Points out that of 30,000,000 tons consumed in Canada, nearly 60 per cent is imported from United States. Suggestions for improving adverse condition.

COKE BREEZE AS BOILER FUEL. Experiences in the Burning of Coke Breeze with Coal-Gas Addition in Large Boiler Houses (Erfahrungen bei der Verbrennung von Koksgrus unter Zusatz von Leuchtgas in grösseren Kesselhausbetrieb), H. Wilde. Gas- u. Wasserfach, vol. 65, no. 51, Dec. 22, 1922, pp. 809-812, 4 fig. Total efficiency of 75 per cent was obtained in installation in electrical works in Kiel.

COMPARATIVE COSTS. Comparative Fuel Costs of Coal and Oil, E. T. McCarthy. Power, vol. 57, no. 12, Mar. 20, 1923, p. 446-447, 1 fig. Presents diagram for comparing cost of fuels on heat-unit and efficiency basis and for working special problems with coal and oil.

ECONOMICAL USES. Fuel Economy Secured by Organization, J. H. Blakey. Power Plant Eng., vol. 27, no. 6, Mar. 15, 1923, pp. 317-319, 1 fig. European countries study economical use of fuel and supervise boiler plants, instrument developed for studying vibration.

SLAG, RECOVERY FROM. Recovers Fuel from Slag and Ashes, F. A. Brackmann. Power, vol. 57, no. 9, Feb. 27, 1923, pp. 322-323, 5 figs. By means of strong magnets acting on ferric acids to which silicates and lime adhere, slag is separated from combustible.

See also Natural Gas; Oil Fuel; Pulverized Coal.

FURNACES, FORGING

SWEDISH. Swedish Welding and Forging Furnaces (Värmetekniska undersökningar a nagra svenska valloch smidesugnar), A. Hallbäck. Jenkontorets Annaler, vol. 107, Special No., May 31, 1922, pp. 263-414, 91 figs. Construction of furnaces; fuel consumption; heat balance; flue gases; preheating; heat loses; etc.

FURNACES, HEATING

PLATES. New Design of Continuous Furnace. Iron and Coal Trades Rev., vol. 106, no. 2866, Feb. 2, 1923, p. 155, 2 figs. Furnace designed by Priest Furnaces, Ltd., for either producer or semi-gas firing; when working on sleeper plates, it will deliver to presses at least 3 plates per min.

FURNACES, METALLURGICAL

SCHÜRMANN. The Schürmann Furnace and Preheater (Der Schürmann-Schmelzofen mit Winderhitzer), Hörnig. Zeit, für die Gesamte Giessereipraxis, vol. 44, no.s 5-6, Feb. 10, 1923, pp. 33-35, 5 figs. Heat balance of furnace; quantity of coal and coke used; cost data.

G

GARBAGE DISPOSAL

METHODS. Modern Methods of Disposal of Garbage, and Some of the Troubles Experienced in Their Use, Samuel A. Greeley. Am. City Mag., vol. 28, no. 1, Jan. 1923, pp. 15-19, 3 fig. Fundamental considerations; importance of haul; length of haul; improved operation of dumps; conditions in United States.

GAS ENGINES

ENCLOSED FORCED-LUBRICATION. Gas Engines of the Enclosed Forced-Lubrication Type. Beama, vol. 12, no. 58, Feb. 1923, pp. 115-116, 5 figs. Features of Brown-Lindley gas engines.

GAS MANUFACTURE

DISTRIBUTION, AND. The Manufacture and Distribution of Gas, Herbert N. Cheney. Boston Soc. Viv. Engrs.—Jl., vol. 10, no. 2, Feb. 1923, pp. 47-55, 1 fig. Hindrances to gas development; process of manufacturing water gas.

GAS PRODUCERS

MECHANICALLY OPERATED. Mechanically Operated Producer. Gas Age-Rec., vol. 51, no. 9, Mar. 3, 1923, p. 275, 2 figs. Compact and high-duty form of revolving producer, using bituminous coal.

GASOLINE

CARBURATION. An Experimental Survey of Gasoline and Kerosene Carburetion, C. S. Kegerreis and G. A. Young. Soc. Automotive Engrs.—Jl., vol. 2, no. 1, Jan. 1923, pp. 63-75, 39 figs. Reasons for present wastage of fuel; gasoline carburetion requirements; comparison of gasoline and kerosene; temperature requirements of fuels; detonation, effect of load; fuel-air mixture requirements for engines; commercial metering characteristics.

FUTURE PRODUCTION. Gasoline Ten Years Hence, Ralph H. McKee. Chem. & Industry, vol. 42, no. 9, Mar. 2, 1923, pp. 193-196. Discusses cracked and casinghead gasoline and gasoline substitutes; future demands; shale-oil industry; shale-oil retorts.

NATURAL GAS. Natural-Gas Gasoline in 1921, E. G. Sievers. U. S. Geol. Survey, 11.30, Jan. 25, 1923, pp. 237-252, 3 figs. Production; capacity of plants; growth of industry; problems in production of natural-gas gasoline; relations to supply of motor fuel; statistics by states.

Proper Utilization of Natural Gasoline, Lloyd F. Bayer. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 273-275. Processes of extraction from natural gas; proper usage of natural gasoline in blended fuels as determined by lengthy series of tests.

POWER-PRODUCING QUALITIES. Preliminary Report of Power Producing Qualities of Certain Gasolines, Hugh M. Milton, Jr. Agricultural and Mech. College of Texas—Bul., vol. 8, no. 8, Aug. 1, 1922, 39 pp., 17 figs. Investigation of efficiency variations of four-cycle internal-combustion engine with different grades of petroleum products.

GEAR CUTTING

BLANK RIM SUPPORTS. Gear Blank Rim Supports, Fred Horner. Machy. (Lond.), vol. 21, no. 542, Feb. 15, 1923, pp. 614-620, 34 figs. Methods of supporting and bracing blanks while cutting.

SPUR AND HELICAL GEARS. Commercialised Gear Cutting (Spur and Helical Gears), T. A. Stoddart. Eng. Production, vol. 6, no. 122, Feb. 1, 1923, pp. 117-118. Fundamental points to be considered in producing gears; notes on cutters; hobbing method of production.

GEARS

GRINDING. Grinding Bevel Gears True With Pitch Circle, Milton Wright. Am. Mach., vol. 58, no. 11. Mar. 15, 1923, pp. 399-400, 2 figs. Device; grinding for clamping and truing preliminary to grinding tips of teeth.

See also Grinding Machines, Spiral Bevel Gear.

MAAG. Maag Toothed Wheels (Maag-Zahnräder). Elektrotechnische Zeit., vol. 44, no. 5, Feb. 1, 1923, pp. 104-106, 9 figs. Describes new type of wheels made by Maag Company, Zurich, said to overcome disadvantages of other types for modern high-speed work; production and operation.

GRAIN ELEVATORS

ELECTRICAL EQUIPMENT. Electrical Equipment of C. & N. W. Grain Elevator, Jos. Andreucetti. Ry. Elec. Engr., vol. 14, no. 2, Feb. 1923, pp. 53-57, 12 figs. Dust-proof distributing panel cabinets, vaporproof lighting units and all new conduit and wiring ensures reliable and safe operation.

GRINDING MACHINES

Internal. Redesign Grinding Machines to Increase Rate of Production. Automotive Industries, vol. 48, no. 9, Mar. 1, 1923, pp. 526-527, 2 figs. Heald Co. incorporates new idler with wider belts on grinding heads suitable for both old and new models with view to augmenting output.

Railway Shops. Grinding in the Railway Shops. Machy. (Lond.), vol. 21, nos. 540 and 541, Feb. 1, and 8, 1923, pp. 545-550 and 577-581, 22 figs. Machines and methods employed by British and American manufacturers in production and maintenance of locomotives and railway equipment.

Spiral Bevel Gear. Grinding Spiral Bevel Wheels. Machy. (Lond.), vol. 21, no. 542, Feb. 15, 1923, pp. 626-629, 11 figs. Machine developed by Reinecker Corp., Chemnitz, Germany, with which inaccuracies due to hardening are removed by grinding.

H

HANDLING MATERIALS

Foundries. Mechanical Appliances in the Foundry, G. F. Charnock. Foundry Trade Jl., vol. 27, no. 341, Mar. 1, 1923, pp. 171-177, 9 figs. Discusses question of transportation applied to jobbing as well as to specialized foundry from standpoint of mechanical engineer.

HARBOR IMPROVEMENTS

Cosport, England. New Landing Stage and Wharf at Gosport. Engineer, vol. 135, no. 3503, Feb. 16, 1923, pp. 166-168, 3 figs. Improvements included reclamation of foreshore, construction of floating landing stage and approach thereto by means of road across reclamation and by movable bridge, and reinforce-concrete wharf.

HARDNESS

Testing. Symposium on Hardness Testing Held at the Fourth Annual Convention of the Society, Detroit, October, 1922. Am. Soc. for Steel Treating—Tram., vol. 3, no. 5, Feb. 1923, pp. 480-501. Contains following articles, including discussions: Significance of Hardness Tests, H. P. Hollnagel; Testing of Metals for Hardness, H. M. German.

HEALTH

Industrial Plants. Health Problems of Industry. C. E. A. Winslow. Power Plant Eng., vol. 27, nos. 3, 4 and 5, Feb. 1, 15 and Mar. 1, 1923, pp. 186-188, 233-235 and 283-284, 3 figs. Health and efficiency in industrial plants. Feb. 1: Factory ventilation and lighting. Feb. 15: Industrial dust and its dangers; control of industrial poison hazards, sanitation in factory. Mar. 1: Fatigue and its factory; industrial medical service.

Promoting Health in Industry, C. E. A. Winslow. Iron Trade Rev., vol. 72, nos. 4, 5, 6, 7 and 8, Jan. 25, Feb. 1, 8, 15 and 22, 1923, pp. 298-299, 371-372, 440-441, 511 and 519, and 593 and 596. Deals with important problems as they affect industrial workers; consideration is given to best practice in eliminating hazards and providing protection. Jan. 25: Health, efficiency and medical service. Feb. 1: Factory ventilation and lighting. Feb. 8: Industrial dusts and poison hazards. Feb. 15: Sanitation in factory. Feb. 22: Fatigue and its factors.

HEAT PUMPS

Tests. Experiments With a Reciprocating Heat Pump at the Steam Laboratory of the Bavarian Revisionsverein (Versuche mit einer Kolbenwärmepumpe in der dampftechnischen Versuchsanstalt des Bayerischen Revisionsvereins). Zeit. des Bayer. Revisions-Vereins, vol. 27, nos. 2 and 3, Jan. 31 and Feb. 15, 1923, pp. 9-12 and 17-18, 2 figs. Determination of relation of heat absorption by steam and heat value of work performed; results of 15 experiments with saturated steam for vacuum, atmospheric pressure and one at excess pressure at 100, 120 and 140 r.p.m.

HEATING

Factories. Economical Factory Heating, Chas. F. Wade. Indus. Management (Lond.), vol. 9, no. 4, Feb. 22, 1923, pp. 99-110, 3 figs. Essential features of economical heating system in modern factory; most efficient methods of heat generation and distribution; fuel economy.

HEATING, STEAM

Central-Station. Electric Central Heating Plant and Heat Storage at Stavanger (Elektriske centralvarmeanlaeg med magasinering i Stavanger). Chr. Grassdal. Elektroteknisk Tidsskrift, vol. 35, no. 36, Dec. 27, 1922, pp. 287-290, 6 figs. Due to high cost of fuel; details of equipment, production and consumption of current.

Radiator Ratings. Standard Ratings for Radiators, Boilers and Complete Installations, A. H. Barker. Domestic Eng. (British), vol. 42, no. 48, Dec. 1922, pp. 242-247. Difficulties of tests, such as determining amount of surface, maintaining uniform temperature, size of radiators for given duty, and similar difficulties in boiler tests.

Vacuum. Is There Any Saving in Vacuum Heating, A. L. Browne. Heating and Vent. Mag., vol. 20, no. 2, Feb. 1923, pp. 37-43, 3 figs. Affirmative replies to inquirer's query as to advantage of vacuum over gravity steam design as follows. Comparison of "Open" and "Closed" Systems, A. L. Browne, Vacuum vs. Vapor or Atmosphere Heating, Charles A. Fuller. See also letter to editor on pp. 68-69.

HELIUM

Bibliography. Bibliography of Scientific Literature Relating to Helium. U.S. Bur. of Standards, Circular, no. 81, Dec. 21, 1922, 32 pp. Bibliography on discovery and identification, occurrence, formation, separation and purification, analysis, properties; applications; and relation to [illegible] phenomena.

Production. Helium and Its Production (L'elio e la sua produzione industriale). Elettricista, vol. 1, Series 4, no. 20, Oct. 15, 1922, pp. 151-152. Processes of production, including Linde, Jeffries and Norton, and Claude.

HIGHWAYS

Researches. Research Foundation for the Economic Theory of Highway Improvement, W. K. Hatt. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 294-295. Outline of necessary research, designated as program upon which efforts should be concentrated, developed by representatives of automotive and highway engineers and motor-truck [illegible].

Use and Abuse. Use and Abuse of Highways, [illegible]. Can. Engr., vol. 44, no. 9, Feb. 27, 1923, pp. 273-274. [illegible] before and after completion; abuse of highways before and after completion; [illegible] of these fundamental principles, maintenance. See also, Mun. and County Eng., vol. 64, no. 2, Feb. 1923, pp. 59-65. Abstract of address before Am. Good Roads Congress.

HOBBING MACHINES

Automatic. Tangent Rack System of Gearing. Machy. (Lond.), vol. 21, no. 541, Feb. 8, 1923, pp. 603-605, 7 figs. Hotchkiss-Taylor automatic gear-generating machine.

HOISTS

Electric. An Induction Motor Operated Mine Hoists with Dynamic Braking, R. W. McNeill. Elec. Jl., vol. 20, no. 3, Mar. 1923, pp. 97-100, 8 figs. Hoist equipment installed at shaft of Lehigh Valley Co., near Shenandoah, Pa.

Pneumatic. Air-Driven Hoists Adaptable to All-Round Service, A. S. Taylor. Compressed Air Mag., vol. 28, no. 3, Mar. 1923, pp. 439-442, 10 figs. Services being performed by 20 "Little Tugger" hoists at Sun Shipbldg. Co., Chester, Pa., description of hoists and their applications.

HYDRAULIC TURBINES

Draft Tubes. Notes on the Draught Tube of a Water Turbine, Otogorô Miyagi. Tôhoku Imperial University, Technology Reports, vol. 3, no. 1, 1922, pp. 57-69, 4 figs. Investigation of losses of energy; consideration of minimum loss and determination of best form of draft tube; numerical example.

Impulse. The Tangential Impulse Water Wheel, Ely C. Hutchinson. Elec. Jl., vol. 20, nos. 2 and 3, Feb. and Mar. 1923, pp. 49-51 and 82-86, 15 figs. Efficiency and general design; buckets and wheel centers; speed regulation; plain and needle, and deflecting nozzles; jet deflectors; auxiliary relief needle nozzles; multiple nozzle wheels; coupled and overhung wheels; bearings and governors.

Small-Plant. Typical Water Turbines for Small Plants, S. C. O'Grady. Beama, vol. 12, no. 58, Feb. 1923, pp. 96-104, 11 figs. Casing turbines.

Types. Development in Hydraulic Machinery During the Last Decade (Die Bedeutung des letzten Dezenniums für den Wasserkraftmaschinenbau), Hans Baudisch. Elektrotechnik u. Maschinenbau, vol. 41, no. 1, Jan. 1, 1923, pp. 14-16. Discusses Francis, Kaplan, and other turbines, their operation and regulation.

HYDRO-ELECTRIC DEVELOPMENTS

Canada. Hydro-Electric Power Development on the Metis River, P.Q. Contract Rec., vol. 37, no. 5, Jan. 31, 1923, pp. 100-103, 4 figs. Lower St. Lawrence Power Co., making use of Grand Metis Falls for plant of 3500-hp. initial capacity; ultimate capacity 7000 hp.; special features of project.

New power Development at Chicoutimi. Contract Rec., vol. 37, no. 7, Feb. 14, 1923, pp. 158-160. 1 fig. Preliminary details of plant to be built on Chicoutimi River for Price Bros. Nature of site and factors entering into design of development. See also Contract Rec., vol. 37, no. 8, Feb. 21, 1923, pp. 178-179, 1 fig. Information on storage dams.

Problems. Hydro-Electric Power Supply, A. Tustin. Instn. Elec. Engrs.—Jl., vol. 61, no. 314, Jan. 1923, pp. 174-178. Chief constituent parts of hydro-electric development and their functions; economic factors controlling development and operation of plants; problem of tidal power where it exemplifies working of these economic factors.

Western U. S. 1923 Hydro-electric Development Program Involves 185,500 Kilowatts. Jl. Elec. and West. Industry, vol. 50, no. 3, Feb. 1, 1923, pp. 96-97. Review of development in West during 1922; tabulated data from annual report of Federal Power Commission on permits and licenses issued and projects under way in 1922 or definitely scheduled for 1923.

HYDRO-ELECTRIC PLANTS

Big Falls, Wis. New Hydro-electric Development at Big Falls. Power Plant Eng., vol. 27, no. 5, Mar. 1, 1923, pp. 286-287, 2 figs. Development of power site on Flambeau River in Northern Wisconsin makes 10,000 kva. of energy available.

Canada. The New Niagara Hydro-electric Plant at Queenston, Canada (La Nouvelle usine hydro-électrique du Niagara à Queenston (Canada), Paul Calfas. Génie Civil, vol. 82, no. 3, Jan. 20, 1923, pp. 49-53, 9 figs. Description of machinery and equipment of Chippawa-Queenston power station; Vertical turbines of 55,000 hp. at 187 r.p.m., 1750 cu. ft. per second.

Pressure-Reducing Device, Automatic. Device for Eliminating Ram Thrusts and Excess Pressure in Pressure Piping (Dispositif pour la suppression des coups de bélier et des surpressions dans les conduites de refoulement), E. Maynard. Revue Générale de l'Electricité, vol. 13, no. 6, Feb. 10, 1923, pp. 211-213, 4 figs. Describes automatic device for hydro-electric power plants; examples of application.

I

IMPACT TESTING

Steel Bars. New Fracture Tests of Mild Steel Bars (Nouveaux essais sur des barreaux d'acier doux rompus par traction), J. Seigle. Revue de l'Industrie Minérale, no. 51, Feb. 1, 1923, pp. 71-74, 4 figs. Effect of impact on bars fractured by elongation, fatigue numbers per sq. mm.

INDICATORS

Mean-Pressure. New Means of Ascertaining Mean Pressure in a Heat Engine, H. E. Wimperis. Engineer, vol. 135, no. 3505, Mar. 2, 1923, pp. 238-239, 7 figs. Describes new and direct method by which average pressure can be ascertained. The Wimperis mean-pressure indicator.

Oil-Engine. Weak Spring H. P. Indicator for Oil Engines, Julius Kuttner. Oil Engine Power, vol. 1, no. 2, Feb. 1923, pp. 85-87, 16 figs. Proposes [illegible] displaced diagram, weak in place of strong springs, and a weak spring diagram of high-pressure end of indicator card, as improvements over normal indicating.

INDUSTRIAL MANAGEMENT

Bibliography. What Belongs on Your Bookshelf? Paul M. Atkins. Indus. Management (N.Y.), vol. 65, no. 3, Mar. 1923, pp. 176-178. Selected bibliography of industrial engineering and accounting.

Charts. Charts and Forms for Specific Circumstances, W. J. Hiscox. Mech. World, vol. 73, no. 1880, Jan. 12, 1923, pp. [illegible], 6 figs. Brief particulars of few examples.

Maintenance Work. Organizing Maintenance Personnel for Greater Economy, Peter J. O'Shea. Factory, vol. 30, no. 2, Feb. 1923, pp. [illegible] and [illegible], 3 figs. Organization of maintenance work along lines parallel to those employed in turning out product at lower cost.

Organization and [illegible]. The Principles of Organization and Management, Wallace Attwood. Eng. Production, vol. 6, nos. 122 and 123, Feb. 1 and 8, 1923, pp. 109-112 and 122-124, 2 figs. [illegible] arrangement, functional [illegible] determination of [illegible] training, appointing or [illegible] control and supervision, ten standards by which to build an organization, etc.

POWER PLANT. Modern Management Methods in the Power Plant, Browning Robinson. Indus. Management (N.Y.), vol. 65, no. 3, Mar. 1923, pp. 166-169, 2 figs. What coal contains, and why; how to appraise it.

PRODUCTION CONTROL. Control of Production (Ueberwachung des Arbeitsfortschrittes), M. Kronenberg. Maschinenbau-Betrieb, vol. 2, no. 8, Jan. 26, 1923, pp. 870-874, 7 figs. Describes method for control of progress of production work which is said to be simple and to require small working staff.

PRODUCTION ORGANIZATION. Does Organization for Production Pay? H. Varley. Indus. Management (Lond.), vol. 9, no. 3, Feb. 8, 1923, pp. 67-69. Discusses root causes of failure in certain forms of production systems, importance of organization to deal with new industrial conditions, and general lines upon which such organization can be economically developed.

STATISTICAL COMPILATION. Statistical Compilation: Some of Its Uses as a Function of Scientific Management, Harry B. Horwitz, Harry A. Wembridge and Herman J. Hutkin. Taylor Soc.—Bul., vol. 8, no. 1, Feb. 1923, pp. 3-11, 8 figs. Notes on compilation of statistics and importance of separate statistical division; expense distribution sheet and steps necessary to obtain it.

STORES ADMINISTRATION. Material Control and Stores Administration, H. Briggs. Eng. Production, vol. 6, nos. 120 and 121, Jan. 18 and 25, 1923, pp. 65-68 and 90-92, 15 figs. Features of efficient procedure for reception, control and distribution of material for production.

TAYLOR SYSTEM. Scientific Management According to Taylor and the Possibility of Its Application in Railway Operation (Wissenschaftliche Betriebsführung nach Taylor und ihre Anwendungsmoglichkeiten im Eisenbahnwessen), Hans A. Martens. Zeitung des Vereins Deutscher Eisenbahnverwaltungen, vol. 62, nos. 41, 42 and 43, Nov. 2, 9 and 16, 1922, pp. 799-803, 816-818 and 837-839. Reviews developments in applying scientific management and explains its principles; production statistics in connection with determination of cost; difficulties of cost determination; getting up reliable statistics.

See also Time Study.

INDUSTRIAL ORGANIZATION

BASIC ESSENTIALS. Seven Axioms of Organization, P. F. Walker. Indus. Management (N.Y.), vol. 65, no. 3, Mar. 1923, pp. 144-146. Explains basic essentials to good organization; charting course of administration.

FACTORY. Factory Organization, H. Gerard Smith. Indus. Management (Lond.), vol. 8, nos. 4, 5, 7, 8, 9, 10 and 11, Sept. 7, 21, Oct. 5, 19, Nov. 2, 16, 30 and Dec. 14, pp. 111-112, 149-151, 179-180, 211-214, 243-245, 275-277, 312-313 and 339-342. Sept. 7: Fundamental principles underlying methods of control of manufacture. Sept. 21: General organization chart. Oct. 5 and 19: Drawing office. Nov. 2: Management of works. Nov. 16: Stores. Nov. 30: Inspection department. Dec. 14: Factory costs.

INDUSTRIAL RELATIONS

RAILWAYS. Personnel and Public Relations, E. K. Hall. New York R. R. Club—Official Proc., vol. 33, no. 4, Feb. 16, 1923, pp. 6956-6970 and (discussion) 6970-6979. Discusses improvement of relations with employees.

INDUSTRIAL TRUCKS

ELECTRIC MULES. The Moog One-Axle Electric Mule (Der neue Akkumulator-Einachs-Schlepper, System Dr. Moog). H. Trautvetter. Elektrische Betrieb (formerly Elektrische Kraftbetriebe u. Bahnen), vol. 21, no. 1, Jan. 10, 1923, pp. 1-2, 3 figs. Describes new electric mule which has only one axle, to each end of which is fastened a solid rubber-tired double wheel; a 3½ hp. 60-volt motor is mounted above axle on each side of which is suspended one half of a 3, 6-kw.-hr. storage battery; weight, 1500 kg.; speed, 1 mi. per sec.; operator walks in front.

INSPECTION

PROJECTION MACHINE FOR. Vertical Projection Machine. Machy. (Lond.), vol. 21, no. 544, Mar. 1, 1923, pp. 692-693, 4 figs. Machine for inspecting screw threads and gear teeth, also tools used for producing these, etc.

INTERNAL-COMBUSTION ENGINES

EXHAUST-GAS ANALYSIS. A New Interpretation of Exhaust-Gas Analysis, E. H. Lockwood. Soc. Automotive Engrs.—Jl., vol. 12, no. 3, Mar. 1923, pp. 299-301. Algebraic formulas for interpretation of results of analysis.

HIGH COMPRESSION, CHARACTERISTICS UNDER. Internal-Combustion Engine Characteristics Under High Compression, J. H. Holloway, H. A. Huebotter and G. A. Young. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 111-117, 11 figs. Report of series of tests conducted during summer of 1922 by authors at Eng. Experiment Station of Purdue Univ., consisting of research into operation of internal-combustion engines under comparatively high compression on ordinary gasoline without detonation.

INDICATOR DIAGRAMS. The Pressure-Volume-Quantity Indicator-Card, Thomas Midgley, Jr. and Robert Janeway. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 105-110, 6 figs. A solid diagram from which each fuel-mixture particle can be properly exposed for analysis during process of combustion.

MEAN EFFECTIVE PRESSURES. Mean Effective Pressures of Internal-Combustion Engines, Robertson Matthews, Power, vol. 57, no. 11, Mar. 13, 1923, pp. 403-404, 1 fig. Presents chart showing relation of air temperature, air-to-oil ratio, air-suction pressure and m.e.p.

STILL. The Still Engine, An Internal Combustion and Steam Engine Combined (Le moteur Still à combustion interne et à pression de vapeur combinées), Herman Hubert, Revue Universelle des Mines, vol. 16, no. 2, Jan. 15, 1923, pp. 83-292 (discussion) 292-294, 34 figs. partly on supp. plates. Design and construction; application to ship propulsion; results of tests.

TYPES. Internal Combustion Engines. Times Trade and Eng. Supp., vol. 11, no. 237, Jan. 20, 1923, p. 6. Two new types of double-acting engines of Diesel and semi-Diesel class, one produced by North Brit. Diesel Engine Works, and other by Reed Patent Engine Co. Gas engines and producers; stationary oil engines; large Diesel engines.

See also Airplane Engines; Automobile Engines; Diesel Engines; Gas Engines; Oil Engines.

IRON ORE

LOW-GRADE, CANADA. Low Grade Ores of Algoma, J. D. Jones. Eng. Jl. (Eng. Inst. Can.), vol. 6, no. 3, Mar. 1923, pp. 134-137. Their development and use with particular reference to Canada.

IRON AND STEEL

COLD WORKING, EFFECT ON. Effect of Cold Working on Tensile Strength of Iron and Steel and Subsequent Annealing (Kallbearbetnings inverkan pa järns och stals hallfasthetsegenskapef samt dessas beroende av efterföljande lagring och anlöpning), Axel Lundgren. Jernkontorets Annaler, vol. 107, no. 12, 1922, pp. 499-513, 2 figs. Report of tests carried out by government laboratory with wire and rods.

CORROSION. The Corrosion of Iron and Steel, J. S. Fuller. Am. Soc. for Steel Treating, vol. 3, no. 1, Oct. 1922, pp. 94-97. Reviews some theories which have been advanced in efforts to explain corrosion phenomena: action of drop of water upon polished surface of steel to determine corrosion-resisting properties.

PROPERTIES AT LOW TEMPERATURES. On the Changes in Iron and Steel at Temperatures below 280 deg. C., Frank Charles Thompson and Edwin Whitehead. Royal Soc.—Proc., vol. 102, no. A718, Feb. 1, 1923, pp. 587-599, 6 figs. Measuring electric resistivity and thermoelectric power for temperatures from 20 to 280 deg. cent. Reference.

IRON ALLOYS

IRON-ALUMINUM. Iron-Aluminum Alloys (Legierungen des Eisens mit Aluminum), N. Kurnakow, G. Urasow and A. Grigorjew. Zeit. für anorganische u. allgemeine Chemie, vol. 125, nos. 3-4, Dec. 18, 1922, pp. 207-227, 3 figs. Thermal analysis of binary system iron-aluminum, cooling curves; microstructure; electric conductivity and hardness.

PREPARATION AND PROPERTIES. Preparation and Properties of Pure Iron Alloys, W. L. Cheney. U.S. Bur. of Standards, Sci. Papers, vol. 18, no. 463, Dec. 27, 1923, pp. 609-632, 14 figs. Magnetic properties of iron-carbon alloys as affected by heat treatment and carbon content.

IRON CASTINGS

CHILLED. Chilled Castings. Eng. Production, vol. 6, no. 124, Feb. 15, 1923, p. 165. Notes on composition of mixtures and care of molds.

CUPOLA MIXTURES. Modern Methods for Making Cupola Mixtures, H. L. Campbell. Chem. and Met. Eng., vol. 28, no. 11, Mar. 14, 1923, pp. 492-495, 4 figs. Diagrams useful to determine amounts of available pig iron to weigh into mixture in order to secure castings of required composition, silicon and manganese may both be easily predetermined if three piles of pig iron are in yard.

POURING TEMPERATURES. Study Pouring Temperatures, S. J. Felton. Foundry, vol. 51, no. 4, Feb. 15, 1923, pp. 138-140, 4 figs. Outline of heat loss of iron as it flows from cupola to mixing ladle and is transferred to pouring ladles; quick pouring essential for small steel castings.

TUNNEL LININGS. Making Castings for Hudson River Tunnel. Iron Age, vol. 111, no. 10, Mar. 8, 1923, pp. 663-667, 10 figs. Quantity production on interchangeable basis; adaptation of armor-plate planer for milling; simplified foundry operations.

IRON, PIG

COSTS. Foreign and Domestic Pig Iron Cost, Paul M. Tyler. Iron Age, vol. 111, nos. 7, 8 and 9, Feb. 15, 22 and Mar. 1, 1923, pp. 467-470, 533-536 and 605-606, 1 fig. Disadvantageous position of United States in export market; pre-war and present analyses for British, Lorraine and Belgian furnaces. Export trade in light of iron costs; how item of freight rates works to check aggressive drives for world iron and steel business.

SAND-CAST VS. MACHINE-CAST. Comparison of Sand Cast and Machine Cast Pig Iron, S. B. Phelps. Blast Furnace & Steel Plant, vol. 11, no. 3, Mar. 1923, pp. 196-197. Economic effects; melting and spout temperatures; differences in melting conditions.

STEADITE. A Controversial Constituent in Gray Pig Iron (Sopra un costituente di natura controversa esistente nelle ghise grigie), Vincenzo Prever. Ingegneria, vol. 2, no. 1, Jan. 1, 1923, pp. 2-8, 9 figs. Discusses steadite, a binary eutectic of Fe. P and Fe, a constituent very similar to ferrite and cementite; micrographs and analyses of various samples.

SYNTHETIC. Synthetic Pig Iron (Les Fontes Synthétiques), Marcel Didier. Fonderie Moderne, no. 12, Dec. 1922, pp. 339-341. Produced by melting mixture of steel turnings with coal, coal acting as fuel, reduction agent and carburization agent.

J

JIGS

DESIGN. Jigs and Tools, J. Moore, Eng. Production, vol. 6, no. 121, Jan. 25, 1923, pp. 74-79, 16 figs. Considerations in regard to design. Discussion of paper, Eng. Production, vol. 6, no. 122, Feb. 1, 1923, pp. 102-104.

ROTATING INDEXING. Rotating Indexing Jigs Reduce Labor Cost in Engine Manufacture, J. Edward Schipper. Automotive Industries, vol. 48, no. 11, Mar. 15, 1923, pp. 612-615, 12 figs. One man operates 3 to 5 machines in production of General Motors truck engine. Describes method which is said to be particularly effective and economical where production is not always up to capacity.

L

LABOR

LUMBER MANUFACTURING. Wages and Hours of Labor in Lumber Manufacturing—1921. U.S. Bur. Labor Statistics Bul., No. 317, Jan. 1923, 55 pp. Tables giving rates of wages per hour, hours of labor per week, and full time weekly earnings, for both sawmill and logging branches.

LABOR TURNOVER

STUDY OF. Need for Co-operative Research in an Industrial Community, Joseph H. Willits. Engrs. and Eng., vol. 39, no. 12, Dec. 1922, pp. 403-408, 6 figs. Study of turnover of labor; includes charts showing turnover percentage.

LABORATORIES

GENERAL ELECTRIC CO., ENGLAND. Research Laboratories at Wembly. Engineer, vol. 135, no. 3505, Mar. 2, 1923, pp. 228-229, 10 figs. partly on p. 232. Layout and equipment of laboratories of Gen. Elec. Co. which are most elaborate and extensive connected with electrical manufacture in England. See also Engineering, vol. 115, no. 2983, Mar. 2, 1923, pp. 256-258, 13 figs. partly on supp. plates.

CHEMICAL. The Sterling Chemical Laboratory of Yale University. Chem. and Met. Eng., vol. 28, no. 9, Feb. 28, 1923, pp. 387-390, 5 figs. Building erected as memorial to John W. Sterling, planned to meet immediate needs, with flexibility for changing requirements.

LATHES

STANDARDIZATION. Standardizing Threaded Spindle Heads (Die Normung der Spindelkopfe mit Gewinde), G. Schlesinger. Werkstattstechnik, vol. 17, no. 2, Jan. 15, 1923, pp. 33-37, 11 figs. Work of special committee of German Union of Machine Tool Manufacturers to standardize mandrel noses for lathes, thread, pitch, etc.

VERTICAL. The Vertical Lathe (Le tour vertical), André Sthégens. Ouvrier Moderne, vol. 5, no. 11, Feb. 1923, pp. 447-452, 13 figs. Advantages, recent developments, design and operation.

LIGHTING

DAYLIGHT, COST OF. The Cost of Daylight, N. Luckiesh and L. L. Holliday. Illuminating Eng. Soc.—Trans., vol. 18, no. 2, Feb. 1923, pp. 119-134 and (discussion) 134-142. Detailed estimates of initial and annual costs of natural and artificial lighting.

LIGHT DISTRIBUTION. Light Obtained From a Luminous Point or Focus (Sur l'éclairement obtenu au moyen d'un foyer lumineux punctiforme), Emile Pierard. Société Belge des Electriciens—Bul., vol. 37, Jan. 1923, pp. 1-5, 3 figs. Calculation of distribution of light; optimum height of focus; importance of reflectors.

STREET. Street Lighting with Mazda Lamps, R. E. Greiner. Am. City Mag., vol. 28, nos. 1 and 2, Jan. and Feb. 1923, pp. 38-43 and 179, 181, 183 and 187, 13 figs. Illumination of principal business sections, secondary business sections, main thoroughfares residence streets, parks, boulevards, highways, outlying suburban sections, alleys and side streets, including size and spacing of lamps.

LIGNITE

CARBONIZATION. Report of Lignite Carbonizing Experiments Conducted at Grand Forks in 1922. U.S. Bur. of Mines, Reports of Investigations, no. 2441, Feb. 1923, 26 pp., 4 figs. Lignite carbonizer was devised which is simple in construction and operation; may be operated intermittently without serious damage; estimated cost and tentative layout of plant of definite capacity; costs of lignite char and briquets made from lignite and binder of various prices.

DRYING AND BRIQUETTING. Brown Coals and Lignites, William A. Bone. Roy. Soc. Arts—Jl., vol. 71, nos. 3663 and 3664, Feb. 2 and 9, 1923, pp. 189-199 and 208-216, 10 figs. Feb. 2: Drying of brown coals; heat treatment at temperatures below 400 deg. cent. as possible method of enhancing their fuel values; briquetting of brown coals and lignites. Feb. 9: Their thermal decomposition and carbonization at different temperatures.

SASKATCHEWAN, CAN. The Lignites of Saskatchewan, R. J. Lee. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 131, Mar. 1923, pp. 62-74, 7 figs. Coal areas; development; utilization; lignite reserves; nature of lignite.

LOCOMOTIVE BOILERS

TESTS. Locomotive Boilers (Etude expérimentale de la chaudière locomotive), Paul Conte. Revue Générale des Chemins de Fer et des Tramways, vol. 42, nos. 1 and 2, Jan. and Feb. 1923, pp. 43-59 and 125-144, 19 figs. Comparison of results of French laboratory studies and those of Pennsylvania Railroad at Altoona, covering heat balance, combustion, increased grate surface, absorption of heat developed by combustion, superheaters, dampers and drafts.

LOCOMOTIVES

BOOSTERS. New Booster Suspension and Locomotive Trailing Truck. Ry. Rev., vol. 72, no. 5, Feb. 3, 1923, pp. 205-209, 5 figs. Main features of new C-S design are said to be lightness, accessibility and adaptability.

COALING STATIONS. Reinforced Concrete Coaling Plant at Michigan City, Ind. Ry. Rev., vol. 72, no. 5, Feb. 3, 1923, pp. 214-218, 8 figs. Latest-type 500-ton automatic electric station, constructed for Mich. Central R.R.; novel fetaure is curved runway for elevating bucket; sand-drying plant is also included.

DIESEL-ENGINE. Are We Due for a Radical Change in Locomotive Construction? A. F. Stuebling. N.Y. R.R. Club Official Proc., vol. 33, no. 3, Jan. 19, 1923, pp. 6930-6935. Discusses electric and turbine locomotives and application of Diesel engine to locomotive service.

Possibilities of the Diesel Engine, Elmer A. Sperry. New York R.R. Club Official Proc., vol. 33, no. 3, Jan. 19, 1923, pp. 6938-6941 and (discussion) by W. E. Symons) 6942-6945. Problems and advantages.

ELECTRIC. *See Electric Locomotives.*

SETLING SLIDE VALVES. A Method of Setting Locomotive Slide Valves, H. G. Pottle. Roy. Engrs. Jl., vol. 37, no. 1, Mar. 1923, pp. 24-30, 6 figs. Method of setting valves of twin inside-cylindered locomotive, fitted with ordinary "D" slide valves and Stephenson's link motion.

STEAM, ADVANTAGES OF. Reliability and Dependability of Steam, James G. Dudley. New York R.R. Club Official Proc., vol. 33, no. 3, Jan. 19, 1923, pp. 6945-6948 and (discussion) 6948-6952. Writer points out prime essentials in favor of steam as proper locomotive power, namely, absolute reliability and dependability of steam and necessity of heating trains.

TRACTIVE FORCE. Maximum Speed at Which Rated Tractive Force Can be Developed, Edward L. Coster. Ry. Mech. Engr., vol. 97, no. 3, Mar. 1923, pp. 150-151. Examination of article by L. R. Pomeroy entitled Curves of Locomotive Operation, published in Am. Engr., Feb. 1923, based on which recalculation of constants and their extention to include higher degree of superheat has been made.

VARIABLE TRANSMISSIONS. Locomotives With Variable Transmissions (Lokomotive mit veränderlicher Uebersetzung), Wittfeld. Glasers Annalen, vol. 92, no. 1, Jan. 1, 1923, pp. 2-5, 8 figs. Proposes three cylinders in place of four and shows advantages in operation.

LUBRICATING OILS

MINERAL. Mineral Lubricating Oils, Their Production, Composition and Testing (Die Mineralschmieröle, ihre Herstellung, Beschaffenheit und Prüfung), Richard Kissling. Chemiker-Zeitung, vol. 47, nos. 11 and 14, Jan. 25 and Feb. 1, 1923, pp. 77-80 and 100-102. American cylinder oils; Russian bearing oils; from asphaltic petroleum, of residual frictional distillation, and others; testing of samples; etc.

RECOVERY, APPARATUS FOR. Apparatus for Recovery of Lubricating Oil Residues (Einige Apparate zur Wiedergewinnung von Schmieröl-Rückständen). Elektrotechnischer Anzeiger, vol. 40, nos. 11 and 12, Jan. 18 and 20, 1923, pp. 74-76, and 80 and 82, 5 figs. Describes new automatic apparatus for separating water from oil, recovering oil and purifying oil.

RESEARCH. Stability of a Viscous Liquid contained between Two Rotating Cylinders, G. I. Taylor. Royal Soc. Proc., vol. 102, no. A 718, Feb. 1, 1923, pp. 541-542. Abstract giving results of mathematical investigation and numerical verification, of stability for symmetrical disturbances of a viscous fluid in steady motion between concentric rotating cylinders.

LUMBER

HARDWOOD INDUSTRY, WASTE IN. The Needless Hardwood Lumber Waste, Frederick F. Murray. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 95-99, 2 figs. Problem of standardization and waste elimination in hardwood industry from tree through factory, necessity for revised grading specifications.

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MACHINE DESIGN

RESONANCE SYSTEM. Application of the Principle of Resonance to Mechanics (Die Anwendung des Resonanzprinzips auf die Mechanik), Hans Bourquin. Elektrotechnischer Anzeiger, vol. 40, nos. 22 and 23, Feb. 7 and 8, 1923, pp. 165-166 and 171-172. Machine parts moving to and fro are developed as an oscillating system; energy is transmitted to them by elastic couplings.

MACHINE TOOLS

DEVELOPMENT. The Development of Machine Tools, Dexter S. Kimball. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 154 and 168. Outstanding names in machine-tool history.

MACHINE-TOOL INDUSTRY

ECONOMIC FEATURES. Economic Features of the Machine-Tool Industry, Ernest F. Dubrul. Mech. Eng. vol. 45, no. 3, Mar. 1923, pp. 151-153, and 200. Features brought out as result of analyzing statistics of 1919 census of manufacturers; problems of management; trade evils and their remedies.

MACHINERY

FOUNDATION VIBRATIONS. Experimental Investigation of Vibration-Damping Foundations for Machinery (Experimentelle-Untersuchung von schwingungsdämpfenden Unterlagen für Maschinen), Ernst Schmidt. Gesundheits-Ingenieur, vol. 46, no. 6, Feb. 10, 1923, pp. 61-71, 29 figs. Investigation of behavior of elastic machine foundations of cork, rubber, etc.; experimental results. Address before Tech. Acad. of Munich.

MAGNESIUM ALLOYS

ELECTRON METAL. Progress and Prospects in the Use of Light Metals (Fortschritte und Aussichten in der Verwendung der Leichtmetalle), Felix Thomas. Maschinenbau, vol. 2, no. 8, Jan. 26, 1923, pp. G85-G87. Magnesium and its alloys; electron metal, most important magnesium alloy and its use in automobile, aircraft, machine and electrical industry, as substitute for horn, galalith, bone, celluloid, etc., for production of useful and luxury products, toys, etc.

MALLEABLE CASTINGS

HANDLING IN PROCESS. Handling Malleable Castings in Process, F. L. Prentiss. Iron Age, vol. 111, no. 9, Mar. 1, 1923, pp. 591-594, 5 figs. Plant designed for saving labor in operation uses standardized 3-wheel trucks; pulverized fuel gives further economies in production cost. Practice of Maumee Malleable Castings Co., Toledo, Ohio.

MALLEABLE IRON

DETERIORATION THROUGH GALVANIZING. Deterioration of Malleable in the Hot-dip Galvanizing Process, W. R. Bean. Am. Inst. Min. and Met. Engrs.—Trans., no. 1214-S, Feb. 1923, 28 pp., 20 figs.; and (abstract) in Min. and Metallurgy, vol. 4, no. 194, Feb., pp. 86-87, 1 fig. Deterioration is found to be intimately connected with phosphorus and silicon contents of iron; in general, low-phosphorus (under 0.15 per cent) low-silicon (under 0.80 per cent) irons will withstand process best and show practically to deterioration.

MANUFACTURE DIRECT FROM ORE. The Old Swedish Osmond Process (Den gamla svenska osmundtillverkningen), Alf Grabe. Jenkontorets Annaler, vol. 107, Special No., May 31, 1922, pp. 5-61, 16 figs. Process for direct conversion of ore into malleable; ore deposits, roasting, furnace construction, smelting, etc.

MANUFACTURING

CHANGING DESIGN. Changing the Design on Short Notice, E. E. Cook. Indus. Management (N.Y.), vol. 65, no. 3, Mar. 1923, pp. 178-181, 5 figs. System which permits radical changes without disrupting production.

MATERIALS

FRACTURES. The Origin of Permanent Fractures (Ueber die Entstehung von Dauerbrüchen), R. Taubert Maschinenbau, vol. 2, no. 8, Jan. 26, 1923, pp. G89-G92, 8 figs. Discusses various causes and describes simple testing method, known as triple-ball pressure test.

METALS

BEHAVIOR UNDER STRESS. The Behavior of Metals under Repeated Stress (Das Verhalten der Metalle bei wiederholter Beanspruchung), P. Ludwik and R. Scheu. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 6, Feb. 10, 1923, pp. 122-126, 16 figs. Torsion, bending and impact duration tests with aluminum, copper and low-carbon steel, influence of hardness, and mechanical and thermal treatment on durability; deformation diagrams of fatigued metals; structural changes.

COMPRESSIBILITY. The Compressibility of Thirty Metals as a Function of Pressure and Temperature, P. W. Bridgman. Am. Acad. Arts and Sci.—Proc., vol. 58, no. 5, Jan. 1923, pp. 165-242, 3 figs. Absolute compressibility of iron, compressibility of metals other than iron, results and theoretical considerations.

FATIGUE. Fatigue of Metals, C. E. Stromeyer. S. Wales Inst. Engrs., except from Proc., vol. 38, no. 3, read before meeting May 25, 1922, pp. 285-308 and (discussion) 308-331, 2 figs. Results of tests on mild steel, only ones ever made for determination of fatigue limits of permanently stressed samples.

RESEARCH. Scientific Bases for Research in Pure Metals (Die wissenschaftlichen Grundlagen der Edelmetallforschung), R. Vogel. Zeit. fur angewandte Chemie, vol. 35, no. 101, Dec. 19, 1922, pp. 705-708, 13 figs. Microscopic structure of metals, physico-chemical relations of metals on alloying, equilibrium, solidification and cooling curves.

STRUCTURE. The Structure and Related Properties of Metals, Henry S. Rawdon. Am. Soc. for Steel Treating—Trans., vol. 3, no. 6, Mar. 1923, pp. 649-679, 33 figs. Discusses ferrous and non-ferrous alloys. Structure of metals macrostructure, conditions affecting structure, chemical composition, temperature, grain growth, etc. Effects of structure of alloys upon their properties. Applications of microscopy of metals, relations of microscopy to heat treatment, examples of deterioration of metals and alloys in service. Photomicrographs.

TEMPERATURES, PHYSICAL CHANGE. Temperatures at Which Physical Changes Occur. Iron Age, vol. 110, no. 23, Dec. 7, 1922, pp. 1492-1493. Fusion, melting and vaporization of metals and other substances. Table of temperatures for producers and users of iron and steel.

MILLING CUTTERS

DESIGN. Effect of Variations in Design of Milling Cutters On Power Requirements and Capacity, Benjamin P. Graves and James A. Hall. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 155-158 and 205, 10 figs. Study of effect of changes in number of teeth, spiral angle, rake angle, and cutting speed of cutter on power consumption, tendency to chatter, and stresses set up in machine.

MILLING MACHINES

AUTOMATIC. New Automatic Manufacturing Type Milling Machine. Machy, (N.Y.), vol. 29, no. 7, Mar. 1923, pp. 519-522, 8 figs. Machine brought out by Brown & Sharpe Mfg. Co. for automatic milling of duplicate parts in large quantities, unique feature of which is automatic control of spindle and table by means of dogs located at rear and front of table.

ELECTRIC DRIVE. Individual Drive of Milling machines (Einzelantriebe von Fräsmaschinen), Karl Meller. Siemens-Zeit., vol. 2, no. 12, Dec. 1922, pp. 659-665, 8 figs. Examples are given showing advance in design of such drives in last 25 years; for large milling machines, multimotor drive is advocated, so that cutter is driven by main motor and feeding device by second smaller motor.

MINE-RESCUE APPARATUS

LIQUID AIR. Liquid Air Rescue Apparatus, Frederick P. Mills. Colliery Guardian, vol. 125, no. 3240, Feb. 12, 1923, p. 270, 2 figs. History of evolution; details of purifier and pack. Abstract of lecture before Past and Present Mining Students' Assn.

OXYGEN. The Value of Oxygen Breathing Apparatus to the Mining Industry, E. H. Denny and M. W. von Bernewitz. U.S. Bur. of Mines. Reports of Investigations, no. 2445, Feb. 1923, 6 pp. Data on investigation work during past 15 years by U.S. Geol. Survey (up to 1910) and U.S. Bur. of Mines (to end of 1922).

MINERALS

INDUSTRIAL READJUSTMENTS. Industrial Readjustments of Certain Mineral Industries Affected by the War. U.S. Tariff Commission, Tariff information Series no. 21, 1920, 320 pp., 10 figs. War disturbances in mineral industries; general features of situation. Deals with antimony, chronite, graphite, magnesite, manganese, potash, pyrites, sulphur, quicksilver and tungsten.

ONTARIO. Mineral Resources of Northern Ontario, A. A. Cole. Can. Min. Jl., vol. 44, no. 10, Mar. 9, 1923, pp. 181-183. Notes on cobalt silver district; gold area; clay belt; water powers; cost of exploration; use of flying boats for exploration.

MINES

FIRE FIGHTING. Discussion of Measures for Preventing and Fighting Fires in Metal Mine Workings, Charles A. Mitke. Eng. and Min. Jl.—Press, vol. 115, no. 7, Feb. 17, 1923, pp. 309-313. Protection for mine shafts rescue of men; selection of fan; reversal of air currents.

MOLDING METHODS

EUROPEAN VS. AMERICAN. Compares Molding Practices, E. Ronceray. Foundry, vol. 51, no. 4, Feb. 15, 1923, pp. 131-135, 7 figs. European vs. American molding machines; points of differences; hydraulic equipment is shown to have advantages and disadvantages over compressed-air operation. Paper read before Am. Foundrymen's Assn.

MACHINE MOLDING. Machine Moulding Methods, T. F. Hardyman. Eng. Production, vol. 6, no. 126, Mar. 1923, pp. 194-198, 20 figs. Describes method of molding by different machines; recommends hydraulic machines for intensive production, and jarring machine in foundry where machine molding is done spasmodically on small batches of castings.

STONEY PROCESS. Intensive Production by the Stoney Process. Can. Foundryman, vol. 14, no. 1, Jan. 1923, pp. 18-19, 3 figs. Describes layout for production of Chevrolet cylinders at plant of Ferro Machine and Foundry Co., Cleveland, Ohio; 500 cylinders made per day with only 28 flasks and one pair of machines; steel flasks used.

MOTOR TRUCKS

ELECTRIC. American Electric Truck Specifications. Automotive Industries, vol. 48, no. 8, Feb. 22, 1923, pp. 434-435.

ELECTRIC VS. GASOLINE. Electric Trucks, their Technical and Economic Efficiency (Ueber die betriebstechnische und wirtschaftliche Eignung der Elektrolastwagen), Schneider. Motor u. Auro, vol. 20, no. 3, Feb. 10, 1923, pp. 11-16, 3 figs. Advantages and drawbacks; competition between electric and gasoline trucks, their proper sphere of action; comparative cost data.

EUROPEAN SPECIFICATIONS. British and Continental Truck Design. Automotive Industries, vol. 48, no. 8, Feb. 22, 1923, pp. 420-427. European gasoline truck chassis specifications.

OVERLOADING. Over-Loading of Motor Trucks, David C. Fenner. Soc. Automotive Engrs.—Jl., vol. 12, no. 2, Feb. 1923, p. 210. Presented at joint session of Nat. Highway Traffic Assn. and Mich State Good Roads Assn.

Causes and Prevention of Overloads, David C. Fenner. Power Wagon, vol. 30, no. 218, Jan. 1923, pp. 27-28.

MUNICIPAL ENGINEERING

ENGLAND, PROGRESS IN 1922. Municipal Engineering in 1922. Surveyor, vol. 63, no. 1619, Jan. 26, 1923, pp. 61-84. Review of municipal engineering work and progress in England, including highways, sewerage and sewage disposal, electricity supply, water supply, housing, town planning, electric traction bridges, refuse disposal and public lighting.

N

NATURAL GAS

CENTRAL-STATION FUEL. Natural Gas as a Fuel for Central Stations, E. A. Quinn, Elec. World, vol. 81, no. 10, Mar. 10, 1923, pp. 575-577, 6 figs. Unusually high efficiency in burning natural gas said to have been developed with new type of burner; long life of burner and boiler settings are assured with this equipment.

NITROGEN

FIXATION BY ACTIVATED SLUDGE. Fixation of Atmospheric Nitrogen by Activated Sludge, C. Lee Peck. Eng. News-Rec., vol. 90, no. 11, Mar. 15, 1923, pp. 487-489. Notes based on data obtained by writer from plants operated and experiments conducted under his observation. Nitrogen in sewage increased by 65 per cent; conditions favourable to B. crenothrix with upwards of 2 p.m.m. of ferric oxide seem necessary.

O

OIL ENGINES

CENTRAL-STATION. Oil Engines for Central Stations, M. S. Mason. Elec. Rev., vol. 92, no. 2360, Feb. 16, 1923, pp. 244-245. Suggestions for operation.

FAIRBANKS-MORSE "Y". Oil Engines for Mines. Can. Min. Jl., vol. 44, no. 6, Feb. 9, 1923, pp. 113-115, 4 figs. Describes Fairbanks-Morse "Y" type, made in sizes 10 to 25 hp. in horizontal type and 37½ to 300 hp. in vertical type; principle of operation; tests and guarantees.

RIPERT. Ripert Motor with Steam Chamber in Head, M. Grison Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 186-187, 1 fig. Summary of conditions which, if satisfied, it is claimed, would improve Diesel engine when operating on heavy oils and, in particular, would make it more flexible. Ripert oil engine is designed to meet these requirements. Translated from Bul. Technique du Bur. Veritas, vol. 4, no. 10, Oct. 1922, p. 245.

OIL FUEL

PRODUCTION. Liquid Fuel Congress (Le Congrès des Combustibles liquides), P. Mallet. Journal des Usines à Gaz, vol. 46, nos. 22 and 23, Nov. 20 and Dec. 5, 1922, pp. 337-339 and 353-360. Transformation of heavy into light hydrocarbons; shales and lignites; low-temperature distillation.

OPEN-HEARTH FURNACES

BASIC. Efficiency of the Basic Open-Hearth Process, J. T. Wright. Iron and Coal Trades Rev., vol. 106, no. 2867, Feb. 9, 1923, pp. 183-184. Notes on manufacture of producer gas; use of waste gases from blast-furnace gas-fired boilers, etc.; comparison of steam-air producer gas and waste gas-air gas; various types of gases used in open hearth; effect of excess air upon flame temperature; conservation of heat in regenerators; slag (Abstract.) Paper read before Cleveland Instn. Engrs.

COKE-OVEN-GAS-BURNING. Using Coke-Oven Gas in Martin Furnaces (Sur l'utilisation du gaz de fours à coke dans les fours Martin), Jean Dupuis. Revue Universelle des Mines, vol. 16, no. 3, Feb. 1, 1923, pp. 201-216. Laboratory tests made, including heat balance.

MATERIALS FOR. Materials Used in the Construction of Martin Furnaces (Les matériaux employés dans la construction des Fours Martin). Métallurgie, vol. 54, no. 6, Feb. 8, 1923, pp. 207-209. Acid and basic linings; furnace beds; properties of silica, magnesia and cromite bricks.

ORE DEPOSITS

SILVER-LEAD-ZINC. Some Mines Of the Slocan, (British Columbia) Robert Dunn. Can. Min. Jl., vol. 44, no. 6, Feb. 9, 1923, pp. 124-126, 3 figs. Geology and ores; descriptive of silver-lead-zinc properties.

GRINDING. Intermediate and Find Grinding, Henry Hanson. Min. and Metallurgy vol. 4, no. 194, Feb. 1923, pp. 77-80. Indication of how data available may be classified; factors that influence capacity of cylindrical mills.

ORE MILLING

SIZING TEST. A Standard Sizing Test, Ernest A. Hersam. Am. Inst. Min. and Met. Engrs., 1923, 33 pp. Outline prepared for consideration of Committee on Milling Methods of Am. Inst. Min. and Met. Engrs., looking to standardization of size testing.

OSCILLATIONS

MECHANICAL. Mechanical and Electromechanical Oscillations (Ueber mechanische und elektro-mechanische Schwingungen), Heinrich Schieferstein. Zeit. für technische Physik, vol. 3, no. 12, 1922, pp. 377-380, 11 figs. Means and ways of improving useful effect of reciprocating mechanisms in order to render them at least as effective as rotating mechanisms.

OXY-ACETYLENE CUTTING

CUTTING MACHINES. Cutting Plates With Blow Pipes (Le découpage de la tôle par le chalumeau), E. Weiss. Nature, no. 2547, Jan. 27, 1923, pp. 60-62, 5 figs. Describes radiograph and camograph, apparatus for oxy-acetylene cutting of plates along definite line or curve.

FORGED STEEL. Investigation of the Effect of Torch Cutting Forged Steel, J. R. Dawson. Acetylene Jl., vol. 24, no. 8, Feb. 1923, pp. 375-379, 16 figs. Results of investigation, dealing with methods for torch cutting of forgings, structural changes resulting from cutting, torch cutting red-hot steel; economics obtained by oxy-acetylene cutting.

MANGANESE STEEL. Cutting Manganese Steel, Z. T. Davis. Am. Welding Soc.—Jl., vol. 1, no. 10, Oct. 1922, pp. 34-37, 6 figs. Discusses oxy-acetylene cutting in connection with production of manganese steel-castings.

OXY-ACETYLENE WELDING

CAST IRON, BIBLIOGRAPHY. Oxy-Acetylene Welding of Cast Iron—Bibliography. Am. Welding Soc.—Jl., vol. 1, no. 10, Oct. 1922, p. 46. Books.

PRESSURE VESSELS. Unfired Pressure Vessels, S. W. Miller. Am. Welding Soc.—Jl., vol. 1, no. 10, Oct. 1922, pp. 47-53. Welding of tanks; facts regarding proposed A.S.M.E. code, and provisions of this code as they relate to welding; necessity of a code and for only one code.

P

PAINTS

CONSISTENCY. Factors Governing Paint Consistency, Henry Green. Indus. and Eng. Chem., vol. 15, no. 2, Feb. 1923, pp. 122-1261, 13 figs. Describes four factors on which consistency depends, with special reference to flocculation in pigment-vehicle system.

PAPER MANUFACTURE

LIGNO-CELLULOSE BLEACHING. The Bleaching of Ligno-Cellulose, C. G. Schwalbe and H. Wenzyl. Paper, vol. 31, no. 17, Feb. 14, 1923, pp. 9-13 and 19. Exhaustive analysis of effects of temperature, time and air on bleaching process; advantages of centrifugal washing; proof that chlorate chlorine has bleaching properties. From Papierfabrikant, 1922.

MICROSCOPE IN. Uses of the Microscope in Paper Mills, James Strachan. Paper, vol. 31, no. 13, Jan. 17, 1923, pp. 7-10. Equipment of laboratory worker for microscropical examination of samples; Origin of fiber microscopy; physico-chemical problems in papermaking; investigation of spherical objects. Paper before Roy. Microscopical Soc., reprinted from Pulp and Paper Mag. of Canada.

STUFF PUMPS. Comparative Tests of Rotating Stuff Pumps, M. Scherrer. Paper, vol. 31, no. 14, Jan. 24, 1923, pp. 7-10. Results show importance of structure of pump, condition of pulp and materials from which it is made, in determining efficiency of operation. From Wochenblatt fuer Papierfabrikation, 1922.

WOOD, PROPERTIES OF. Properties of Wood in Paper Making, Bjarne Johnsen and H. N. Lee. Paper, vol. 31, no. 15, Jan. 31, 1923, pp. 11-14. Effect of physical and chemical properties of wood on economy and quality, particularly in sulphite process. Paper read before Can. P. and P. Assn.

PAPER MILLS

ELECTRIC DRIVE. A New All-Electric Paper Mill, A. H. White and R. H. Rogers. Elec. World, vol. 81, no. 9, Mar. 3, 1923, pp. 494-510, 48 figs. Progress requirements governing selection of motor, control and electrical equipment for electrification of paper mills; installation details for 65,000 motor drives of St. Maurice Lumber Co. paper mill, Three Rivers, Can.; electrical material-handling equipment required in production of paper.

NEWSPRINT. Pitch Troubles in Newsprint Paper Mills, Frederick Barnes. Chem. and Met. Eng., vol. 28, no. 11, Mar. 14, 1923, pp. 503-506. Experiments carried out by writer show that if pitchy pulp be raised to temperatures above 150 deg. cent. in digester, pitch troubles on machines are almost eliminated.

PAVEMENTS

RESURFACING WITH ASPHALT. Salvaging Old Pavements by Resurfacing With Asphalt. Highway Engr. and Contractor, vol. 8, no. 1, Jan. 1923, pp. 51-56, 1 fig. Salvage value of old pavements; general considerations governing utilization of old pavements for foundations; practical experience in and method of resurfacing old macadam, resurfacing gravel roads, old brick, block, and portland cement concrete pavements.

RUBBER PAVING BLOCKS. Rubber on Road Surfaces. Rubber Age, vol. 3, no. 12, Feb. 1923, pp. 608-610, 2 figs. Advantages gained by use of rubber paving blocks.

PEAT

CANADIAN RESOURCES. Peat Resources of the Central Provinces and Their Utilization for Fuel Purposes, B. F. Haanel. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 131, Mar. 1923, pp. 83-111, 4 figs. Detailed examination of peat bogs; physical and chemical properties; processes for converting content of peat bogs into marketable fuel; briquetted carbonized peat, peat coke and charcoal; carbonization of air-dried-machine peat; briquetting peat without carbonizing; investigation conducted by peat committee; fuel value of peat.

PETROLEUM

SPECIFICATIONS OF PRODUCTS. Specifications for Petroleum Products and Methods for Testing. U.S. Bur. of Mines, Tech. Paper, no. 323, 1923, 88 pp., 21 figs. Specifications officially adopted by Fed. Specifications Board on Feb. 3, 1922, for use of departments and independent establishments of Government in purchase of materials covered by them.

PILES, CONCRETE

DAMAGE FROM BORERS. Rock Boring Mollusks Attack Concrete Pile Jackets, C. A. Kofold and Robert C. Miller. Eng. News-Rec., vol. 90, no. 11, Mar. 15, 1923, pp. 499-500, 1 fig. Unusual occurrence of these clams in Los Angeles and San Diego harbors augments marine piling protection fight. Preliminary report to Am. Wood Preservers Assn.

PIPE BENDS

ELASTICITY. The Elasticity of Pipe Bends, Sabin Crocker and S. S. Sanford. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 159-161, 9 figs. Mathematical formulas are developed connecting deflection of different types of pipe bends with force producing deflection, and also expressing stress set up as function of observed deflection and constants of bend. Experiments made to check force vs. displacement; charts for use in selecting proper size and shape of bends to take care of given expansion; and to determine force exerted by bend when in given state of deflection.

PISTON RINGS

DRIVES. Planer Drives, Albert Clegg. Machy. (Lond.), vol. 21, no. 541, Feb. 8, 1923, pp. 588-591, 6 figs. Characteristics of various types. Buckton spiral-geared planers.

PLANERS

ATTACHMENTS. Planer and Shaper Attachments, Edward K. Hammond. Machy. (N.Y.), vol. 29, no. 7, Mar. 1923, pp. 531-535, 13 figs. Special equipments that adapt planers and shaper for performing unusual operations.

PNEUMATIC TOOLS

POWER HAMMERS. Single-Blow Pneumatic Power Hammers. Ry. Gaz., vol. 38, no. 5, Feb. 2, 1923, p. 155, 2 figs. Describes new design introduced by B. &. S. Massey, Ltd., Manchester.

POLES, WOODEN

DESIGN AND MAINTENANCE. Pole Lines. Am. Ry. Assn., Signal Section, for meeting Mar. 13-15, 1923, pp. 293-311, 1 fig. Basic rules and pole tables for construction and maintenance of wooden pole lines along railroads for telegraphy, telephone and (signal) service; method of calculating class and number of wood poles required for railroad telegraph and telephone pole lines; tables giving strength of various sizes and classes of poles; ice and wind data; etc. Report of Committee XVII.

FOUNDATIONS. Wooden Poles for Electric Power Transmission Lines (L'emploi des poteaux en bois pour l'établissement des lignes de transmission d'énergie électrique), T. Pausert. Revue générale de l'Electricité, vol. 13, no. 3, Jan. 20, 1923, pp. 103-108, 7 figs. Process of impregnating wood; types of reinforce-concrete foundations for wooden poles.

POWER FACTOR

IMPROVEMENT. The Improvement of Power Factor, Gisbert Kapp. Instn. Elec. Engrs.—Jl., vol. 61, no. 314, Jan. 1923, pp. 89-108 and (discussion) 109-135, 29 figs. Economical limit of power-factor improvement in relation to capital outlay. Methods of starting synchronous induction motor; phase advancers of rotating type connected to slip-rings of induction motors, and effect of such advancers upon performance of induction motor. Author gives expression for apparent capacity of his vibrator in terms of constants of machine, and shows how to arrive at size of vibrator required to suit any given conditions. Notes on meters and tariffs.

PRODUCER GAS

PRODUCTION AND USE. The Production and Use of Producer Gas (Streifzüge durch das Gebiet der Erzeugung und Verwendung von Generatorgas), Hubert Hermanns. Wärme, vol. 45, nos. 32, 34, 36, 37 and 39, Aug. 18, Sept. 1, 15, 22 and Oct. 6, 1922, pp. 389-292, 413-416, 439-442, 454-457 and 477-479, 56 figs. Discusses new types of grateless producers, stationary- and travelling-grate producers, charging arrangements, gas-purification plants, low-temperature-tar recovery plants, gas burners, gas-heated metallurgical and foundry furnaces, lime kilns, etc.

PULLEYS

BELT. Belt Pulley Models (Herstellung von Riemenscheibenmodellen), Richard Löwer. Werkstattstechnik, vol. 17, no. 2, Jan. 15, 1923, pp. 39-41, 14 figs. Discusses designs to economize metal in casting.

PULVERIZED COAL

CENTRAL STATIONS. Pulverized-Coal-Burning Central Station, Bruay Mines, France, Jacques Boyer. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 183-184, 3 figs. Installation said to be one of largest pulverized-coal-burning plants in Europe, embodying several improvements as compared with general European practice. Translated from Nature, no. 2543, Dec. 30, 1922, p. 422.

COMBUSTION. Combustion of Powdered Coal, Henry Kreisinger and John Blizard. Jl. Indus. and Eng. Chem., vol. 15, no. 3, Mar. 1923, pp. 249-251, 2 figs. Review of tests conducted by Bur. of Mines and Combustion Eng. Corp. on boilers fired with pulverized coal, showing that when pulverized may be burned with greater thermal efficiency for steam raising than when burned by any other methods.

PULVERIZERS AND DRIERS. Pulverized Coal—Its Utilization in the Industries, Cecil F. Herington. Combustion, vol. 7, no. 6, Dec. 1922 and vol. 8, no. 1, Jan. 1923, pp. 345-350 and 362 and 42-48, 16 figs. History of pulverized coal; describes various types of driers and pulverizers.

Powdered Coal for Reverberatory Furnaces, J. B. Johnson. Combustion, vol. 8, no. 2, Feb. 1923, pp. 90-93, 6 figs. Describes powdered-coal plant of United Verde Copper Co., Clarkdale, Ariz., built for maxiumm capacity of 700 tons per 24-hr. day, designed to provide powdered coal fuel for six open-hearth reverberatory furnaces, including storage plant, conveyor system, dryers, etc.

PUMPING STATIONS

DIESEL. Diesel Pumping Plant Shows Low Operating Cost, Arthur J. Hall. Power Plant Eng., vol. 27, no. 5, Mar. 1923, pp. 274-276, 3 figs. Cost of pumping with Diesel engines is lower than with motor drive in Appleton (Wis.) municipal plant.

UNDERGROUND. Pumping Station 360 Ft. Underground. Power, vol. 57, no. 13, Feb. 13, 1923, pp. 253-255, 4 figs. Supplanting air-lift system comprising ten deep wells with underground pumping station equipped with two 3500-gal-per-min., two-stage centrifugal pumps driven by slip-ring induction motors equipped with liquid control.

PUMPS

ACCUMULATOR, MOTOR-DRIVEN. Motor Driven Accumulator Pumps, J. R. Penman. Assn. Iron and Steel Elec. Engrs., vol. 5, no. 2, Feb. 1923, pp. 44-[illegible]. Account of author's experience.

ROTARY. The Kitson-Utley Rotary Pumps. Engineering, vol. 115, no. 2983, Mar. 2, 1923, pp. 279-280, 8 figs. Essential feature of pump is that interior of drum forming blade chamber is so shaped that ends of blade are [illegible] in contact with wall in any position so that no spring control [illegible] are required.

SCREW VISCOSITY. Screw Viscosity Pumps. Engineering, vol. 114, no. [illegible], Nov. 17, 1922, pp. 606-607, 2 figs. [illegible] theory of viscosity pump for [illegible] high hydraulic pressures.

TYPE. Hydraulic Pumps (Les Pompes Hydrauliques). [illegible], vol. [illegible], no. 1, Jan. 1923, pp. [illegible]. [illegible] of articles by different authors [illegible] centrifugal, piston, rotary, [illegible] pumps. [illegible]

PUMPS, CENTRIFUGAL

CHARACTERISTICS. Chief Characteristics of Centrifugal Pumps, Robert W. Angus. Can. Engr., vol. 44, no. 7, Feb. 13, 1923, pp. 225-227, 5 figs. High speed and compactness important factors in operation; double-suction pumps give higher efficiencies; advantage of low-suction lift; effect of changing impeller or guide ring.

HOT-WATER HEATING. The Use of Centrifugal Pumps in Heating Installations, A. H. Barker. Domestic Eng. (British), vol. 43, nos. 1 and 2, Jan. and Feb. 1923, pp. 12-17 and 29-33, 10 figs. Considerations of flow of water through pipes of heating installations; power necessary to supply circulating head for installations; describes centrifugal pump, how it works, factors bearing on its efficiency, and meaning of different kinds of efficiency in connection with a centrifugal pump.

SEWAGE-DISPOSAL. Pumps for Sewage Disposal Work, R. M. Jones. Can. Engr., vol. 44, no. 7, Feb. 13, 1923, p. 230, 2 figs. Factors to be considered in design; accessibility and freedom from clogging important features; details of typical installations.

TESTING MOTOR-DRIVEN. The Testing of Motor-driven Centrifugal Pumps, G. A. Wedgewood. Beama, vol. 12, no. 58, Feb. 1923, pp. 87-92, 3 figs. Describes how graphical method may be applied to complete test.

THEORY. The Theory of Centrifugal Pumps (Zur Theori der Zentrifugalpumpen), W. van der Smissen. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 1, Jan. 6, 1923, pp. 13-15, 8 figs. Points out discrepancies of theoretical calculation and cause thereof; derivation of correct equations; verification of Hagens' experimental results.

R

RADIOTELEGRAPHY

AERIALS. The Problem of Effective Heights of Aerials, P. P. Eckersley. Elecn., vol. 90, no. 2334, Feb. 9, 1923, pp. 134-135. Difficulties of determination; Pession's method; two-aerial method; transmission over perfectly conducting plane; Sommerfeld's theoretical treatment; effective height defined.

AIRCRAFT WIRELESS EQUIPMENT. The Wireless Equipment of Aircraft. Engineer, vol. 135, no. 3504, Feb. 23, 1923, pp. 192-196, 17 figs. Details of Croydon wireless aerodrome station, consisting of two stations, one for direction finding and other for radiotelephonic communication with aircraft; Marconi aircraft wireless set for use on airplanes for telephonic and telegraphic transmission.

DIRECTION FINDING. The Effect of Local Conditions on Radio Direction-Finding Installations, R. L. Smith-Rose and R. H. Barfield. Instn. Elec. Engrs.—Jl., vol. 61, no. 314, Jan. 1923, pp. 179-191 and (discussion) 191-196, 6 figs. Experiments carried out during year by Sub-Committee of Radio Research Board on wireless direction finding. Summary of work of previous investigators. Experiments which provide quantitative data regarding effect of metal work, coils, aerial overhead wires and tress on direction-finding set in their vicinity; figures showing extent of errors produced by mountains and buildings.

RADIOTELEPHONY

TRANSATLANTIC. Transatlantic Radio Telephony. Elecn., vol. 90, no. 2331, Jan. 19, 1923, pp. 58-59, 2 figs. Record of successful experiments with series of radiotelephone conversations carried on between New York and London; technical factors in problem.

RAILWAY CONSTRUCTION

SETTING SLOPE STAKES. A Simplified Method of Setting Slope Stakes, Arthur L. Higgins. Ry. Engr., vol. 44, no. 517, Feb. 1923, pp. 74-75, 5 figs. Describes simple artifice that greatly facilitates otherwise tedious operation of staking out points where side slopes of railway cuttings and embankments will meet existing surface of ground.

RAILWAY ELECTRIFICATION

ADVANTAGES. Railway Electrification, Vincent Raven. Ry. Gaz., vol. 38, no. 5, Feb. 2, 1923, pp. 159-161. Advantages which may result from substitution of electric for steam locomotive operation. (Abstract.)

ECONOMICS OF. Progress Report of the Special Committee on Electrification of Steam Railways. Am. Soc. Civ. Engrs.—Proc., vol. 59, no. 3, Mar. 1923, Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 488-490. Study of subject from viewpoint of economies of problem.

RAILWAY MAINTENANCE

MECHANICAL EQUIPMENT FOR. Mechanical Equipment Saves Men and Money, G. L. Moore. Ry. Age, vol. 74, no. 10, Mar. 10, 1923, pp. 559-563, 5 figs. Methods of operation adopted on Lehigh Valley during last 14 years which have reduced maintenance costs by substituting machinery for labor.

RAILWAY MANAGEMENT

REGULATION. Railroad Regulation, Harley W. Brundige. Jl. Pac. Ry. Club—Proc., vol. 6, no. 10, Jan. 1923, pp. 7-9, 11, 13, 15, 17, 19, 21, and 23. History of regulation, its development, how it has functioned in California, and problems encountered.

RAILWAY MOTOR CARS

DIESEL-ELECTRIC. Operating Local Railways by Means of Railway Motor Cars (L'exploitation des chemins de fer d'intérêt local par automotrices à moteurs à explosion), Pierre Jacquinot. Génie Civil, vol. 82, no. 4, Jan. 27, 1923, pp. 73-79, 16 figs. Design, construction and operation of Renault, Crochat and Berliet types, driven by explosion engines.

GASOLINE. A French Petrol Rail Car. Engineer, vol. 135, no. 3498, Jan. 12, 1923, pp. 47-48, 4 figs. Details of 62-72-hp. rail car constructed by Schneider & Cie., Creusot; trial and working results.

GASOLINE-ELECTRIC. Gasoline-Electric Railway Motor Cars (Note sur l'automotrice pétroléo-électrique du tramway départemental de Pithiviers à Toury), M. Watier. Annales des Ponts et Chaussées, vol. 2, no. 5, Sept.-Oct. 1922, pp. 160-174, 8 figs. Application of Crochat system, consisting of 4-cycle Aster explosion engine, a generating dynamo of 1000 to 1800 r.p.m., and electric motor, to Pithiviers-Toury line, France; for local traffic. Rolling stock; comparison with steam operation.

RAILWAY OPERATION

ELECTRICAL PROBLEMS. Report of Committee XVIII on Electricity. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 254, Feb. 1923, pp. 579-603. Deals with water power, electrolysis, co-operation with Bur. of Standards, wire-crossing specifications; standardization of adhesive and rubber tapes, standardization of insulators, knife and snap switches; protection of oil sidings from damage due to stray currents; railway specifications for electric light, power supply and trolley lines.

TRAIN CONTROL. Automatic Train Control. Ry. Signal Engr., vol. 16, no. 3, Mar. 1923. Contains following articles: G. R. S. Automatic Train Control, pp. 113-116, 9 figs.; The Simmen System of Speed Control and Train Dispatching, pp. 117-118, 2 figs.; The Miller Automatic Train Control, pp. 118-119, 4 figs.; The Indiana Equipment Corporation System of Train Control, pp. 120-122, 4 figs.; Shadle Automatic Train Signal-Stop, pp. 122-124, 2 figs.; The Schweyer Induction Train Control, pp. 124-125, 2 figs.; The Richards Train Control System, pp. 126-130, 4 figs.

RAILWAY REPAIR SHOPS

BOILER SHOPS. Equipment for Locomotive Boiler Repair Shops. Boiler Maker, vol. 23, no. 2, Feb. 1923, pp. 31-35, 10 figs. Arrangement types and capacities of machines for use in carrying out major boiler work; factors entering shop design.

METHODS AND MACHINERY. Repair Work in a Georgia Railroad Shop, S. Ashton Hand. Am. Mach. vol. 58, no. 11, Mar. 15, 1923, pp. 403-406, 14 figs. Methods and equipment of Central of Georgia Ry. shops, Macon.

RAILWAY SIGNALLING

AUTOMATIC BLOCK. Alternating Current Automatic Block Signalling. Am. Ry. Assn., Signal Section, for meeting Mar. 13-15, 1923, pp. 162-181, 6 figs. A.C. track-circuit characteristics; instructions for adjustment, care and operation. Report of Committee VIII.

RAILWAY TIES

REINFORCED-CONCRETE. Reinforced-Concrete Railway Ties (Eisenbahnschwellen aus Eisenbeton), W. Petry. Bauingenieur, vol. 4, no. 1, Jan. 15, 1923, pp. 9-13, 4 figs. Results of experiments in Germany with reinforced ties in various beddings, also asbestos ties made of mixture of cement and asbestos.

RAILWAY TRACK

COMMITTEE REPORT. Report of Committee V on Track. Am. Ry. Eng. Assn.—Bul. vol. 24, no. 253, Jan. 1923, pp. 451-502, 11 figs. partly on supp. plates. Typical plans for double-slip switches, crossings, frogs, etc.; specifications for performing maintenance work and laying new track; plans for switch stands, targets and switch locks; tests of tie plates subject to brine drippings; curving of rails; experience with precurging rails on B. & O. R.R.; use of guard rails on curves; results obtained from oiling track fixtures, and recommendations relating to most economical method of applying oil.

STRESSES. Third Progress Report of the Special Committee on Stresses in Railroad Track. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 253, Jan. 1923, pp. 295-450, 102 figs. Tests on straight and curved tracks.

STRESSES. Stresses in Railroad Track. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 295-456, 102 figs. Third progress report of special committee. Tests on straight and curved track.

RAINFALL

MEASUREMENT. Calculation of Normal Annual Precipitation (Sul calcolo delle precipitazioni acquee normali nella loro ripartizione annuale), Filippo Eredia. Elettricista, vol. 1, (Series 4), no. 22, Nov. 15, 1922, pp. 166-168. Formulas and calculations of rainfall.

REFRACTORIES

THERMAL CONDUCTIVITY. Structure and Thermal Conductivity of Refractories (Gefüge und Wärmeleitvermögen feuerfester Steine), Max Jacob. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 6, Feb. 10, 1923, pp. 126-127. In measurement of heat conductivity of magnesite bricks, wide varying results have been obtained by different observers; writer seeks to show that this is due to difference in structure; possibilities for production of refractories with high or low conductivity.

The Thermal Conductivity of Refractory Materials at High Temperatures, A. T. Green. Ceramic Soc.— Trans., vol. 21, Part 4, Session 1921-22, pp. 394-414, 4 figs. Review of previous work, together with principles of thermal conductivity; theory of present investigation, experimental considerations, calculation and discussion of results. References.

REFRIGERATING MACHINES

ABSORPTION SYSTEM. Checking Up on the Absoprtion System, Heywood Cochran. Power Plant Eng., vol. 27, no. 6, Mar. 15, 1923, pp. 328-331, 4 figs. Operating pointers which aid in efficient use of exhaust-steam type of refrigerating machine.

AMMONIA. Flooding in Ammonia Refrigerating Machines (Das Arbeiten mit Ueberflutung bei Ammoniak-Kühlmaschinen). Constanz Schmitz. Wärme- u. Kälte-Technik, vol. 25, no. 1, Jan. 1, 1923, pp. 3-8. Improvements in working process in ammonia refrigerating machines by allowing vapors to leave refrigerator very wet and yet arrive dry to compressor; results of tests made.

HEAT WASTE IN. Heat Waste in the Ammonia Compression Refrigerating Machine, J. H. H. Voss. Refrig. Eng., vol. 9, no. 8, Feb. 1923, pp. 249-251, 5 figs. Describes plain method of temperature-entropy graph for comparing actual with ideal performance of heat carrier; method is said to be more reliable than indicator card, and is easily available.

REFRIGERATING PLANTS

BRINE CIRCULATION. Brine Circulation with Centrifugal Pumps, Russell K. Annis. Power, vol. 57, no. 11, Mar. 13, 1923, pp. 401-402, 3 figs. Effects on centrifugal pump when liquids heavier than water are handled. Frictional resistance of brine; handling brine with water pump.

INSULATION FOR, THICKNESS OF. The Economic Thickness of Insulation in the Refrigerating Field. Refrig. Eng., vol. 9, no. 8, Feb. 1923, pp. 254-258, 1 fig. Discussion of paper by P. Nicholls, published in same journal, Nov. 1922.

RESEARCH

ENGINEERING. Engineering Research. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 3, Mar. 1923, pp. 511-551. Contains following papers: The Research Activities of the American Society of Civil Engineers, Arthur N. Talbot; Engineering Foundation: Division of Engineering of National Research Council: Their Origin, Work, Plans, Needs, Alfred D. Flinn; The Study of Steels for Engineering Structures, George K. Burgess; Radio and Research, Otta B. Blackwell.

SCIENTIFIC Co-operation with the Federal Government in Scientific Work, E. W. Allen. Nat. Research Council—Bul., vol. 5, part 1, no. 26, Dec. 1922, 27 pp. Types of co-operative work; examples of co-operative enterprises; form and terms of co-operation; volume of co-operative funds.

RHEOSTATS

LIQUID. A Liquid Rheostat for 30,000 Volts (Un rhéostat liquide pour 30,000 volts), J. Reyval. Revue générale de l'Electricité, vol. 13, no. 3, Jan. 20, 1923, pp. 101-103, 2 figs. Installation and results obtained with it at hydroe-lectric plant at Eymoutiers; voltage raised to 32,000 by a 1,900-kva., transformer for supply to transmission lines.

ROAD CONSTRUCTION

APPLIANCES AND MATERIALS. Roadmaking Materials and Appliances. Surveyor, vol. 63, no. 1619, Jan. 26, 1923, pp. 111-120, 22 figs. Review of developments in England during 1922.

MODERN METHODS. Modern Road Engineering, H. Percy Boulnois. Roy. Engrs. Jl., vol. 37, no. 1, Mar. 1923, pp. 13-23. Notes on pitch grouting; tar macadam, tar slag, asphalt or bituminous carpets; unsurfaced or bare concrete.

ROAD MATERIALS

NON-BITUMINOUS, TEST STANDARDS. Standard Tests for Non-Bituminous Paving Materials. Highway Engr. and Contractor, vol. 8, no. 1, Jan. 1923, p. 59. Committee report before Am. Soc. for Mun. Improvements, giving methods of testing which committee recommends for adoption.

ROADS

BATES EXPERIMENTAL. The Bates Experimental Road. State of Ill. Dept. of Pub. Works and Bldgs., Division of Highways, Test Road Bul., no. 6, Aug. 15, 1922, 8 pp., 5 figs. on supp. plates. Load used was 8000 lb. on each rear wheel, which is max, load per wheel allowed on state roads in Illinois. Data on behavior of different sections.

ROADS, BITUMINOUS

MAINTENANCE. Modern Developments in Methods of Maintaining Bitunimous Pavements, B. C. Tiney, Can. Eng., vol. 44, no. 9, Feb. 27, 1923, pp. 283-285. Surface treatment on water-bound and bituminous macadam roads; cost of operating motor distributors; specification for materials adopted in Michigan. Paper read before Univ. of Mich.

ROADS, CONCRETE

MAINTENANCE. Recent Developments in Concrete Pavement Maintenance, Leroy C. Smith. Eng. and Contracting (Roads and Streets), vol. 59, no. 3, Mar. 7, 1923, pp. 545-547. New methods used by Wayne Country, Mich. Paper presented at University of Mich.

ROADS, MACADAM

MAINTENANCE. Salvage and Maintenance of Macadam Roads. Eng. and Contracting (Roads and Streets), vol. 59, no. 2, Feb. 7, 1923, pp. 323-328. Practice in Pennsylvania, W. A. Van Duzer. Practice in New Jersey, Alex W. Muir.

ROCK DRILLS

HAMMER. The Evolution of Rock Drilling, H. A. Burbank. Can Inst Min. and Metallurgy.—Monthly Bul, no. 131, Mar 1923, pp. 138-148, 8 figs. Discusses development and manufacture of hammer drill.

ROLLING MILLS

BALANCING GEAR New Electrically-Operated Top-Roll Balancing Gear, E Krahnen. Iron and Coal Trades Rev., vol. 106, no. 2866, Feb. 2, 1923, p. 161, 3 figs. Details of new German type of balancing gear and advantage claimed.

PLATE MILLS 120-In Motor Driven Plate Mill, W Kennedy Assn Iron and Steel Elec Engrs, vol 5, no 2, Feb 1923, pp. 39-41 Mill installed by Worth Steel Co., Claymont, Del.

ROPE DRIVE

DESIGN AND MAINTENANCE The Rope Drive Its Design and Maintenance, P Kenyon Ceramic Soc—Trans, vol 21, Part 4, Session 1921 22, pp 337-351 and (discussion) 354-357, 9 figs Advantages claimed for rope drive; pulleys, centrifugal tension, total allowable tension slip, wear, grooves, center distances; under and over driving; splicing and fixing; etc. Particular application to potteries.

S

SAND, MOULDING

WASHING AND DRYING California Sand for Foundry Practice West Machy World, vol 14, no 1, Jan 1923, pp 14-15, 5 figs Washing and drying plant of Del Monte Properties Co at Lake Kajella

SCREW MACHINES

AUTOMATIC A Novel Automatic Eng Production, vol 6, no 123 Feb 8, 1923, pp 126-128, 7 figs Details of five-spindle screw machine manufactured by Davenport Machine Tool Co, Inc, Rochester N Y

CAMS FOR MILLING Table for Use in Milling Cams for B. & S Automatic Screw Machines, Ernest C Allen Am Mach vol 58 no 10, Mar 8, 1923, pp 371-372 Improvement in former tables, theoretical rise for Brown & Sharpe cams not a spiral errors in steep rises, use of table

SCREW THREADS

MEASUREMENT. Screw-Thread Measurements (Gewindemessungen), G. Berndt. Zeit. für technische Physik, vol. 3, no. 12, 1922, pp. 381-386, 8 figs. Recommends for workshops new measuring instrument for comparative measurements only.

SEWAGE DISPOSAL

SLUDGE FILTRATION. The Effect of Certain Chemicals upon the Filtration of Ripe Imhoff Sludge, P. A. van der Meulen and R. O. Smith. Jl. Indus. and En~. Chem., vol. 15, no. 3, Mar. 1923, pp. 281-282, 1 fig. Study of effect of certain chemicals, especially sulphuric and sulphurous acid and aluminum sulphate, on filterability of ripe Imhoff sludge.

SHERARDIZING

EXTENT OF COATING. Sherardized Coatings—Where They Serve Best, F. L. Wolf. Raw Material, vol. 6, no. 1, Jan. 1923, pp. 12-14, 9 figs. Deals with results of series of practical experiments made with view to determining amount of coating deposited by sherardizing.

SILICON STEEL

BRITTLENESS. Low-temperature Brittleness in Silicon Steels, Norman B. Pilling. Am. Inst. Min. and Met. Engrs.—Trans., no. 1220-S. Feb. 1923, 10 pp. 7 figs.; also (abstract) in Min. and Metallurgy, vol. 4, no. 194, Feb. 1923, p. 90, 2 figs. It is shown that brittleness is inherent property of iron, modified by alloyed silicon; commercial silicon steel becomes brittle when silicon content exceeds 4.2 per cent; brittleness is only slightly modified by heat treatment.

SMOKE

METALLURGICAL. Smokes. Royal Soc.—Proc., vol. 102, no. A 718, Feb. 1, 1923, pp. 600-627, 10 figs., partly on supp. plate. Part 1: Study of their behavior and a method of determining number of particles they contain, by R. Whytlaw-Gray, J. B. Speakman and J. H. P. Campbell. Part 2: Method of determining size of particles in smokes, by R. Whytlaw-Gray and J. B. Speakman. References.

STANDARDIZATION

AUTOMOBILE. Current Standardization Work. Soc. Automotive Engrs.—Jl., vol. 12, no. 1, Jan. 1923, pp. 124-128, 7 figs. Brake lining; clutch-release-type thrust ball bearings; engine numbers; iron and steel specifications;fuel and lubrication; pipe fittings; license-plates and brackets; motor-truck rating; radiator nomenclature; etc.

STANDARDS

GERMAN N. D. I. REPORTS. Report of German Industrial Committee on Standards (Normenaussehuss der Deutschen Industrie). Maschinenbau, vol. 2, no. 9, Feb. 8, 1923, pp. N63-N66, 5 figs. Includes list of newly published standard sheets. Tentative proposals for screw and spindle holes, hexagonal wooden screws, etc. Proposed standards for high-frequency terminology; mass and weight; density and specific weight; units for mechanical magnitudes.

Report of the German Industrial Standards Committee (Normenausshuss der Deutschen Industrie). Maschenenbau (Mitteilungen des NDI), vol. 2, no. 8, Jan. 26, 1923, pp. N55-N60, 5 figs. Proposals of Board of Directors for designation of screws and nuts. Proposed standards for sheet iron and rolled ingot steel.

STAYBOLTS

ZWILLING. Zwilling Staybolts (Mtteilungen über Zwillingstehbolzen), H. Lorenz. Glasers Annalen, vol. 92, nos. and 3, Jan. 15 and Feb. 1, 1923, pp. 22-32 and 92-96, 40 figs. Gives results of tests, theoretical investigations and calculation of Zwilling type of staybolts and discusses advisability of substituting iron for copper in their construction. Paper read before German Mech. Soc. and discussion in issue of Feb. 1.

STEAM

RESEARCH. Progress in Steam Research. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp 165-168, 6 figs Reports and comments on progress at A S M E meeting as follows: The Joule-Thomson Effect in Superheated Steam, R. V. Kleinschmidt Steam Investigation Program at the Research Laboratory of Physical Chemistry, M I T, F G Keyes. Steam Research at the U.S. Bureau of Standards, N. S. Osborne.

STEAM-ELECTRIC PLANTS

OFFICE-BUILDING GROUP Central Heat and Power Plant for Group of Office Buildings, George C Stierhoff Power, vol 57, no 9, Feb 27, 1923, pp 316-318, 5 figs Plant located in residential section of city, supplies light, heat, power and other services; main units, poppet-valve engines direct-connected to generator, boilers fired with underfeed stokers, ashes handled by steam-jet conveyor.

THREE-PHASE. Electrical Developments at Stoke-on-Trent. Eleen., vol. 90, no. 2331, Jan. 19, 1923, p. 66, 2 figs. How several systems are supplied from one 3 phase station

WOOD-REFUSE BURNING Furniture Plant Uses Wood Refuse as Fuel Power Plant Eng, vol 27, no 6, Mar 15, 1923, pp 303-308, 8 figs At plant of Berkey & Gay Furniture Co, wood refuse forms 70 per cent of total fuel supply; details of equipment.

STEAM ENGINES

BOILER-LOAD INDICATOR The Kent Boiler Load Indicator Engineering, vol 115, no 2982 Feb 23, 1923, pp 234-235, 7 figs Describes new type of steam meter for boiler house service

UNIFLOW. Valve-Gear Designs of British Uniflow Engines. Power, vol. 57, no. 7, Feb 13, 1923 pp 246-248, 11 figs It is shown that British uniflow engines have as varied valve gearing as American engines

STEAM POWER PLANTS

HEAT ACCUMULATION IN Heat Accumulation in Steam Plants (Die Wärmespeicherung in der Dampfwirtschaft) Clemens [illegible] Zeit für die gesamte Giessereipraxis, vol 44, no 3-4 Jan 27, 1923, pp 18-20 Steam and heat accumulation necessary conditions for steam entering and leaving [illegible] pressures, initial cost data, etc

Natural Steam Sources. The Geothermal Power Plant in Larderello (Italy) (Das geothermische Kraftwerk in Larderello (Italien)), Wilhelm Wieder. Elektrotechnische Zeit., vol. 44, no. 6, Feb. 8, 1923, pp. 122-125, 4 figs. Describes plant for production of boric acid through utilization of natural steam sources in Province of Pisa.

Types. Production and Utilization of Steam as Motive Power (La Production et utilisation de la vapeur comme source de force motrice). Technique Moderne, vol. 14, no. 13, Dec. 1, 1922, pp. 513-560, 41 figs. Stationary steam-generating apparatus: types, superheaters, preheaters, economizers, fuels, grates, stokers, control apparatus, water purification; stationary steam engines: piston type, turbine type, condensers, marine steam boilers, types fuels, grates; marine steam engines: piston type, turbine type, condensers; steam locomotives; superheating, fuels, firing turbine type.

STEAM TURBINES

Coal-Mine Power Plants. Turbine Machinery for Colliery Power Stations, C. H. N. Naylor. Iron and Coal Trades Rev., vol. 106, no. 2869, Feb. 23, 1923, pp. 272-274, 4 figs. Compares uses of mixed-pressure and high-pressure turbines. Notes on steam accumulators; condensers; vacuum; and cooling towers. Paper read before joint meeting of Nat. Assn. Colliery Mgrs. and Assn. Min. Elec. Engrs.

Troubles and Failures. A Review of Turbine Troubles and Their Causes, A. L. Mellanby and William Kerr. North-East Coast Instn. Engrs. and Shipbldrs., advance paper, no. 2683R for meeting Feb. 16, 1923, 18 pp. Discusses main causes and aspects of troubles and failures.

STEEL

Chrome-Nickel. *See Chrome-Nickel Steel.*

Chrome-Vanadium. *See Chrome-Vanadium Steel.*

Cooling Velocity, Influence of. The Influence of Cooling Velocity on Location of Critical Points and Structure of Carbon Steels (Der Einfluss der Abkühlungsgeschwindigkeit auf die Lage der Haltepunkte und das Gefüge der Kohlenstoffstähle), W. Schneider. Stahl u. Eisen, vol. 42, no. 42, Oct. 19, 1922, pp. 1577-1584, 9 figs. Influence of heating and cooling velocity; tests with high cooling velocities; influence of heating temperature (initial temperature).

Metallographic Tests. Improvement in Crusher Steel Is Suggested by Metallographic Tests, Oscar E. Harder. Eng. and Min. Jl.-Press, vol. 115, no. 7, Feb. 17, 1923, pp. 314-318, 12 figs. Examination of failures of mine and mill equipment indicates that sufficient attention is not given to heat treatment in process of manufacture.

Silicon. *See Silicon Steel.*

Stainless. Stainless Steel, Robt. N. Richardson. Eng. Production, vol. 6, no. 121, Jan. 25, 1923, p. 80. Consideration of its valuable properties.

STEEL CASTING

Centrifugal. New Patented Process for Steel Casting. Ry. and Locomotive Eng., vol. 36, no. 3, Mar. 1923, pp. 63-65, 4 figs. Describes McConway machine for casting steel under pressure by centrifugal process in vertical plane.

STEEL CASTINGS

Defects in. Blow Holes in Steel Castings. Metal Industry (Lond.), vol. 22, no. 5, Feb. 2, 1923, pp. 107-108. Deals with blowholes arising from condition of metal itself.

Defects in Steel Ingots and Castings, O. A. Knight. Forging and Heat Treating, vol. 9, no. 2, Feb. 1923, pp. 98-102, 6 figs. Discussion of common defects in ingots and castings; cracks; piping; blowholes; non-metallic inclusions; coarse crystallization; segregation.

STEEL, HEAT TREATMENT OF

Carbon and Alloy Steels. Heat Treatment of Electric Carbon and Alloy Forging Steels, Larry J. Barton. Forging and Heat Treating, vol. 9, no. 2, Feb. 1923, pp. 102-105. Characteristics of plain carbon and alloy steels containing nickel, chromium, molybdenum and vanadium; effect of heat treatment on phyiscal properties.

Coal vs. Electricity for Heating. Heating by Combustion and by Electricity (Le chauffage par combustion et le chauffage électrique), Edgar Rosa. France-Belgique, vol. 2, no. 5, Nov. 1922, pp. 49-53. Heat treatment of tool steels; advantages of electric heating; comparison of heating with coal and electricity.

Drill Steel. Specifications and Heat Treatment of Drill Steel, H. S. Brainerd. Min. and Metallurgy, vol. 4, no. 195, Mar. 1923, pp. 119-120. Gives specifications used and recommended by one of largest distributors of hollow drill steel in world; recommendations for heat treatment.

Quenching. The Effect of High-Temperature Quenching on the Microstructure of High-Carbon Steels, Howard Scott. Am. Soc. for Steel Treating—Trans., vol. 3, no. 6, Mar. 1923, pp. 593-623, 19 figs. Deals with conditions necessary to produce austenite at ordinary temperatures in plain high-carbon steel and metallographic properties in this constituent; study of transformation in cooling steel; effect of rate of cooling and thermal stress on distribution of matersite and troostite; aspects of transformation of austensite to martensite.

Tool Steel. Tool Steel Manipulation, L. K. Marshall. Am. Soc. for Steel Treating—Trans., vol. 3, no. 1, Oct. 1922, pp. 90-93. Discusses most important points encountered in actual practice of scientific heat treatment of tool steel.

STEEL, HIGH-SPEED

Tool Steel, Bibliography. Bibliography of High-Speed Tool Steels. Am. Soc. for Steel Treating—Trans., vol. 3, no. 1, Oct. 1922, pp. 47-89. Bibliography covering literature available, prepared by Eng. Societies Library, New York City, for use of Committee on High Speed Tool Steels of Division of Eng., Nat. Research Council; complete up to May 20, 1922.

STEEL MANUFACTURE

Colloid Chemistry Applied to. Application of Colloid Chemistry to Production of Clean Steel, H. W. Gillett. Am. Inst. Min. and Met. Engrs.—Trans., no. 1221-S, Feb. 1923, 7 pp., 4 figs.; and (abstract) in Min. and Metallurgy, vol. 4, no. 194, Feb. 1923, p. 95. Points out that making of both steel and non-ferrous alloys should be studied from colloid viewpoint.

Possibilities in Application of Colloid Chemistry to Production of Clean Steel, H. W. Gillette. Am. Inst. Min. and Met. Engrs., paper at meeting, Feb. 19-22, 1923, 11 pp. Selected bibliography.

Ingot Casting. Ingot Casting, J. Kent Smith. Metal Industry (Lond.), vol. 22, no. 8, Feb. 23, 1923, pp. 169-171, 8 figs. Process of freezing, top heat losses; methods of mechanical contraction, pouring temperature.

Open-Hearth Steel. Raw Materials for Making Martin Steel (Les matières premières employées pour la fabrication de l'acier Martin). Métallurgie, vol. 55, no. 7, Feb. 15, 1923, pp. 243-244. Basic and acid manufacture, hematite and phosphor pigs, action of content of manganese and silicon, scrap, rich and poor ore; ferroalloys.

The Manufacture of Steel, G. A. Reinhardt. Blast Furnace and Steel Plant, vol. 11, no. 3, Mar. 1923, pp. 193-195, 2 figs. Processes involved in refining iron into steel, facts concerning production of open-hearth steel.

STEEL WORKS

Electricity in. Consideration in the use of Electricity in Steel Works, Wm. McFarlane. West of Scotland Iron and Steel Inst.—Jl., vol. 30, part 3, Dec. 1922-23, pp. 34-39 and (discussion) 40-45, 6 figs. Discusses problem of production of electrical energy.

Krupp Plant, Essen. To-day's Products of the Krupp Plants, Godfrey L. Carden. Iron Age, vol. 111, no. 11, Mar. 15, 1923, pp. 758-760, 6 figs. Large variety and range of products, of which steel or some metal is always basic element; employee loyalty a notable factor.

Pouring Device. Designs Pouring Device for Steelworks. Iron Trade Rev., vol. 72, no. 11, Mar. 15, 1923, p. 806, 1 fig. Pouring device for bessemer steel works and open-hearth furnace plants invented by Hubert Hermanns, Berlin.

STOKERS

Arch for Chain-Grate. Deflecting Arches for Chain Grate Stokers, Henry Weaver. Power Plant Eng., vol. 27, no. 6, Mar. 15, 1923, pp. 314-315, 3 figs. Types of arches installed at rear of furnace which have been found effective in bettering combustion conditions.

Operation and Design. The Stoker Problem Discussed from an Operating Viewpoint, R. E. Dillon. Elec. World, vol. 81, no. 10, Mar. 10, 1923, p. 583. Factors controlling efficiency; design of clinker crushers claimed to be wrong; heating feedwater by bleeding main turbine units.

Pluto. The "Pluto" Stoker. Iron and Coal Trades Rev., vol. 106, no. 2867, Feb. 9, 1923, p. 191, 3 figs. Grate is in two sections, one slightly inclined downward from hopper, and other, towards back end, horizontal.

Small-Capacity Boilers. Mechanical Stokers for Boilers of Small Capacity, C. W. Roberts. Southern Engr., vol. 38, no. 6, Feb. 1923, pp. 36-40, 8 figs. Procedure in operation of mechanical stoker; fuel economy; advantages.

Underfeed. Nine Years with Underfeed Stokers and Illinois Coal, C. C. Cobb, Jr. Power, vol. 57, no. 9, Feb. 27, 1923, pp. 328-330, 1 fig. Data on average operating results and maintenance; difficulties encountered; how they were overcome and how high ratings are carried in spite of limited furnace volume.

STONE

Crushing and Screening Plant. Electric Crushing and Screening Plant at Quarry. Eng. News-Rec., vol. 90, no. 9, Mar. 1, 1923, pp. 387-388, 1 fig. Plant with output capacity of 10,000 tons per 8-hr. day, built by Kelley Island Lime and Transport Co, Marble head, Ohio.

SUBSTATIONS

A. C. Design. Alternating-Current Substation Design, R. A. Hentz. Elec. World, vol. 81, no. 9, Mar. 3, 1923, pp. 513-516, 7 figs. Method adopted for distribution at 13,200 volts, 3-phase, and 2400-volts, 2-phase, 3-wire; ample reserve capacity and simplicity in layout are features.

SUPERHEATED STEAM

Experiments. Experiments on Superheated Steam, M. Stromeyer. Engineer, vol. 135, no. 3505, Mar. 2, 1923, pp. 241-242, 1 fig. Discusses Knoblauch's 133 experiments in Munich and Thomas' 83 experiments in America. (Abstract.) Memorandum to Manchester Steam Users' Assn.

SURVEYING

Aerial. Limitations of Aerial Surveying Outlined, P. J. Barry. Can. Engr., vol. 44, no. 6, Feb. 6, 1923, pp. 197-199, 2 figs. States that aerial photographs are useful for certain classes of reconnaissance work but many claims made for aerial photography as aid to field surveying are too extravagant; analyzes statements.

Coast and Geodetic. Description of Work, Methods, and Organization of United States Coast and Geodetic Survey. U.S. Coast and Geodetic Survey, Special Publication No. 23, 1920, 102 pp., 35 figs., partly on supp. plates. Triangulation, base lines, precise traverse, astronomic work, terrestrial magnetism, seismology, topography, hydrography, tides and currents, coast pilots, leveling, oceanography, nautical charts, gravity, and geodesy or measurement of earth.

Stereoautographic. Stereoautography (Stéréoautogrammetrie), Hans. Dock. Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 75, no. 7-8, Feb. 23, 1923, pp. 37-41, 6 figs. Development of stereophotogrammetric surveying and its application in surveying work for hydro-electric plants.

T

TAPERS

Measuring. Measuring Tapers by Means of Discs and Rods, R. H. Worthy. Mech. World, vol. 73, no. 1882, Jan. 26, 1923, pp. 50-51, 5 figs. Particulars are given for providing simple and rapid formulas.

TEMPERATURE CONTROL

Regulator for. A New Type Automatic Temperature Regulator and Its Application to Heat Treating Furnaces, R. W. Newcomb. Am. Soc. for Steel Treating, vol. 3, no. 1, Oct. 1922, pp. 98-102, 2 figs. Describes machine of Charles Englehard, Inc., and its operation.

TERMINALS, RAILWAY

Freight Facilities. Freight Facilities in the Proposed Terminal, Chicago. Ry. Rev., vol. 72, no. 5, Feb. 3, 1923, pp. 209-213, 2 figs. How Chicago and West. Ind. R.R.'s suggested terminal is planned to accommodate ultimate freight business.

PASSENGER. The Modernisation of Passenger Railway Stations, F. Bushrod and J. F. S. Tyler. Inst. of Transport—Jl., vol. 4, no. 5, Mar. 1923, pp. 166-175. Types of stations; arrangement of station offices, etc.; influence of electrification on station design; relation of layout of stations to signaling arrangements and benefit of modern signaling appliances; effect of station design on construction of time tables.

TESTS AND TESTING

LABORATORY, PA. R. R. Origin and Development of the Pennsylvania R. R. Testing Laboratory, Geo. L. Fowler. Ry. and Locomotive Eng., vol. 36, no. 3, Mar. 1923, pp. 72-74. History of its establishment under Theodore V. Ely.

METHODS. Modern Mechanical Material-Testing Methods (Neuere Mechanisch-technische Material-prüfverfahren), G. Schulze. Maschinenbau, vol. 2, no. 8, Jan. 26, 1923, pp. G79-G84, 15 figs. Recommends use of short bar for testing tensile strength; static hardness determinations: Martens scratch test; Brinell test. Dynamic methods: impact-hardness and ball-hardness tests. Notched-bar and permanent shock tests, new testing arrangements and research work; Erichsen plate-testing apparatus.

TEXTILE MILLS

HEAT ECONOMY. Heat Economy in Textile Industries (Die Wärmewirtschaft in der Textillindustrie unter Berücksichtigung der Abdampfverwertung), F. Möller. Archiv für Wärmewirtschaft, vol. 4, no. 1, Jan. 1923, pp. 3-6, 3 figs. Waste-heat utilization in spinning and weaving plants requiring more power than heat; power and heat in mixed operations; use of surplus energy where more heat than power is required.

THERMIT WELDING

CAST IRON. Welding Cast Iron by Means of the Thermit Process, J. H. Deppeler. Am. Welding Soc.—Jl., vol. 1, no. 10, Oct. 1922, pp. 27-33, 6 figs. What thermit is; general directions for welding. Particularly adapted to welding of heavier parts.

TIME STUDY

CALCULATIONS. Avoiding Mistakes in Time Study Results, Eugene J. Benge. Management Eng., vol. 4, no. 3, Mar. 1923, pp. 195-197, 1 fig. Calculations which reduce errors in setting standard times.

MOTION STUDY AND. Time and Motion Study Defined, William Baum. Iron Trade Rev., vol. 72, no. 11, Mar. 15, 1923, pp. 810-812. Misconception of principles outlined by Taylor cause of much antagonism; it is claimed that nearly all plants offer opportunities for correct application; use of stop watch.

RATE SETTING BY. Rate Setting by Means of Elemental Time Study, Floyd M. Avery. Indus. Management (N.Y.), vol. 65, no. 3, Mar. 1923, pp. 161-163, 4 figs. Taking care of variable elements by rate curves.

TRACTORS

MILITARY. Cross-Country Tractors, G. le Q. Martel. Roy. Engrs. Jl., vol. 37, no. 1, Mar. 1923, pp. 115-122, 2 figs. Discusses conversion of brigade of artillery from horse to tractor transport.

TRAIN HEATING

ELECTRIC-HEATING CARS. A 15,000-Volt Electric Heating Wagon. Engineer, vol. 135, no. 3504, Feb. 1923, pp. 208-209, 4 figs. High-voltage heating car, placed in commission on Swiss Federal Rys., built by Brown, Boveri & Co., Baden, and Sulzer Bros., Winterthur; details of electric boiler.

TRANSFORMERS

TEMPERATURE MEASUREMENTS. Obtaining an Indication of Transformer Temperatures, J. B. Gibbs. Power, vol. 57, no. 10, Mar. 6, 1923, pp. 371-372, 7 figs. Measurements by thermometers placed in oil; difference in temperature between oil and windings; use of heating coils for determining winding temperature.

TRANSPORTATION

RAILWAY. The Evolution of Canadian Transportation, J. H. Walsh. New England R.R. Club, Feb. 13, 1923, pp. 246-257 and (discussion) pp. 257-261. History of development.

TUBES

MANUFACTURE. Manufacture of Solid Drawn Steel Tubes, J. A. Richards. Inst. Mar. Engrs.—Trans., Feb. 1923, pp. 445-462 and (discussion) 462-468, 9 figs. Explanation of various processes employed.

The Manufacture of Iron and Steel Tubes, Ewald Röber. Eng. Progress, vol. 3, no. 11, Nov. 1922, pp. 250-254, 5 figs. Methods of manufacturing welded and seamless tubes; working range and diameters, length and thickness.

TUBING

NICKEL. Manufacture of 99 Per Cent Nickel Tubing, F. L. Prentiss. Iron Age, vol. 111, no. 11, Mar. 15, 1923, pp. 743-744, 4 figs. Commercially successful processes for both seamless and welded products developed by American Nickel Corp.

WELDED STELL. Making Welded Steel Tubing. Machy. (Lond.), vol. 21, no. 543, Feb. 22, 1923, pp. 641-643, 8 figs. Rolling tubing; welding by electric or oxy-acetylene process, finishing welded seam.

TURBO-ALTERNATORS

STARTING. Starting Turbo-Alternators and putting Them in Service, Guy M. Mankin. Power, vol. 57, no. 12, Mar. 20, 1923, pp. 444-446. Practice in large central station; 1¼ hr. required to start 30,000-kw. unit from cold standstill and get it fully loaded.

TURBO-GENERATORS

COOLING. The Cooling of Turbine Generators, A. R. Smith. Gen. Elec. Rev., vol. 26, no. 2, Feb. 1923, pp. 83-87, 6 figs. Heat transfer in surface air coolers.

PEDESTALS. The Design of Structural Supports for Turbo Generators. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 2, Feb. 1923, pp. 274-278. Discussion of paper by Edward H. Cameron, published in Jan. 1923, Proc.

U

U.S. BUREAU OF STANDARDS

PUBLICATIONS, LIST OF. Publications of the Bureau of Standards. U.S. Bur. of Standards—Circular, no. 24, July 1, 1922, 182 pp. List of publications of scientific and technologic papers, circulars, handbooks and miscellaneous publications, including alphabetical index of topics.

V

VARNISHES

AUTOMOBILE. Automobile Finishing-Varnish, L. Valentine Pulsifer. Soc. Automotive Engrs.—Jl., vol. 2, no. 1, Jan. 1923, pp. 89-94. Shop and service qualities; elasticity; rsistance to moisture and alkalis; film factor; details concerning tests for drying, safety of working non-volatile content, ash, flash-point and acid number; Kauri reduction test.

VENTILATION

WARM-AIR HEATING AND. Ventilation and Warm-Air Heating, G. A. Voorhees. Sheet Metal Worker, vol. 14, no. 3, Mar. 2, 1923, pp. 81-82. Relation of temperature to ventilation.

VIBRATION

HIGH-SPEED MACHINERY. Vibration in Small Direct Connected Units, H. M. Phillips. Power, vol. 57, no. 11, Mar. 13, 1923, pp. 398-400, 2 figs. Although usually attributed to unbalance, vibration, in author's opinion, is more frequently due to misalignment or coupling trouble, which can be corrected by comparatively simple means.

VOCATIONAL EDUCATION

A.S.M.E. COMMITTEE REPORT. Means for Vocational Training for the Industries. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 169-179. Report of A.S.M.E. Committee on Education and Training for Industries: Extension and Correspondence Schools, James A. Moyer. Schools for Apprentices and Shop Training R. L. Sackett. Industrial Education as Represented in Schools, C. R. Richards. Discussion.

W

WAGES

GROUP BONUS SYSTEM. Group Bonus System (Def Gruppenakkord), Egon Broecker. Stahl u. Eisen, vol. 42, nos. 41 and 42, Oct. 12 and 19, 1922, pp. 1553-1559 and 1584-1591. Discusses system according to which contract for a job is let to a group of workers for a given sum to be shared by the workers. Bibliography.

STANDARDIZATION OF SYSTEMS. Standardization of German Wage-Payment Systems (Vereinheitlichung der deutschen Lohntarife), Paul Schmerse. Stahl u. Eisen, vol. 43, nos. 5 and 6, Feb. 1 and 8, 1923, pp. 145-153 and 191-194, 5 figs. German wage-payment methods; time premium payment; new piece-rate payment; percentage wage scale.

WASTE HEAT

UTILIZATION. Connecting Steam Power and Heating Plants and Coal Saving by Utilization of Waste Steam and Intermediary Steam (Verbindung von Dampfkraft- und Heizanlagen und die durch Abdampf- und Zwischendampfverwertung erzielbare Wärme- und Kohlenersparnis), M. Hottinger. Gesundheits-Ingenieur, vol. 46, no. 3, Jan. 20, 1923, pp. 25-33, 23 figs. Connecting condensing machines with heating plants; waste-steam machines, turbines, Ruths steam accumulators; steam consumption by the various machines.

Waste Heat From Steam Hammers (Abwärme von Dampfhämmern), E. Weidemann. Archiv für Wärmewirtschaft, vol. 4, no. 1, Jan. 1923, pp. 1-3, 3 figs. Recovery of heat for heating feedwater; condensation of total waste steam and return to boiler; using waste heat for heating buildings.

WELDING. *See Electric Welding, Arc; Electric Welding, Resistance; Oxy-Acetylene Welding; Thermit Welding.*

WATER MAINS

FRICTION LOSSES. Abnormal Friction Losses in a 12-inch Water Main, James Purves. Eng. Jl. (Eng. Inst. Can.), vol. 6, no. 3, Mar. 1923, pp. 137-139. Considerations in design of water supply pipe line; specific case of abnormal friction losses; effect of different qualities of water in pipe line.

WATER POWER

CANADA. How Water Power Development in Canada Compares with Other Industries, J. B. Challies. Contract Rec., vol. 37, no. 7, Feb. 14, 1923, pp. 156-158. Present condition of water power industry as outlined by Dominion Water Power Branch of Dept. of Inter.; more money invested than in any other manufacturing industry.

WATER SOFTENING

PERMUTIT. Water Softening by Means of Permutite (Il raddolcimento delle acque industriali per mezzo della permutite), D. Marotta. Giornale di Chimica Industriale ed Applicata, vol. 5, no. 1, Jan. 1923, pp. 10-12, 3 figs. Describes a battery of filters, and its operation; regenerating; comparison of water before and after treatment.

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SURFACE, CANADA. Surface Water Supply of Canada — Arctic and Western Hudson Bay Drainage, 1919-20. Can. Dept. Inter., Dominion Water Power Branch, Water Resources Paper No. 31, 336 pp., 2 figs., on supp. plates. Hydrometric data of Nelson, Churchill, Mackenzie, Mississipi rivers and other drainage basins.

WATER TREATMENT

CHLORINATION. Chlorination Apparatus and Control, G. A. H. Burn and A. E. Berry. Contract Rec., vol. 37, no. 9, Feb. 28, 1923, pp. 195-199. Description of apparatus used for treatment of water with liquid chlorine; effective means of water supply sterilization.

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INDUSTRIAL MUSEUM, WORCESTER. Story of Wire in Picture and Product, John Nelson. Iron Age, vol. 111, no. 11, Mar. 15, 1923, pp. 733-738, 8 figs. Describes Industrial Museum of Am. Steel and Wire Co. at Worcester, Mass.

WOOD

KILN DRYING. Kiln Drying of Lumber, F. O. Farey. Can. Ry. Club—Proc., vol. 22, no. 1, Jan. 1923, pp. 20-37 and (discussion) 37-41, 1 fig. Study of kiln, various schedules for drying lumber, and condition which should be obtained in finished product.

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DESIGN. New Factors Influencing the Design of Woodworking Machinery, Sern Madsen. Mech. Eng., vol. 45, no. 3, Mar. 1923, pp. 180-182, 3 figs. Discusses such factors as adoption of high speed steel, demands of greater economy, power and speed, use of ball bearings, and direct application of electric drive, and summarizes problems of driving and fitting cutter heads. Points out savings in power resulting from use of ball-bearing motor-driven arbors. Tables of synchronous-motor speeds and motor speeds available for two or three frequencies.

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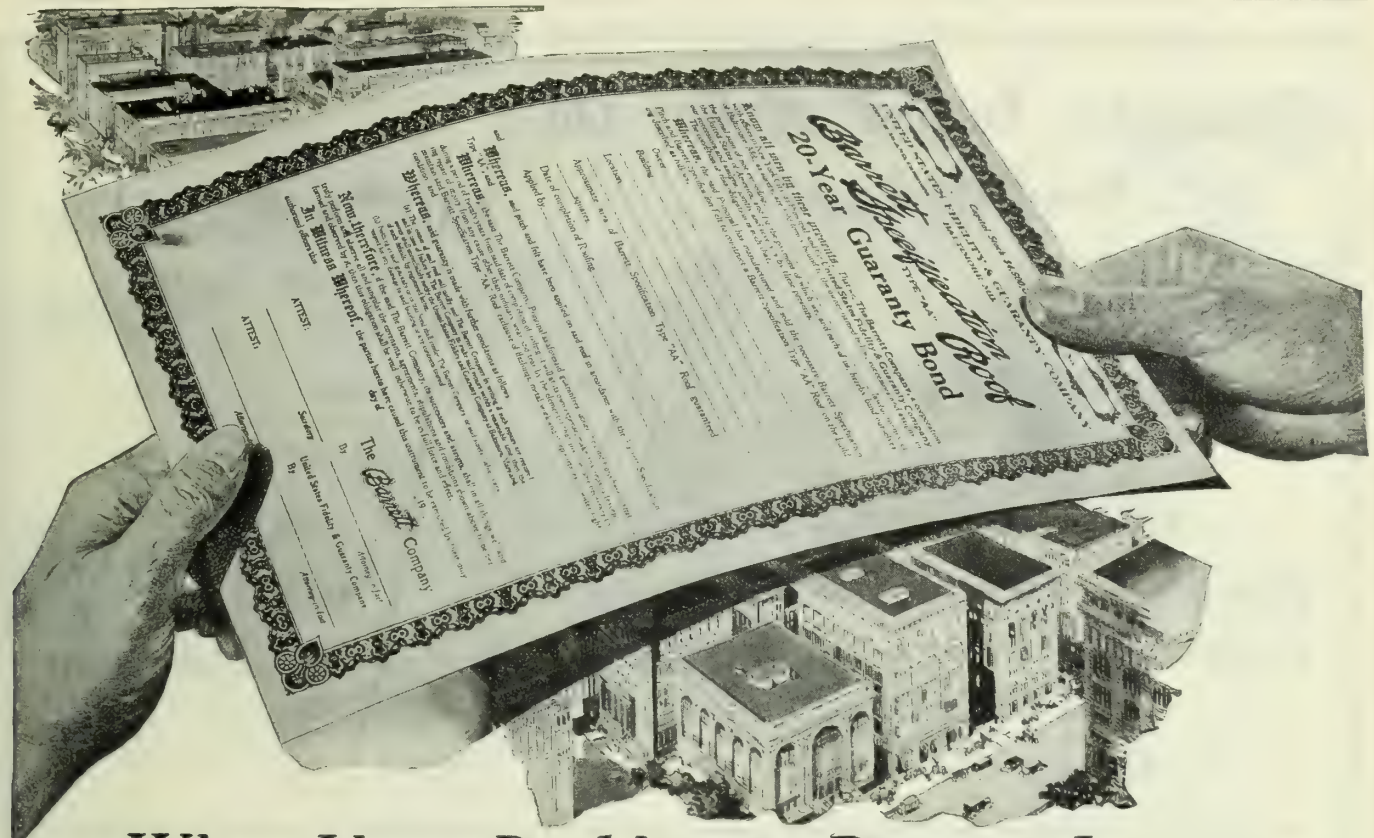

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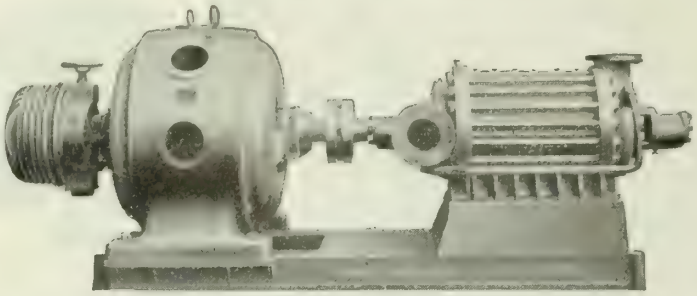

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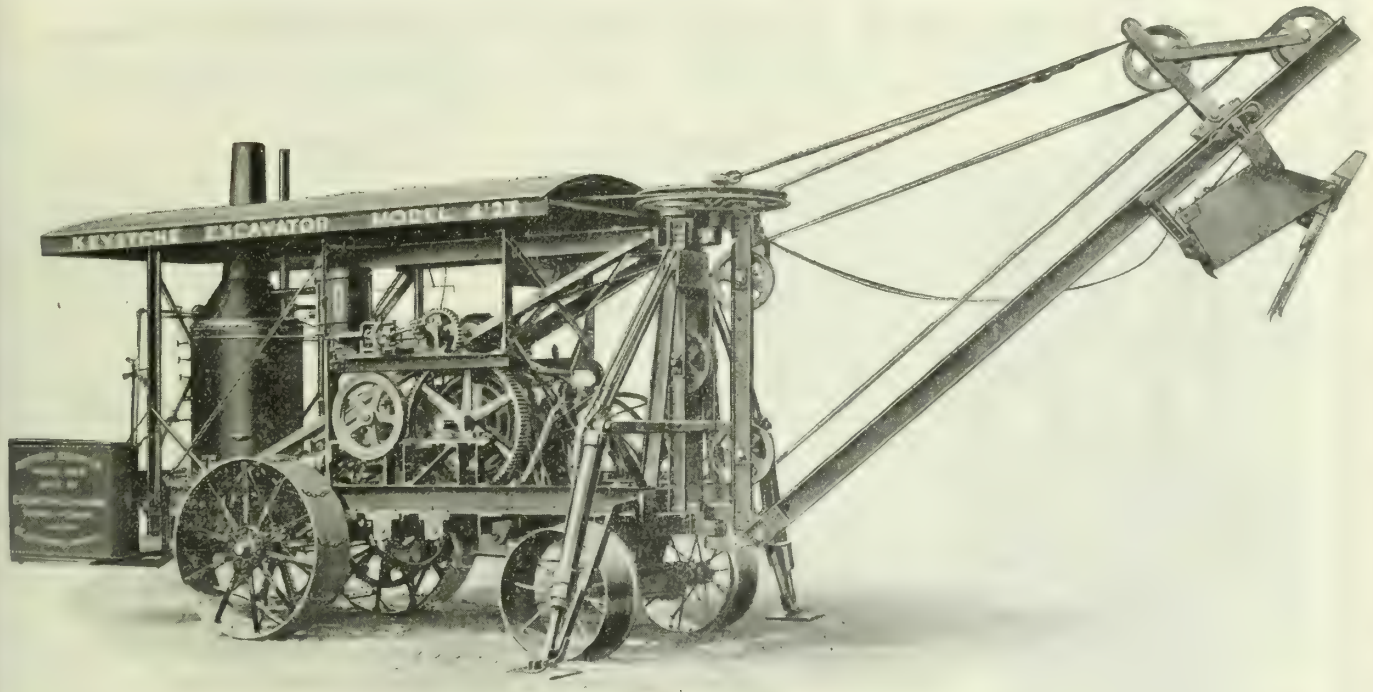

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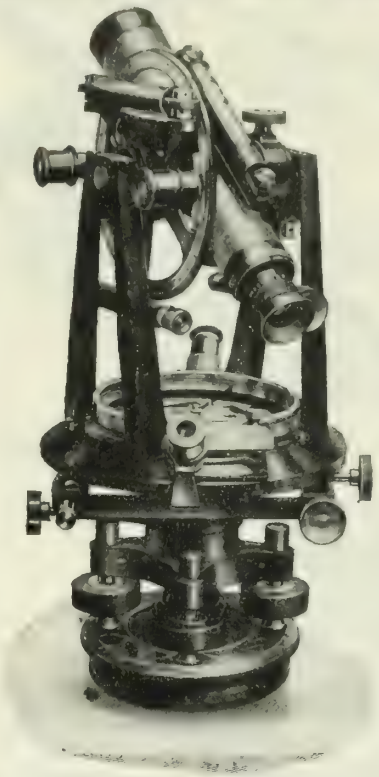

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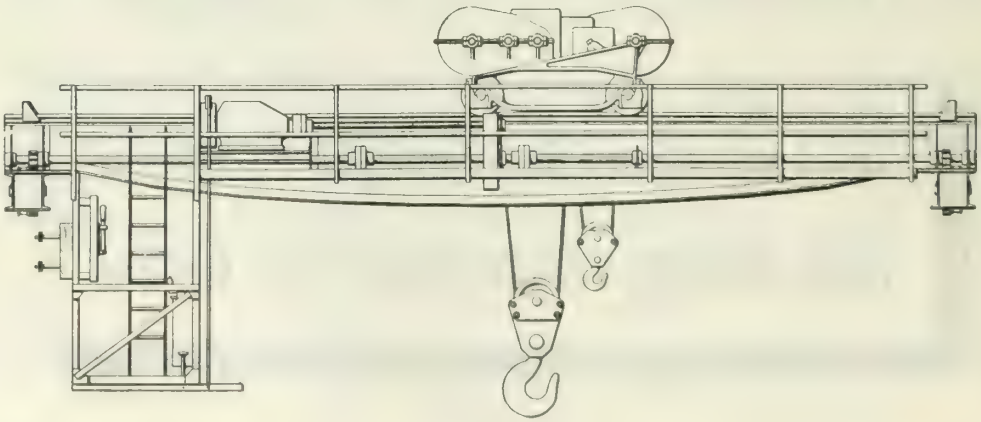

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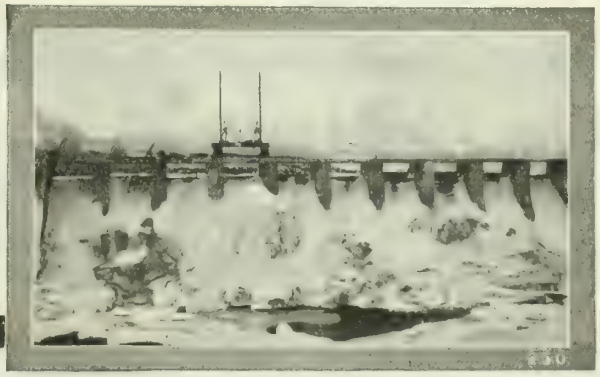

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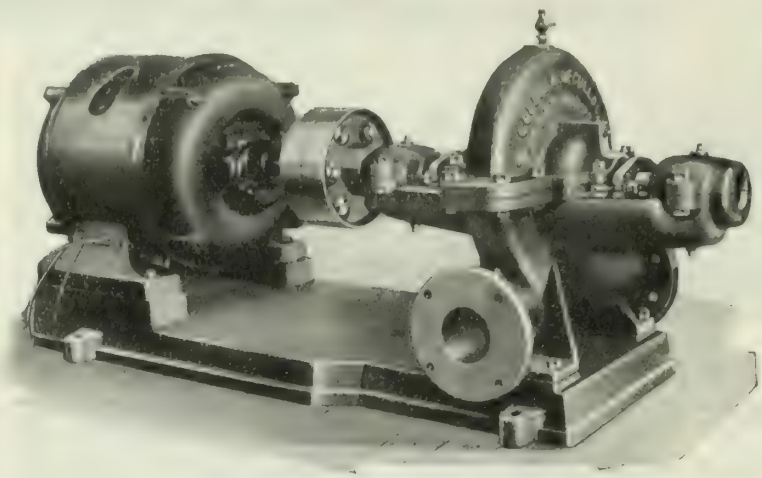

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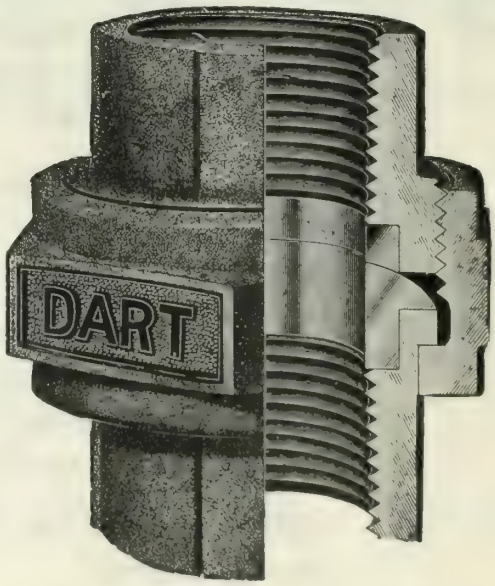

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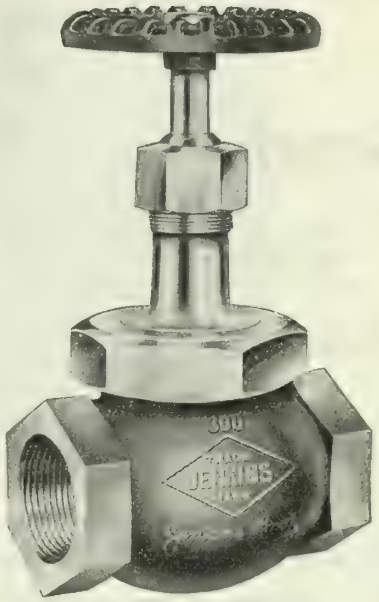

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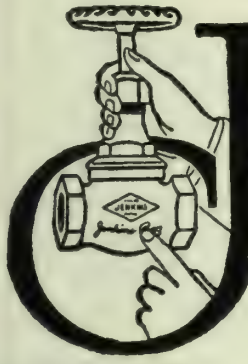

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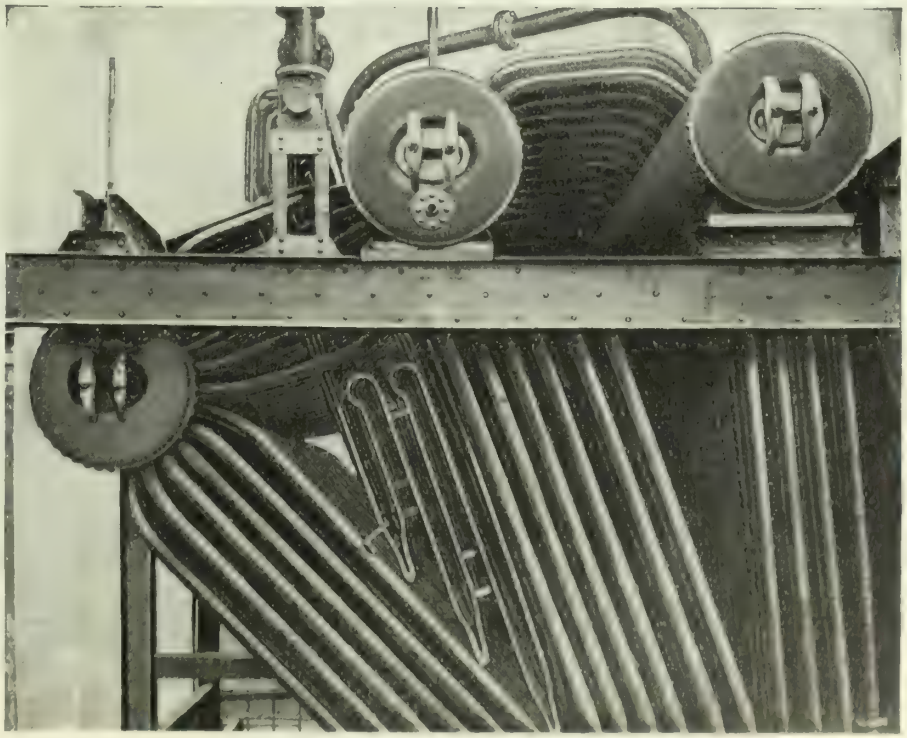

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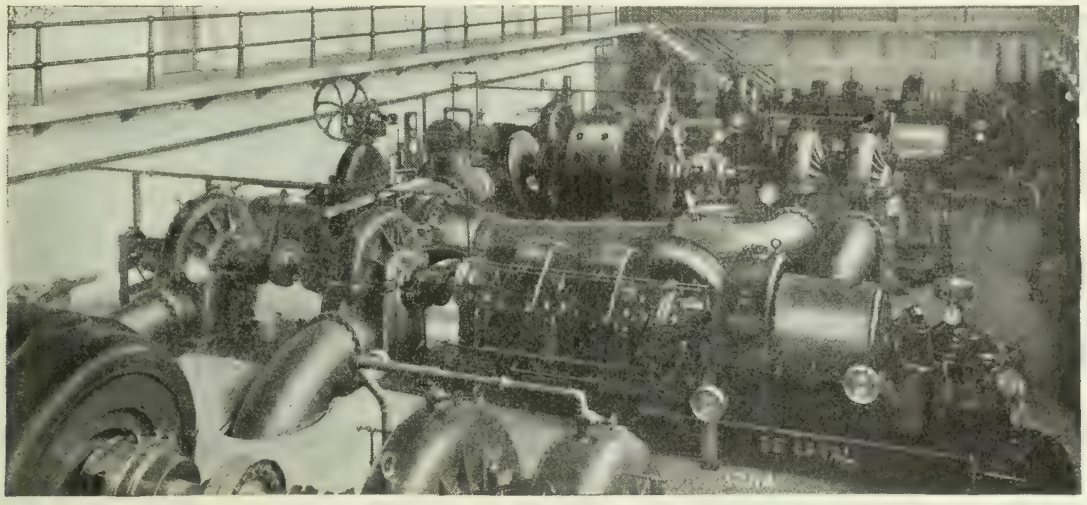

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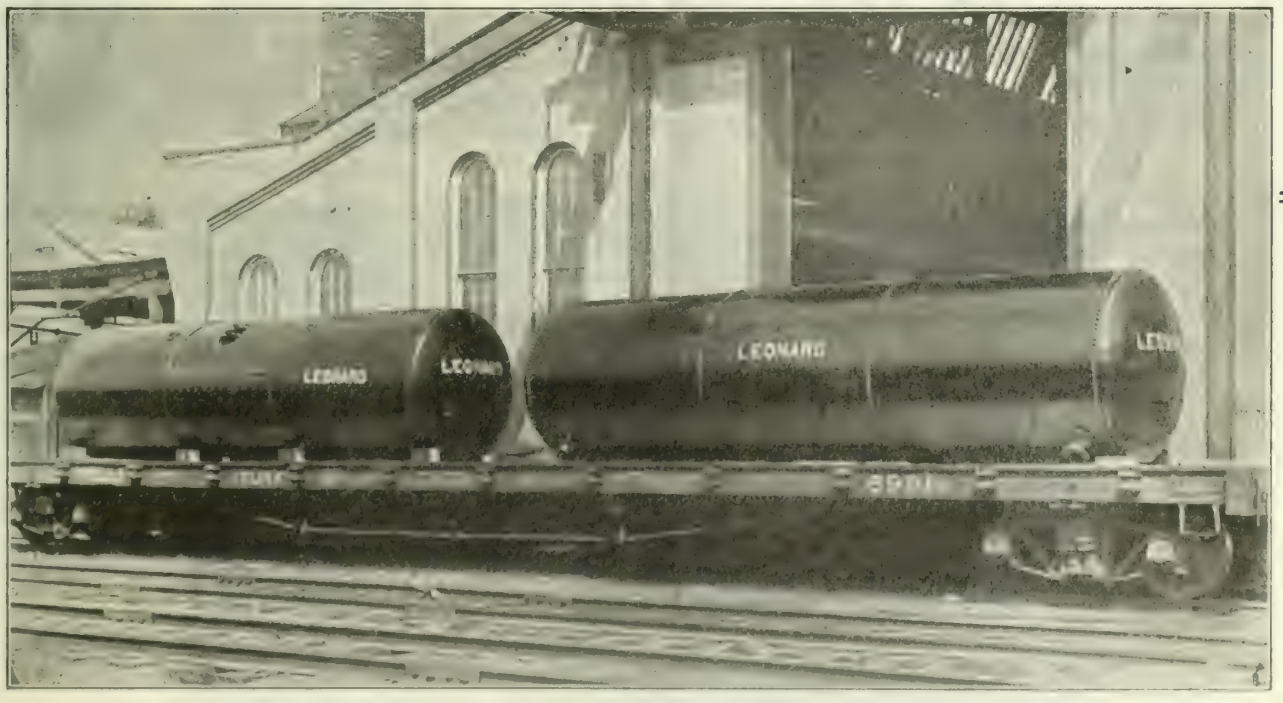
THE John Street Pumping Station at Toronto contains three De Laval Geared Turbine Driven Centrifugal Pumps having a capacity of 24,000,000 Imperial gal. each against 250 ft. head. The first unit installed was designed for a capacity of 15,000,000 Imperial gal. per day but provision was made for changing the capacity later to 24,000,000 Imperial gal. per day. This first unit, when tested by Prof. R. W. Angus in the year 1914, set the high record of 130,449,000 ft. lb. per 1,000 lbs. of steam when pumping at a capacity of 15,000,000 gal. per day, which duty had never before been reached by a steam turbine driven pump. One of the 24,000,000 gal. pumping units when tested by Prof. Angus in 1917, however, put the record up to 153,920,000 ft. lb. per 1,000 lb. of steam, which has only lately been surpassed by De Laval units of somewhat larger capacity and power. Efficiencies of over 87% were obtained at the official tests made by Prof. Angus of four 20,000,000 Imperial gal. per day motor driven De Laval pumps for 250 ft. head, recently installed at Toronto.

The De Laval Steam or Electric Driven Centrifugal Pump is the most economical means for handling water. Ask for book W-103.

De Laval
Steam Turbine Company

TURBINE EQUIPMENT CO., LTD.
73 King St., West, Toronto
THE E. LAURIE COMPANY
243 Bleury St., Montreal, Que.

261



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QUEBEC CITY

City of Quebec

Province of Quebec

Population	110,500
Total value of assessable property	$120,540,965
Building permits issued, 1921	3,693,397
Bank clearings, 1921	302,237,674
Port Statistics, Imports 1921	26,663,862
" " Exports, 1921	28,799,768
" " Duty collected, 1921	4,772,693
Number of Industries and Workshops	835
Number of Industrial Employees	18,000
Value of Production in 1919	33,126,504

QUEBEC—has plenty of electrical power at reasonable rates.

QUEBEC—means good steady labour.

QUEBEC—offers exceptional opportunities for new industries with nine railways entering the City and six miles of deep water front.

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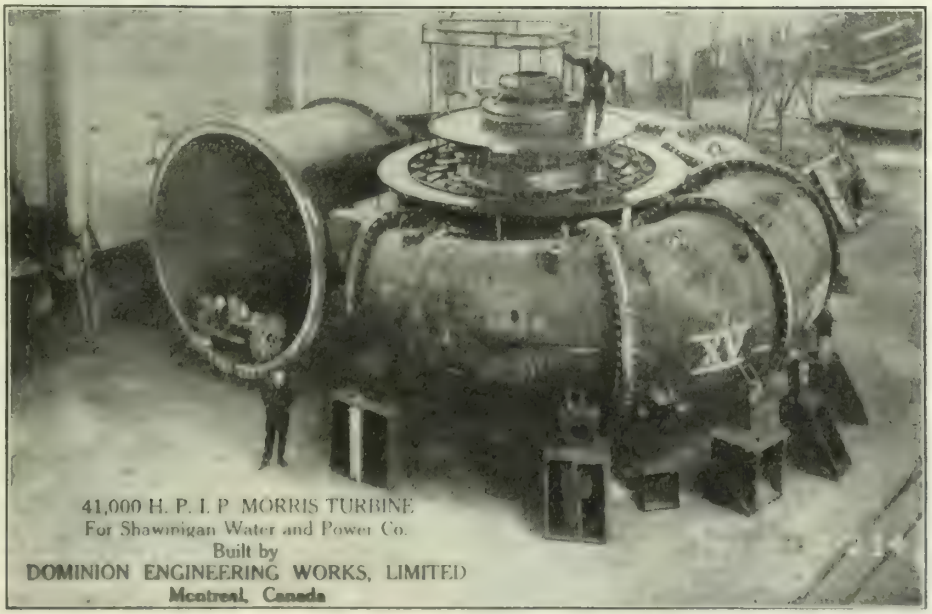

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Built by
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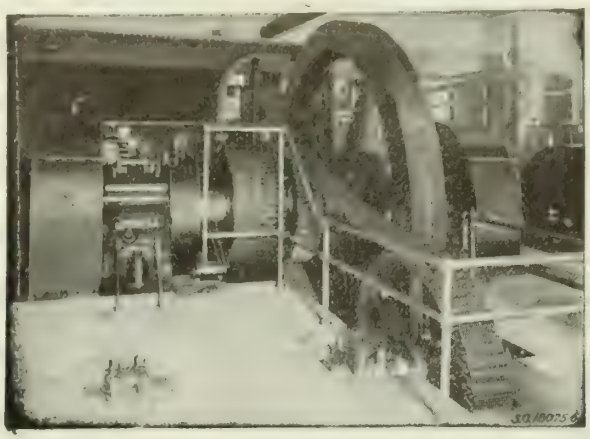

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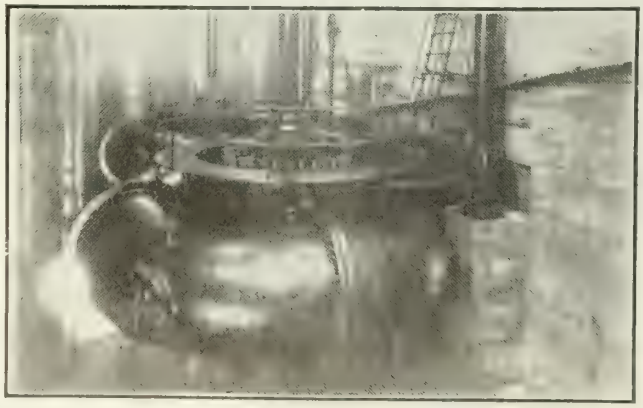

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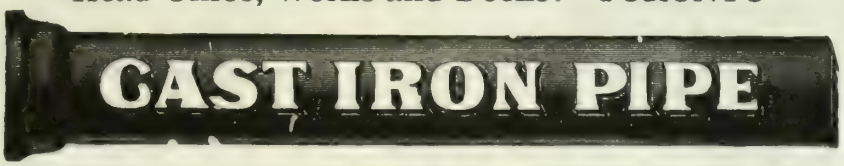

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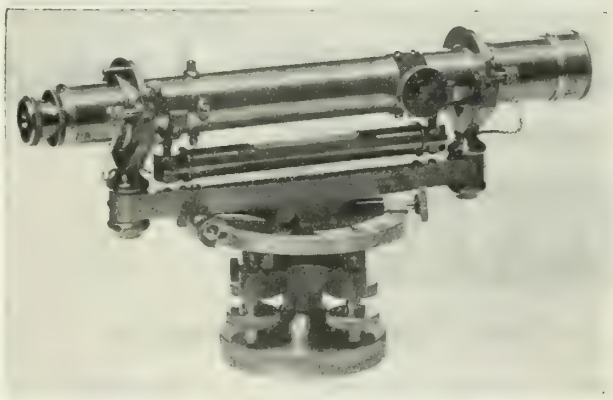
Minister: Honourable Honoré Mercier;
Deputy-Minister: Elz. Miville Dechêne;
Chief of Hydraulic Service: Arthur Amos, A.M.E.I.C.



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HEATING SERVICE
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Institute Badge

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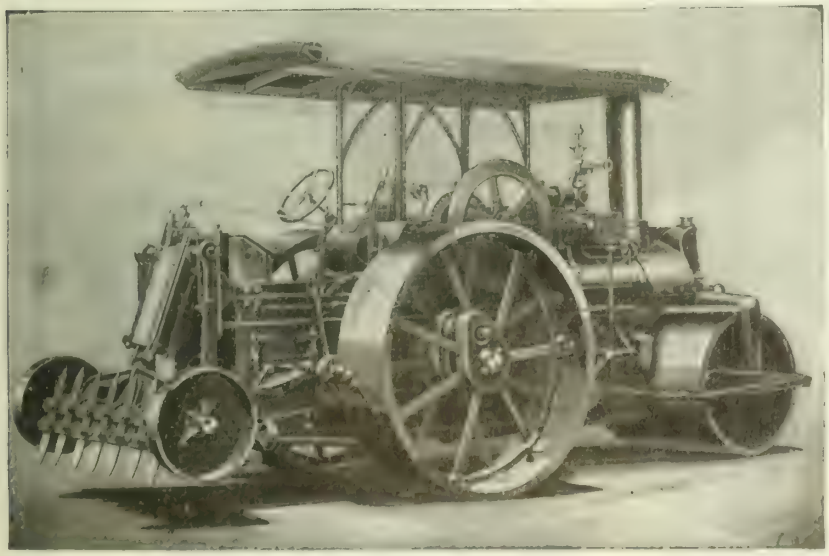

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It is the Roller for Canadian Road Work

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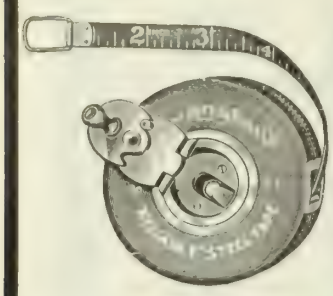

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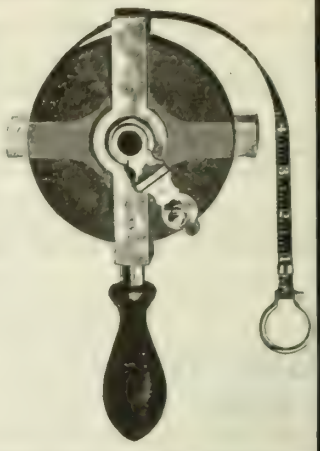

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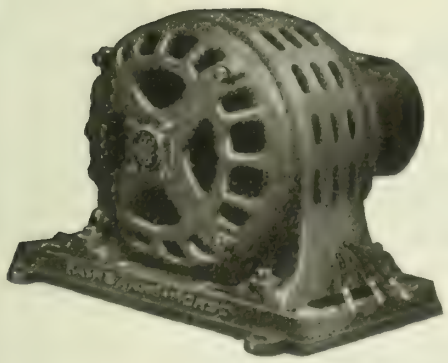

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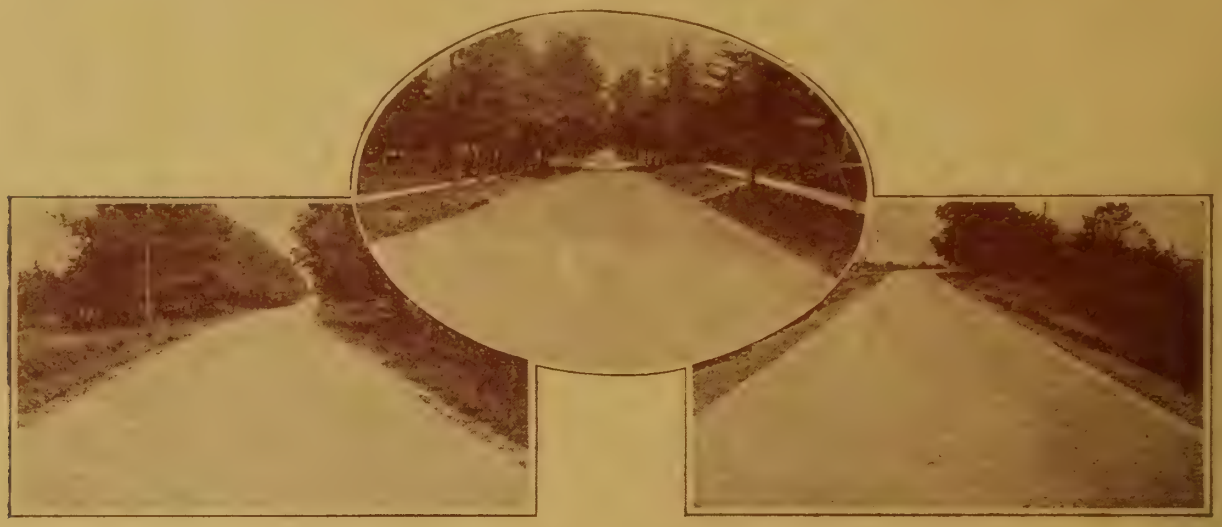

Top—Passing through Ancaster.
Left—Near Radial Station 13.
Right—At Duff's Corners.

On the Brant Highway

One of the chief links in the Ontario Provincial Highway System to be completed last year, was that section of the Brant Highway from the foot of Ancaster mountain westward through the village of Ancaster to the Brant line—and here again Asphalt was laid.

The type of construction was 3″ Hot-Mix Asphalt, (1½″ Asphalt Binder and 1½″ Sheet Asphalt) over a crushed stone base. The Asphalt driveway is 20′ wide with loose stone shoulders. The Provincial Contracting Company, Limited, carried out the contract under the supervision of Deputy Minister W. A. McLean and Chief Engineer G. Hogarth of the Department of Public Highways, and completed the work in a very capable manner and in schedule time. It was our pleasure to co-operate with our usual prompt deliveries of Imperial Asphalt.

What with the excellent workmanship and the type of pavement chosen, the Brant Highway, one of the chief outlets of the City of Hamilton, is now well equipped to serve that important area and to carry the large increase in both local and through traffic that will surely develop.

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Asphalt
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JUNE 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VI

No. 6

Here's Real News

The Hydro Electric Power Commissioners of Ontario have appointed a Sales Syndicate to advantageously liquidate all the

Equipment and Supplies

which can be released from the

Queenston-Chippawa Development

The majority of this Equipment—recently released—was purchased new and used only on the above undertaking. This is a splendid opportunity to secure really high grade, modern Machinery-Accessories and Supplies at prices that are right.

Our amended Stock List is now being prepared and we will be very glad to forward your copy, upon request. Time spent consulting this list will be time well spent. Someone will profit handsomely as those who purchase any of this "special offering" which is available are going to make one of the best purchases in their career.

We give below a general idea of what class of equipment is available.

Steam and Electric Shovels — Steam and Electric Locomotives — Air Dump Cars — Air Compressors — Channellers — Conveyors — Drills — Motors — Concrete Mixers — Concrete Cars and Auxiliary Equipment — Electric and Steam Hoists. In fact — almost everything you might require.

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Our Representatives will give every service

Put your name on our mailing list at once for complete "Sales Inventory"

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P.O. Box 109 Niagara Falls, Ont.

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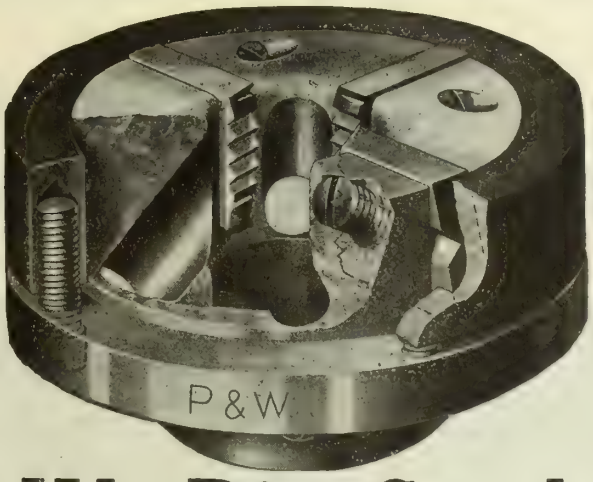


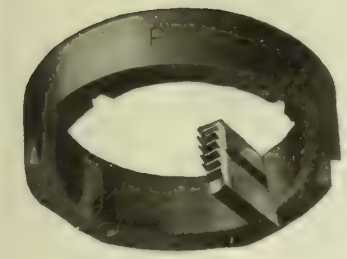
P. & W. Die Stock Dies

For Clean, Accurate Threads

THE die consists of a single piece collar and guide containing four chasers held in radial slots by set screws placed at an angle of 45°.

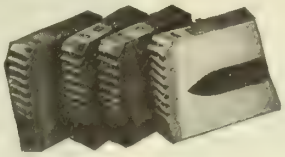
A ring surrounds the collet and in this ring are four tapered slots which match the bevel backs of the chasers. Pushing and pulling screws in the flange of the collet move the ring to permit adjusting the chasers 1/32 in. over or under standard size.

The chasers are hobbed one at a time in a separate holder in such a manner as to provide proper relief or clearance when set up in the collet. Chasers are readily removed for regrinding. Their proper location is always determined as the collet slots and chasers are correspondingly numbered. Collet is bored to correct diameter to act as a guide and thus insures true alignment.



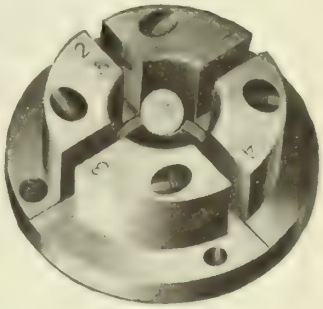
The Holding Ring

Note the taper adjusting slots for the chasers. Threaded for pulling screws.



The Chasers

Set in the holding ring to provide the correct relief or clearance. Easily sharpened on the cutting face.



The Collet

Market slots for chasers. Clearance holes for chips. Center hole bored to correct diameter for true alignment. Slot for locking in the die stock. Counterbored for pulling screws, threaded for pushing screws and tapped on an angle for chaser locking screws.

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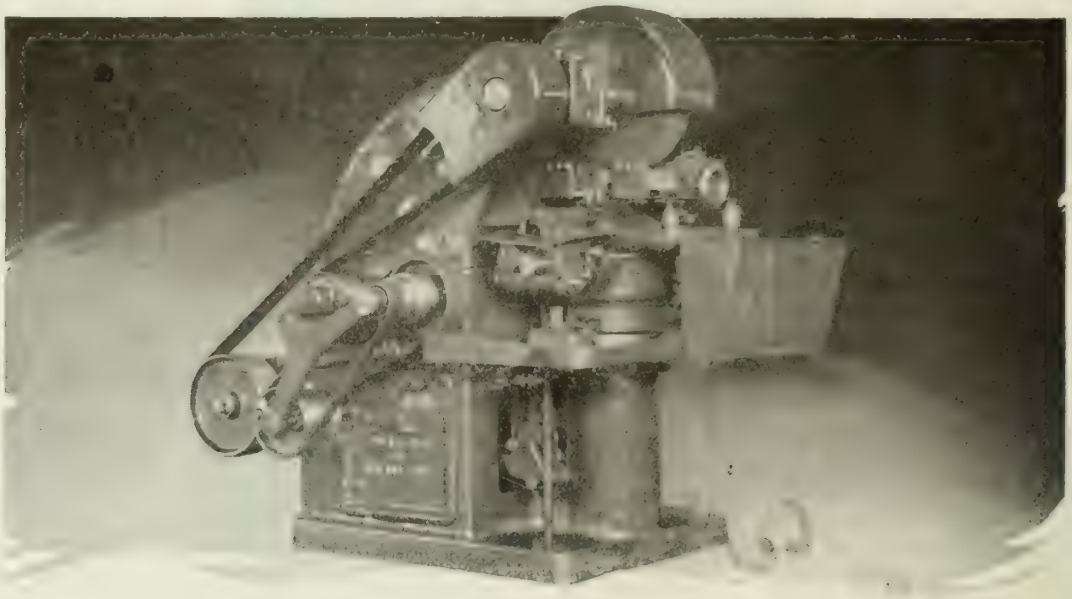

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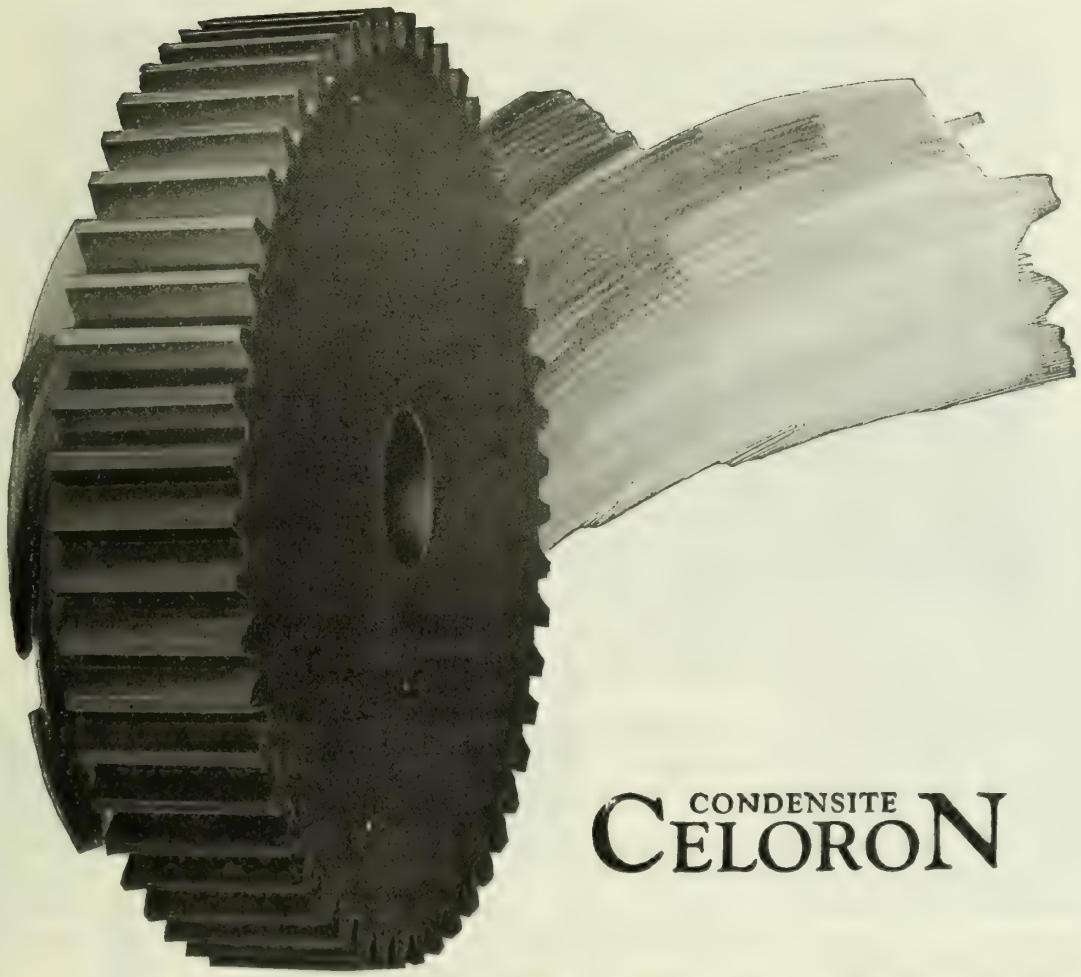

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Supreme, because of their smooth, silent operation at high speed, their durability and the economy resulting from their use.

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Domtar will assure long service from this Highway despite the exacting test to which it will be put. The first cost was most moderate and plus maintenance charges will be comparatively negligible when compared to initial expenditure for a higher priced construction.

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FRED DAVENPORT, City Engineer,
Kokomo, Indiana.

Write for complete information and quotations.

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6" to 24"
"Lock Joint"
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SEWER PIPE
"THE PIPE THAT ENDURES"

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Dorman (patented) Expansible and Flexible Joints and Piping.

Vislok the Reliable and ONLY Safety TRIPLE Lock in the World.

Will be practically demonstrated at the following LONDON Exhibitions:—

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Worn Hammers replaced at small cost without the necessity of the scrapping or regrinding of the Wave Rock Drill Body which continues workable. This is a distinct *saving in maintenance cost* compared with Compressed Air practice.

Patented in the Chief Countries of the World

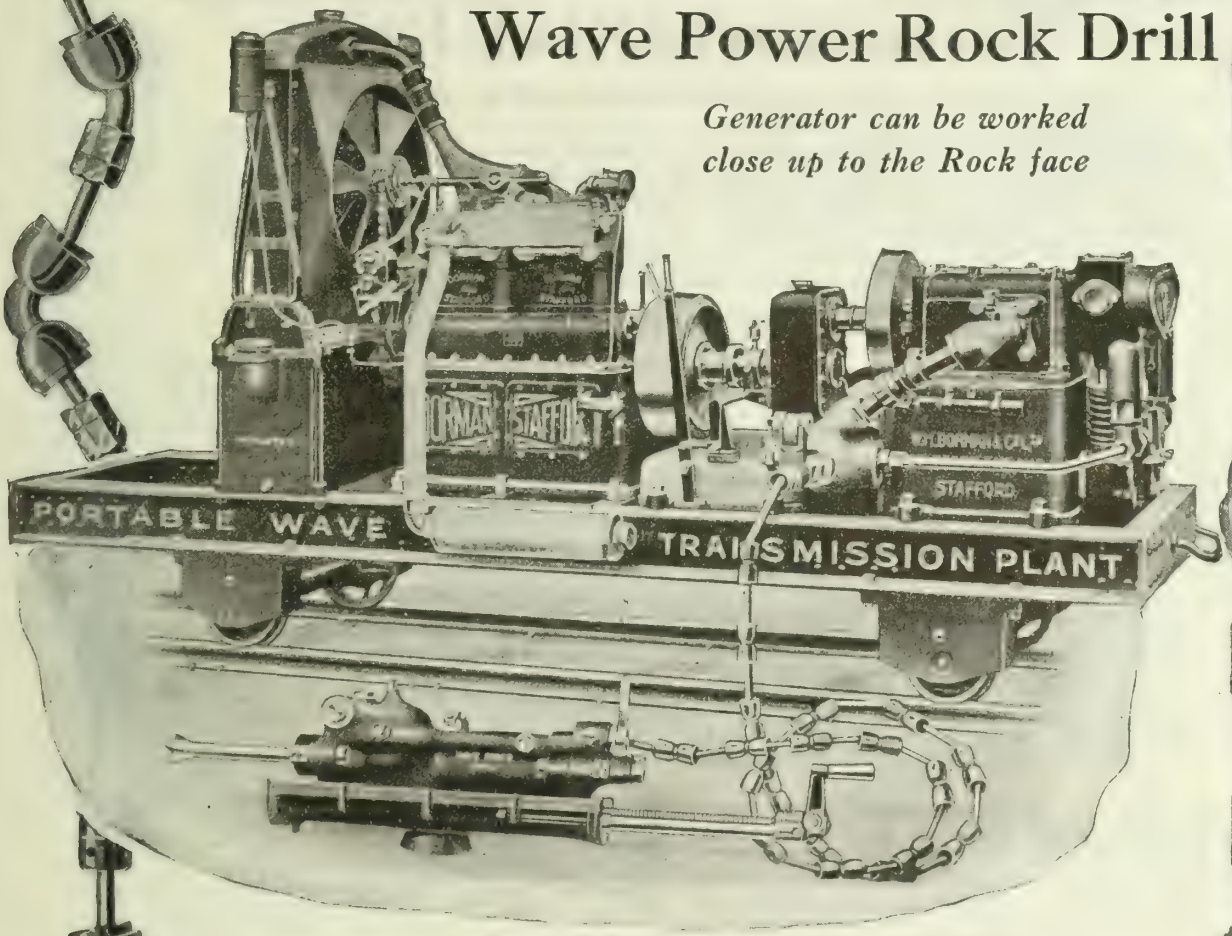
Patented in the Chief Countries of the World

Advertisements have an educational value. Read them carefully.

Saves over 50% in *Power Costs* and *Time* compared with Air Power

DORMAN Self-Contained DUSTLESS Wave Power Rock Drill

Generator can be worked close up to the Rock face



36 hp. R.A.C. Petrol Engine Wave Power Plant working THREE Drills simultaneously or separately at **2,400 blows per minute or at any frequency required.**

INDEPENDENT and AUTOMATICALLY SYNCHRONISED ROTATION of the DRILL STEELS on the return stroke of hammer. No Splines used. Any Drill Steel used from 1-in. to 4-in. bits with one chuck only. The high frequency makes for ease in collaring holes as Wave Power impulses arrive continuously at all lengths of stroke from zero.

The running Water conveying the Power converts all the rock debris into liquid sludge. Controlled by Drill Operator. Keeps Drill Cool. The bit always works on the virgin rock face.

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DORMAN Self-Contained DUSTLESS Wave Power Rock Drill

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The running Water conveying the Power converts all the debris into liquid sludge. Controlled by Drill Operator. Keeps Drill Cool. The bit always operates on the virgin rock face. INDEPENDENT and Automatically synchronised Rotation of the Drill Steels on the return stroke of the Hammer. No Splines used. Any Drill Steel used from 1-in. to 4-in. bits with one chuck only. The high frequency makes for ease in collaring holes as Wave Power impulses arrive continuously at all lengths of stroke from zero.

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A Three Drill Self-contained Wave Power Plant is permanently fixed on a Steel Frame Trolley to run on a 2 ft. 6 in. gauge railway, and consists of a 4 cylinder Dorman Petrol Engine, 36 R.A.C. rating, coupled to a Wave Generator (Patented) through an ordinary gear-box and clutch. Can be designed for Engine, under its own power, to move the complete unit any distance. Rails not necessary.

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Several separate pipe lines of 500 ft. each can be in economic use serving in rotation the several districts of the Quarry. One Drill continuously at work while the other rock faces are being cleared.

The Power Input through Generator, instantaneously and automatically adjusts itself to the varying working load to correspond with the number of Dustless Rock Drills being operated at any one time. Immediately one or more drills are shut off or temporarily stopped, the Power Input automatically reduces itself to the minimum power demanded. There is no heavy idle load.

The "Dorman" Engine is a standard design with all working parts standardized and interchangeable and giving ample reserve power. If necessary can be adapted to run on Paraffin. The Oil Lubricator of Engine and Wave Generator is automatic. The complete Generator Plant can be left unattended for long working periods. The Plant can be worked by unskilled labor. The working pressures are within perfectly safe limits. Wave Power is transmitted through "Flexstel"—a Patented Flexible Steel Pipe Line tested hydraulically up to 9 tons pressure per square inch. Wave Power can be transmitted through permanently fixed plain piping. The complete equipment is made to withstand the roughest usages of practical mining.

There are no Mechanical Springs in the Equipment as the basic scientific principle of Wave Transmission, viz., the Storage of Energy in fluids, is practically applied. A distinct feature of the Dustless Rock Drill is the independent automatically synchronized rotation of the Drill Steel. No splines used. Any standard Drill Steels can be used with any Wave Plant. The Cradle is made to suit standard rigs.

Water—the medium for carrying the Wave Power—is continuously passed under pressure down the centre of the Drill Steel to the drill point, and this supply can be controlled and varied by the operator as he works the drill. The running water helps to keep the drill cool.

The prompt and continuous clearance of debris eliminates the cushioning effect associated with air drilling, and the natural result is the drilling speed of Wave Power correspondingly increases. The drill always works on the virgin face of the rock. Dry drilling, if required can be done on a closed Water Pipe Line, and does not involve any serious or expensive alterations in the Wave Equipment.

Wave Power reliably secures dustless rock drilling without extra water cost. With certainty it eliminates all dust, and effectually overcomes the cause—dry dust—that creates miner's Phthisis—the dreaded disease peculiar to the Mining Industry.

Actual comparative drilling results on hardest Cornish Granite show a saving in power and time of more than 50% over compressed air. On the basis of equal power consumption the drilling results by Wave Power are more than double that by compressed air.

Wave Plants work with any ordinary Drill Steels varying in diameter from 1 inch to 4 inches at 2,400 blows per minute or whatever number of blows conditions require. One Chuck is only necessary for the whole range of Drill Steel sizes named.

Regular working Drilling speeds in **hardest Cornish Granite** as follows. In quarries, other than granite, these speeds are exceeded.

Diameter of Bit.	Rate of Penetration.	Diameter of Bit.	Rate of Penetration.
4 in.	2 ins. per minute	2 in.	10 ins. per minute
3⅝ in.	3 ins. per minute	1½ in.	14 ins. per minute
3 in.	4 ins. per minute	1 in.	18 ins. per minute
2⅝ in.	6 ins. per minute		

Where drilling hole traverses fissures or joint planes or drilling near a faulted zone there is reduced jambing of Wave Drill.

The Wave Generator can be driven by Electric Motor or any form of Prime mover

Patented in the Chief Countries of the World.

Patented in the Chief Countries of the World.

Advertisers appreciate the engineer's purchasing power.

DORMAN Self-Contained DUSTLESS WAVE POWER ROCK DRILL

Generator can be worked close up to Rock Face

INDEPENDENT and Automatically synchronised Rotation of the Drill Steels on the return stroke of the Hammer. No Splines used. Any Drill Steel used from 1-in. to 4-in. bits with one chuck only. The high frequency makes for ease in collaring holes as Wave Power impulses arrive continuously at all lengths of stroke from zero. The running Water conveying the Power converts all the rock debris into liquid sludge.

Controlled by Drill Operator. Keeps Drill Cool. The bit always operates on the virgin rock face.

DUSTLESS Drilling without Increased Equipment or Power Costs.

WAVE POWER COSTS compared with COMPRESSED AIR POWER COSTS

Using Electricity as the motive Power at 3d. per unit, Wave Power shows a Saving of the Power Costs alone of approximately 16/- per 100 feet when horizontally drilling short holes (4 feet deep). With deeper holes (20 feet deep) and fewer changes of drill bits Wave Power would show greater savings of the power costs than 16/- for each 100 feet drilled.

DOWN HOLES drilled by this plant to a depth of 20 ft. at Double the Speed of a Steam Driven Piston Drill

Comparative tests have been made by an Independent engineer of a Wave Power Rock Drill with the latest pattern of a Compressed Air Drill, both horizontally drilling the same diameter holes, and using same steels, through a 4 foot thick block of hardest Cornish Granite. The Wave Power Generator and Air Compressor were driven by an electric motor. In each case 4 steels were used, starting with a 2 inch bit and finishing with 1½ inch bit.

The power both consumed when drilling and with the drill shut off was recorded and results in units given below	COMPRESSED AIR	WAVE POWER
a. Time drilling hole through 4 ft. block including time to set up drill for next hole	17 minutes	10½ minutes
b. Net drilling time	13 minutes	6½ minutes
c. Time occupied in changing Steels and setting up drill for next hole	4 minutes	4 minutes
d. Power consumption when drilling	17.78 K.W.	11.9 K.W.
e. Power consumption when drill was shut off	6.97 K.W.	7.0 K.W.
f. Power cost when drilling in units (K.W. hrs.) $\left(\frac{b \times d}{60}\right)$	**3.85 units**	**1.29 units**
g. Power cost when drill shut off $\left(\frac{c \times e}{60}\right)$ in units	.464 units	.467 units
h. Total power cost (f + g)	**4.314 units**	**1.757 units**

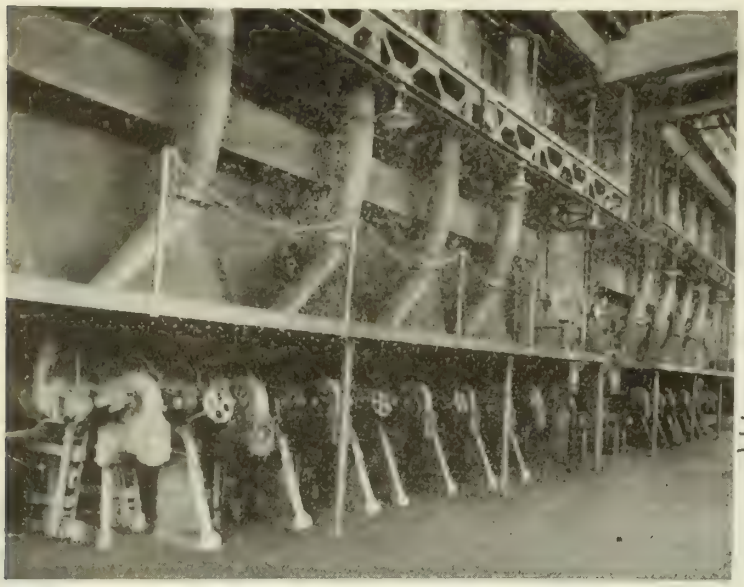
Wave Power drills at twice the speed when using only two-thirds of the power consumed by Compressed Air both working under the same conditions *viz.*, 6½ minutes compared to 13 minutes taken by Compressed Air, therefore, Drilling by Wave the Power cost is only one-third the cost of drilling by Compressed Air, *viz.*, Wave Power costs 1.29 units whereas Air Power costs 3.85 units per foot drilled.

Including the time and power for changing steels (4 minutes in each case) the inclusive power costs are 1.757 units per foot drilled for Wave as compared to 4.314 units for Air. Wave Power costs are only 40% of Compressed Air Power costs per foot drilled, therefore conservatively stated Wave shows savings in Power and Time alone of more than 50%.

There are no Mechanical Springs. Lower Maintenance costs. Absolute Portability. The plant can be worked by unskilled labor and the working pressures are within perfectly safe limits. Fine fitting pistons not necessary thereby reducing maintenance costs. Wave Power Hammer is water lubricated.

Where the drilling hole traverses fissures or joint planes or drilling near a faulted zone there is reduced jambing of Wave driven drill.

Worn Hammers replaced at small cost without the necessity of the scrapping or regrinding of the Wave Rock Drill Body which continues workable. This is a distinct *saving in maintenance cost* compared with Compressed Air practice.



Firing aisle in the Delaware Station of the Philadelphia Electric Co., Taylor Stokers, of course.

Repeat Orders show the Taylor Stoker is the Best Salesman we have

Once the Taylor Stoker is installed in a plant invariably many more follow.

Since 1908, when the first installation was made in the Schuylkill Station of the Philadelphia Electric Company, repeat orders have been placed every year except three, up to the present time.

In the four large plants of this Company, supplying light and power to the most concentrated manufacturing center of its size, probably in the whole world, are 82 Taylor Stokers serving more than 76,000 rated B.h.p.

The great percentage of repeat orders, that we receive regularly from plants large and small in a variety of industries, is one of the most convincing reasons we can offer why you should select for your plant

The Taylor Stoker

"The Pioneer Underfeed Stoker ---and still leading"

Just the Kind of Data You Want

Do you want to read how some boiler plants whose problems are much the same as yours have lowered power costs, increased combustion efficiency, materially increased output without adding to building space or boiler equipment, made boiler output absolutely dependable under everyday operating conditions as well as in the emergency?

Forty-five pages of such FACTS, actual experiences worked out in tons of coal and horsepower, with the results measured in dollars and cents, are interestingly brought out in our publication, "Are Mechanical Stokers a Good Investment?" We shall be glad to send you a copy and know you'll appreciate it. A line brings it.

THE TAYLOR STOKER COMPANY, LTD.

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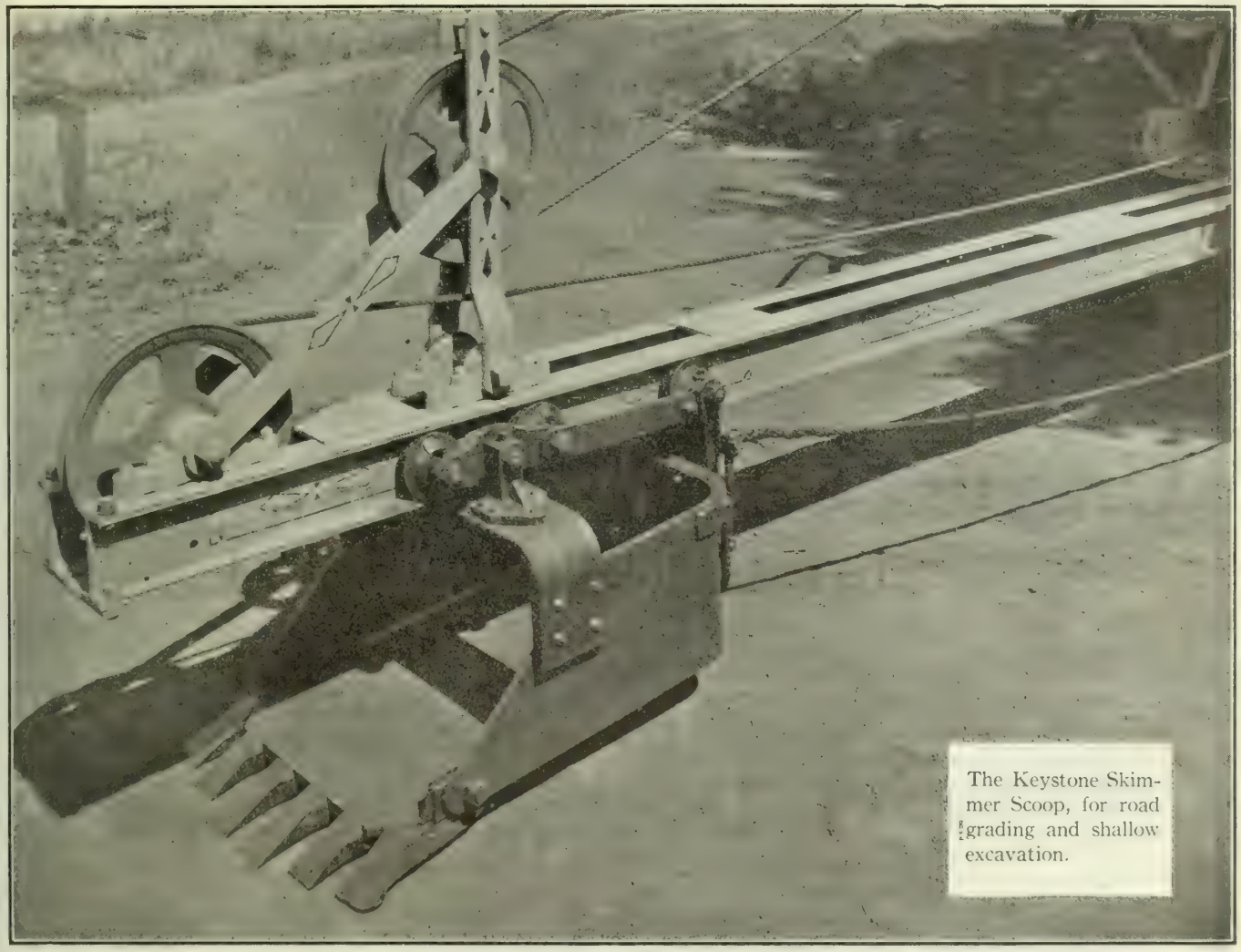

The Keystone Skimmer Scoop, for road grading and shallow excavation.

The Keystone Excavator's

New Skimmer Scoop

The reserve of power in the sturdy Keystone Excavator Model 4'23 has made it possible to fit a new, improved Skimmer Scoop of larger capacity.

The new Skimmer Scoop has a capacity of 5/8 yard at one thrust. Smooth, sure operation, and extra strength are ensured by six rolls with equalizing bars. Flat bale increases clearance and new and heavier design of teeth effectively adds to the excavating powers of this sturdy "digger."

The Keystone is a moderately priced Excavator, but it has all the punch needed to handle 95% of the excavation work in Canada.

Remember—4 different scoops: Skimmer, Excavator or (Ditcher), Dipper, Clamshell Bucket—can be used with the 32 h.p. steam traction Keystone. Send for new illustrated folder.

Skimmer Scoop raised for dumping.

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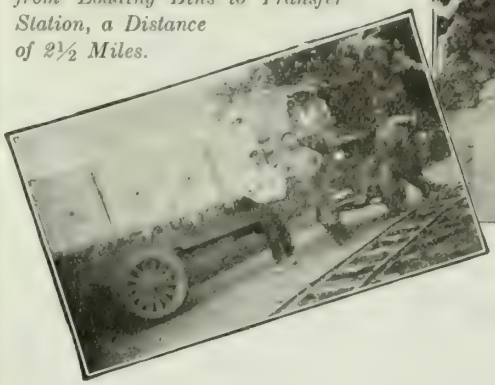
Five-Ton Trucks Hauling Batch Boxes from Loading Bins to Transfer Station, a Distance of 2½ Miles.



Batch Boxes at Cement Station Taking on Cement

Transfer Station Unloading Batches from Trucks to the Industrial Railway

Unusual Construction Features
in Thamesville Concrete Road

A splendid example of concrete highway work, the 2½ mile road between the C.P.R. Depot at Thamesville and the Wabash track running from Thamesville to Dresden, was handled in a method that commends itself for both economy and speed.

For the portion completed in 1922, the sand and stone—measured at the stock pile—and loaded into "batch boxes"—were carried over the 2½ mile stretch already completed, in motor trucks.

Arriving at the end of the finished section of road, these batch boxes were transferred to an industrial railway. Cement was picked up a little further on and the flat cars then travelled over the narrow-gauge track to the point where the mixer was at the moment working.

As the newer section of the road was gradually extended, the railway track was taken up and relaid from the end of the finished road to the advanced position of the mixer.

By this means, the "truck haul," which at first was only 2½ miles to the transfer station, gradually was extended; the 5-ton trucks taking their loads of batch boxes farther and farther as the road advanced and as the transfer station was moved along.

The contractors were Merlo, Merlo & Ray Limited, of Walkerville.

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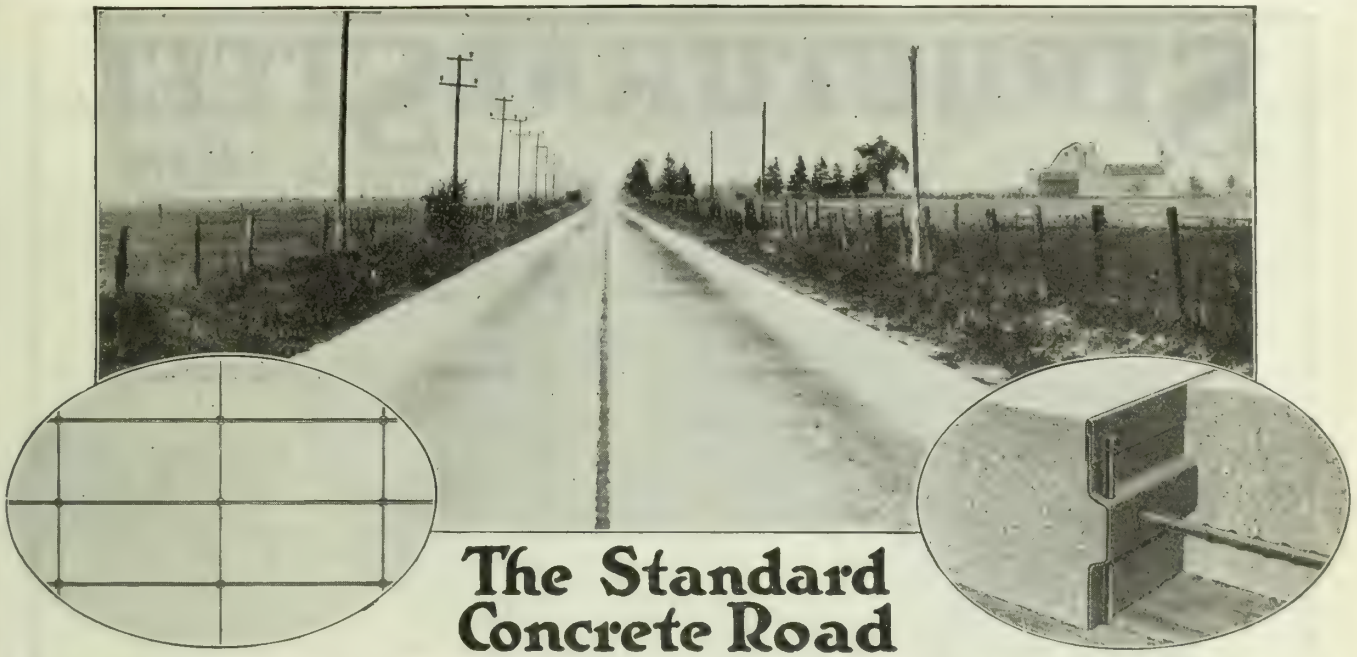

The Standard Concrete Road

Reinforced with Flat Sheets of Truscon Wire Mesh

Truscon Wire Mesh, furnished in flat sheets cut to lenght, saves time and labor; no cutting, straightening, uncoiling, etc. Rigidly connected joints keep sheets true and flat. Weights and areas as desired.

Contraction Joints Formed by Truscon Contraction Plates

Provide a definite plane of weakness in the pavement and thus form a straight regular crack for contraction and expansion. Used longitudinally, they offset lifting of pavement edges from the sub-grade and act as a permanent traffic marker. Truscon Contraction Plates are rigid, substantial, easy to install.

Trussed Concrete Steel Co. of Canada Limited

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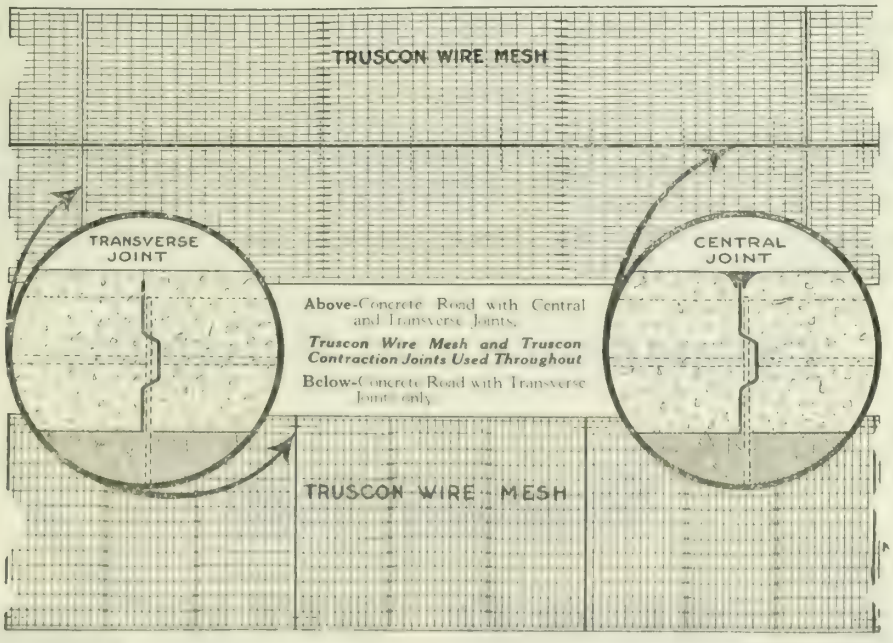
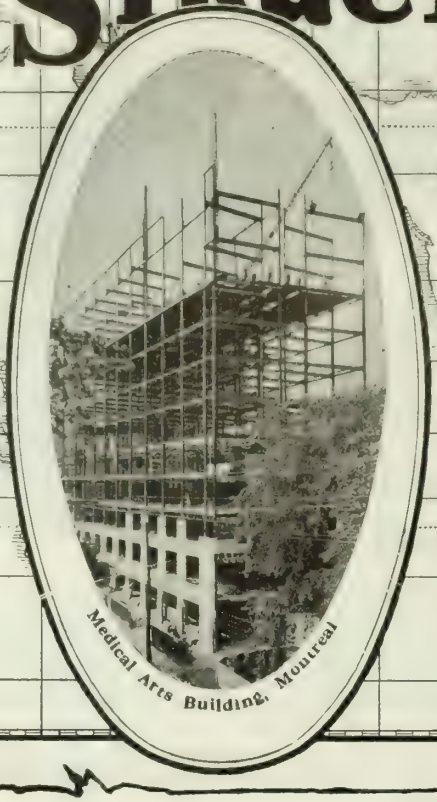
Branches: TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER



Truscon Wire Mesh and Contraction Joints

STRUCTURAL STEEL IS USED THE WORLD OVER



STRUCTURAL STEEL IS USED THE WORLD OVER. IT IS USED WITH EQUAL ECONOMY AND RELIABILITY IN SMALL STRUCTURES AS WELL AS LARGE ONES—BUILDINGS, BRIDGES, TANKS, CONDUITS, RAILWAY TIES, ETC., ETC.

THE CITY OF NEW YORK, FOR EXAMPLE, HAS MANY LARGE STEEL BRIDGES AND MAMMOTH BUILDINGS. ANOTHER NEW STEEL BRIDGE OVER THE EAST RIVER AT FOURTH ST. IS NOW PROPOSED. THE COST OF THIS STRUCTURE WILL BE ABOUT $41,000,000. THIS IS A FURTHER TRIBUTE TO THE WORLD-WIDE CONFIDENCE IN THE

Permanence and Reliability of Structural Steel

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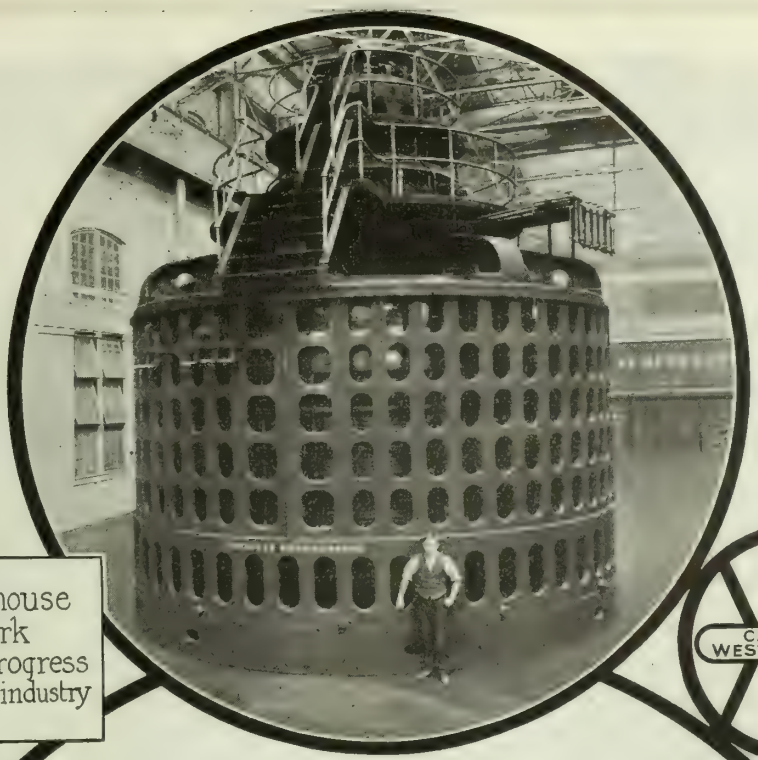
Issued by the
Structural Steel Association



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CANADIAN WESTINGHOUSE

New Forces From Old Sources

Fire and water are the sources of energy which have raised civilization out of barbarism and savagery.

For generations man used them clumsily through machinery that was expensive to operate, limited in capacity and extremely local in application. Today, we are entering upon a new age of greater achievement because we have learned to translate natural resources into a more efficient, economical and convenient form of energy—Electricity.

For electricity can be generated at low cost, transported to greater distances, transformed at will into light, heat and power.

Herein is one of the great contributions to civilization of the Westinghouse organization in that it did not confine its activities to the designing of apparatus for the use of electricity alone. It went back of the current to the primal source—that power might be more widely distributed.

The Westinghouse Company was the first to turn the power of Niagara Falls to man's advantage. Westinghouse turbine-generators in central stations and power plants utilize steam more economically and turn it into the alternating-form of current which, largely through Westinghouse engineers, has made possible the wide distribution of light, heat and power.

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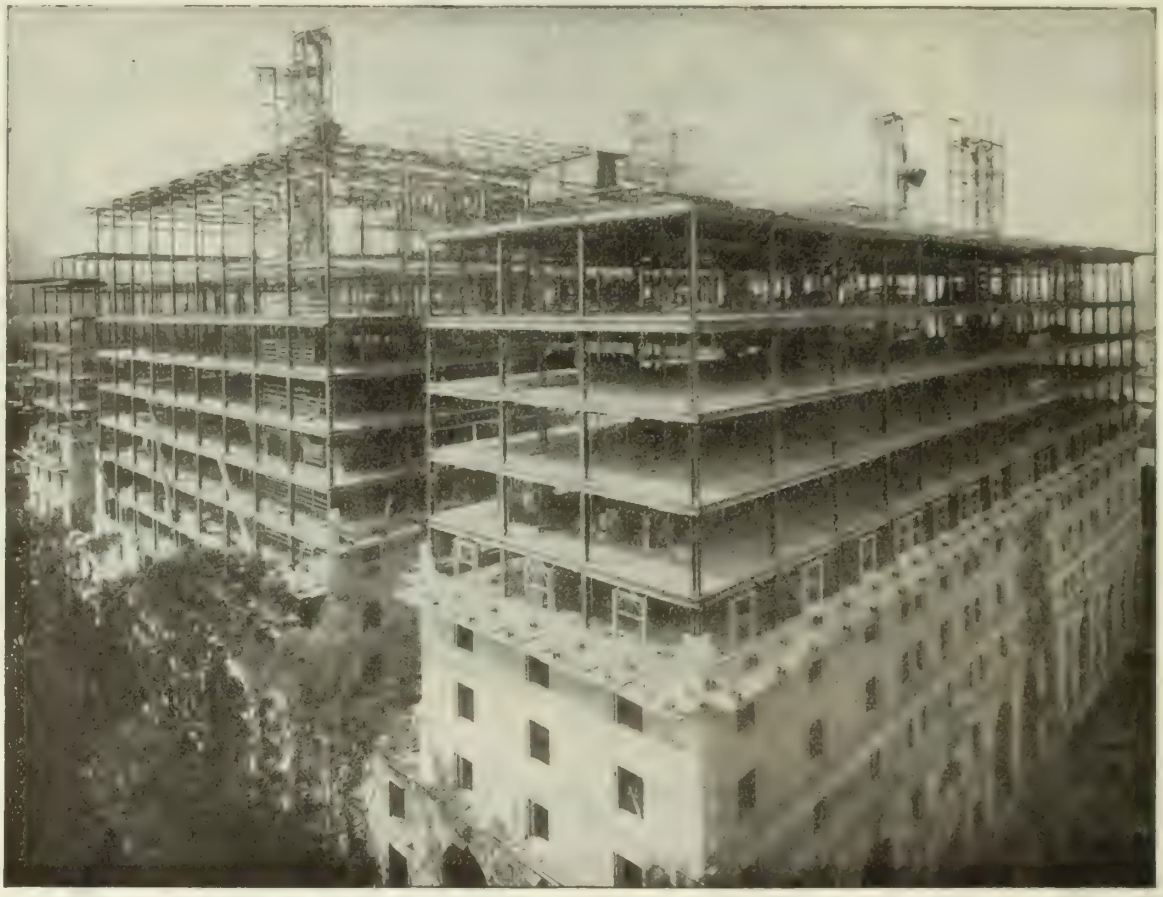
The Westinghouse Trade Mark is your guarantee for all things electrical

Westinghouse

The advertiser is ready to give full information.



Mount Royal Hotel
Montreal

Architects—Ross & MacDonald
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Architects and engineers the country over—and building owners as well—pin their faith on SUPERIOR GRAPHITE PAINT, because they know through experience and observation it can be used with definite assurance of service and satisfaction.

On this basis it is not surprising that SUPERIOR GRAPHITE PAINT was selected for the protection of the structural steel used in the Mount Royal Hotel. Its service record in many of the representative structures throughout the country was a determining factor in its selection.

SUPERIOR GRAPHITE PAINT is one of the DEGRACO line of dependable paints, which includes STA-WHITE—the light reflecting paint that stays white; DEGRACO-TONE-flat wall paint; Degraco Brick and Concrete Paints; Degraco House Paints and Varnish; Dampproof Coatings, Enamels—in fact, paints in all colors for all purposes.

DEGRACO PAINTS are sold through branch offices, with warehouse stocks in all principal cities. Their use eliminates the hazard of experiment.

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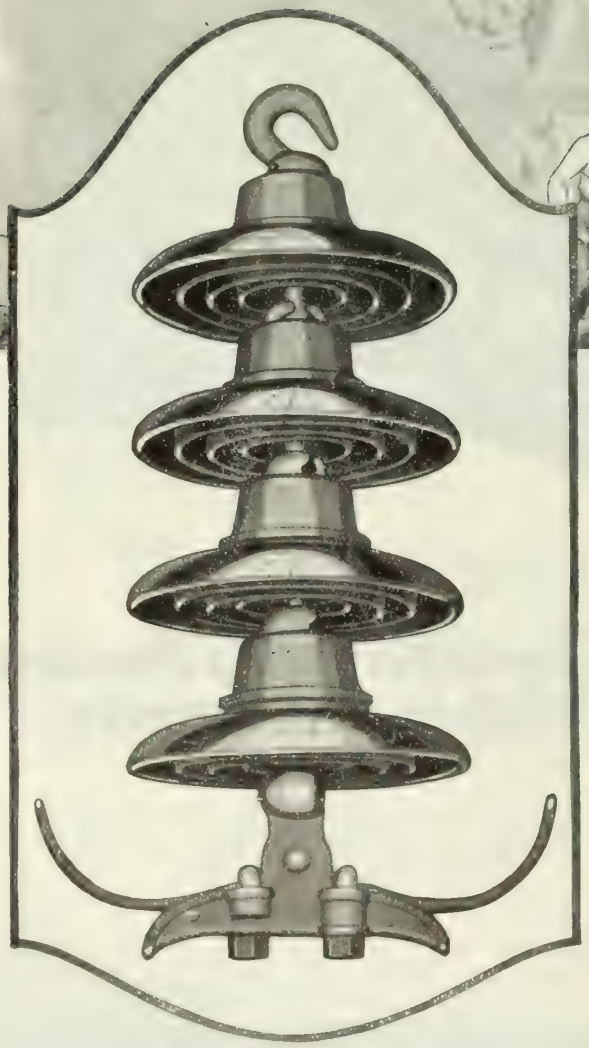

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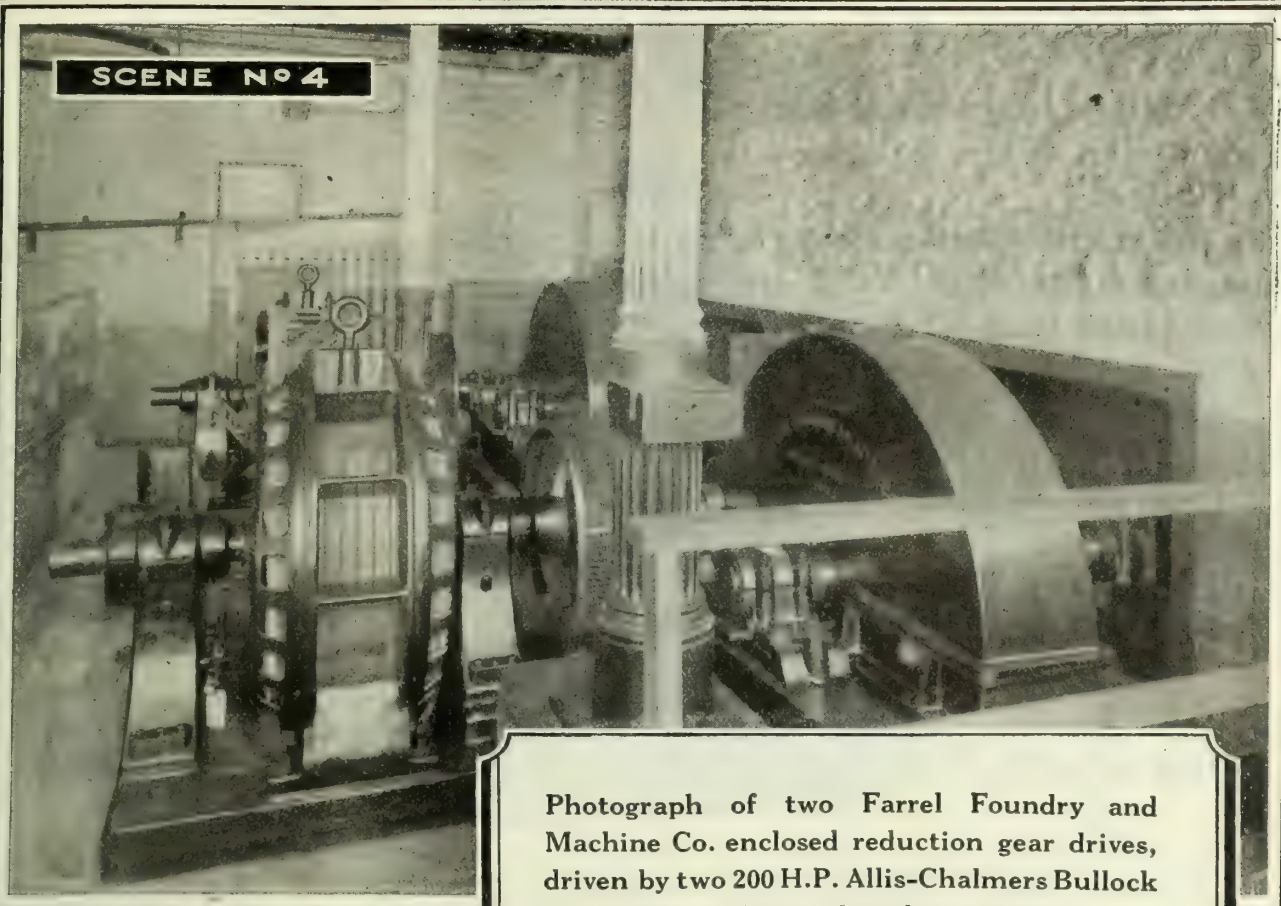

Photograph of two Farrel Foundry and Machine Co. enclosed reduction gear drives, driven by two 200 H.P. Allis-Chalmers Bullock A.C. Motors. Motor Speed 290 R.P.M.

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Imperial Renown Oil.
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We Give Guarantees under Bond as to Watertightness of our lines.
We guarantee under Bond to maintain for One Year the Pipe Lines that we Build.

WE SELL PIPE LINES not unit lengths of pipe.

Pipe Lines of Reinforced Concrete

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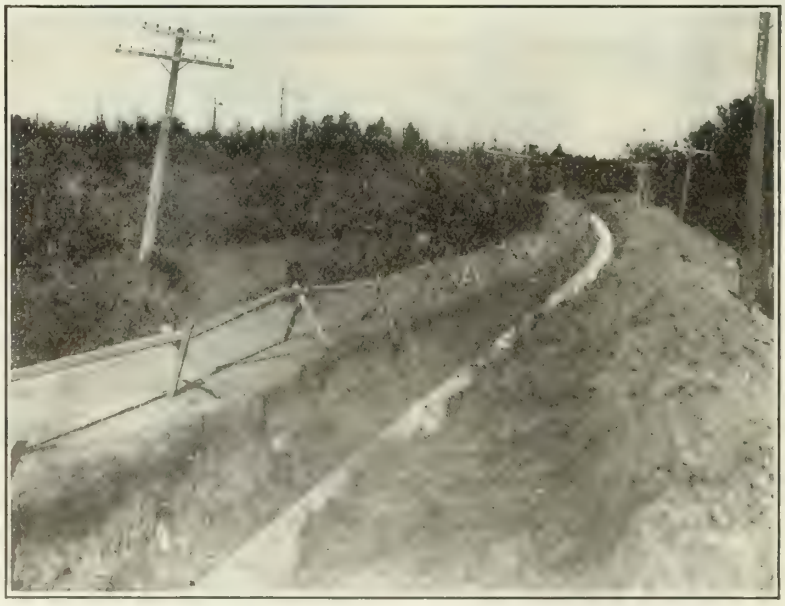

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Pressure Pipe Needs.

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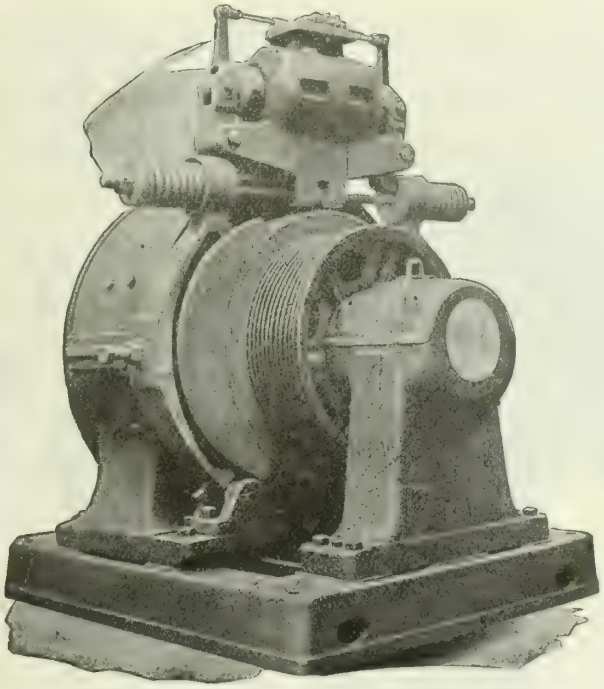

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With Variable Voltage Control

These elevators meet the most exacting demands of high speed elevator service. The acceleration and retardation of car is remarkably smooth and the wide range of speeds (the lowest being from 15 ft. to 30 ft. per minute) enables the operator to make accurate stops at landings. Levelling devices are therefore unnecessary. As the starting current never exceeds full load running current, Turnbull Elevators do not require nearly as much electric power to operate as elevators using armature resistance.

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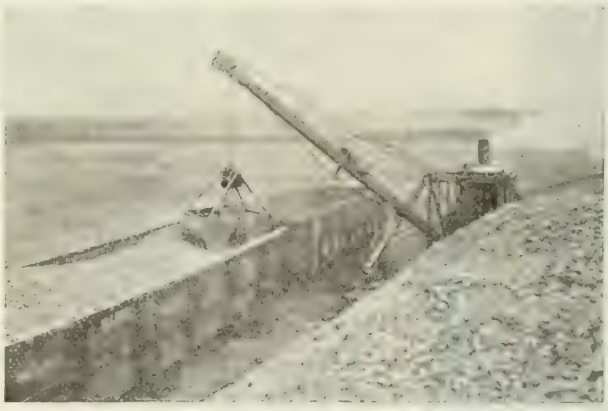

We can offer you a varied line of Handling Equipment.
For instance:

BYERS CRANES

Full Revolve and Half Circle.

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The TRUCKRANE for mounting on your own truck.

Byers Cranes can be used for loading, unloading, excavating, hoisting, etc., etc.

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ROAD MACHINERY OF ALL KINDS.

Send us your inquiries.

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The Standard of Quality

Type H

Type H Transformers, through many years of satisfactory service, have earned an enviable reputation, resulting in their being regarded as the standard of quality. Large central stations, and operating companies specify Type H Transformers because of their long life, and excellent operating characteristics. Low depreciation rates, and uninterrupted service will eventually win on any system.

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ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

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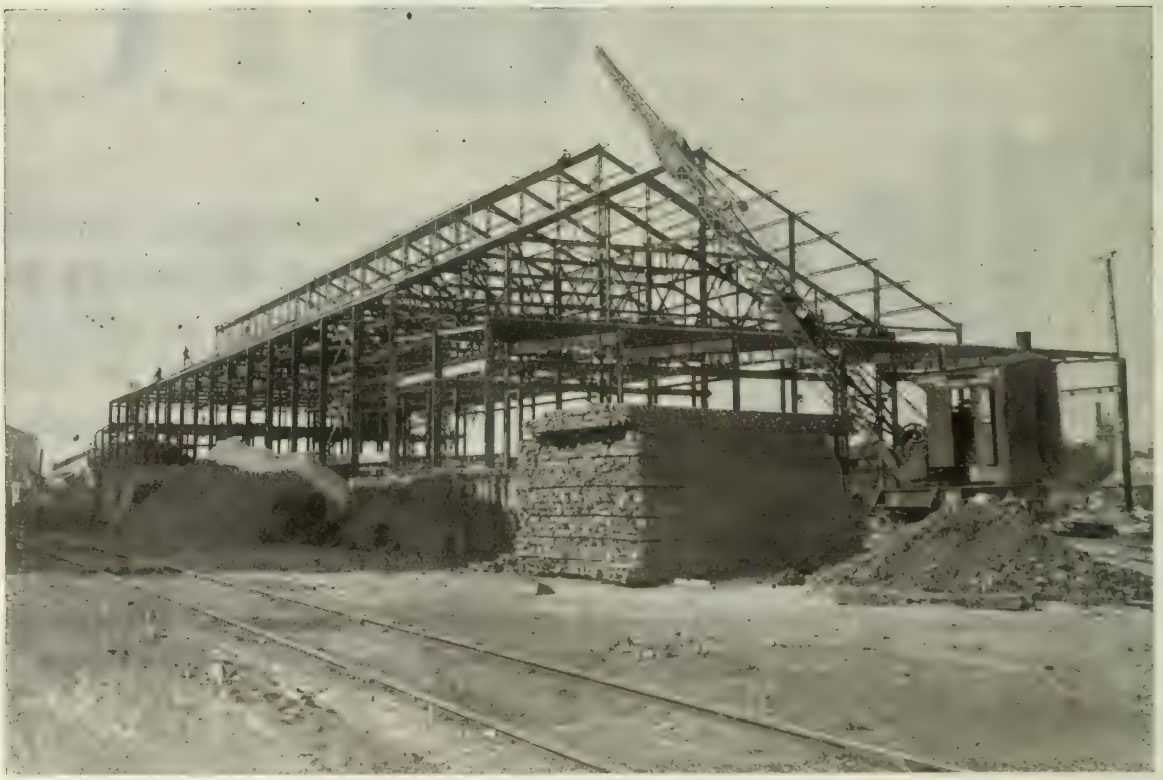
MINE BUILDINGS AND HEADFRAMES.



We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

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Private Automatic Exchange

ECONOMICAL

The Automatic Telephone

The P.A.X. is a time saver—a trouble saver and is built to last. Pays for itself in any plant.

The P.A.X. is the only rapid, easy and economical means of intercommunication between widely separated departmental heads of a business.

Business needs action. The turn of the dial gives action any time—all the time.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
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"Makers of the Nation's Telephones"

MANUFACTURING
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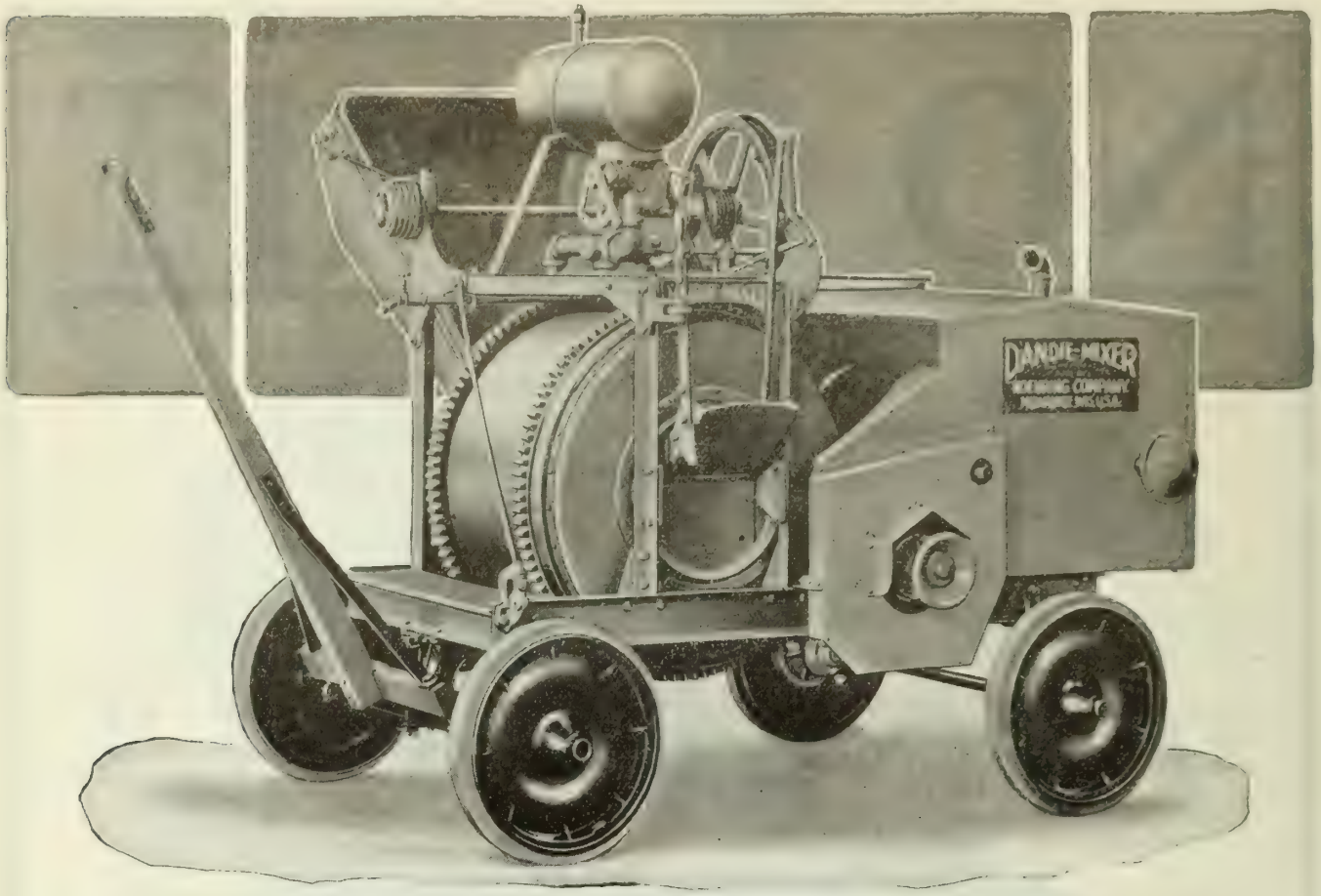

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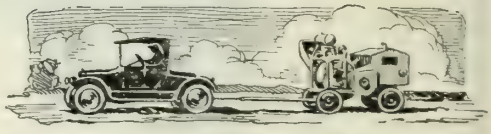

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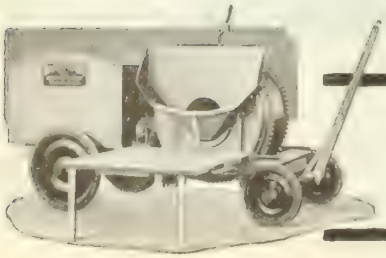

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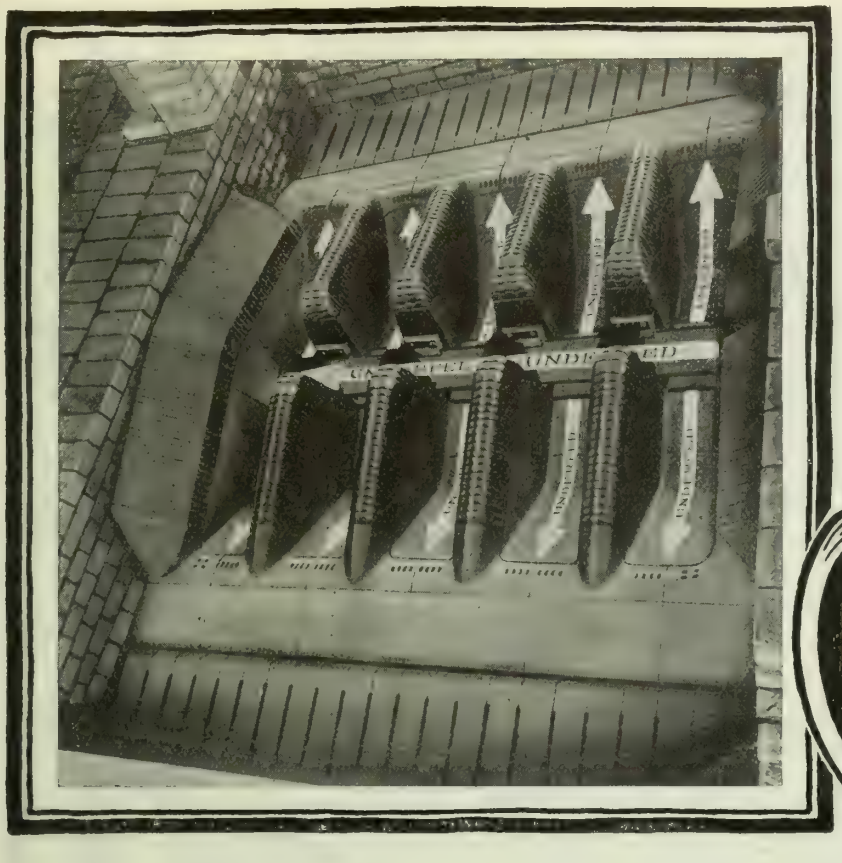

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These instances might be duplicated many times and they all serve to illustrate the great help that many organizations are getting out of the Factory Management Course and Service.

After a very careful study of many such instances we have come to the conclusion that these very gratifying results are secured by a conversion into effective services of a great deal of brain power which is now going to waste in many industrial plants.

Your own experience will doubtless verify this statement that comparatively few of the suggestions made by your subordinates can be worked into your practice successfully. This fact is due to one or both of two things. Either the suggestion is an old one that has been tried out in many plants and failed, or else it is worked out with reference only to one department and without regard to the conflict with the work of other departments which it may involve.

Suppose now, practically all of this ineffective thinking could be eliminated and the brain power of your staff could be concentrated upon practical ideas. Such a change would not only free you from the task of considering and disposing of a great many impractical suggestions, but it would free the men from the depressing effect of repeated failures and enable them to offer real solutions to problems instead of making mere guesses at solutions.

In other words, we are now getting real value out of only about 5% to 10% of the thinking of the executive staff in almost any industrial organization. A similar waste among the hand workers would be ruinous.

Now, what the Industrial Extension Institute proposes to help you do is to decrease the number of failures in the thinking of your production staff and increase the number of successful suggestions which they offer. This can be accomplished through the Factory Management Course and Service, which not only gives a very thorough training in modern industrial management, but also presents in an organized way those essential things in the way of methods which more than one hundred industrial engineers and industrial executives who prepared the Course, have established as a result of the many years of their wide experience in the industrial field.

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THE
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THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

JUNE 1923 Volume VI, No. 6

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Advantages to be Gained from Pulverizing Canadian Fuels

A review of Practical Results in Existing Installations and Operating Tests with various Powdered Fuels

H. D. Savage.
Director Pulverized Fuel Dept., Combustion Engineering Corp., Ltd.

Paper read before the Winnipeg Branch, The Engineering Institute of Canada, March 15th, 1923.

The conditions surrounding the production and marketing of fuel during the past several years have brought forward pre-eminently the necessity for conservation of, and economy in, the use of this great national asset. The engineer directing the activities of public utilities or industrial endeavour is of necessity forced to give every consideration to any means that will accomplish either of these ends. There is probably no feature of industrial activity where waste is so general and so great as in the use of fuel for steam production. This applies equally to the small isolated industrial plant, to the larger central station, and to the firing of locomotives. This statement is based on the assumption that every pound of coal burned beyond the minimum practical requirements for the purpose to which it relates, is a waste. The statement has been repeatedly made that the average combined boiler and furnace efficiency of the steam power plants throughout the United States would not be above 65 per cent. Since there are central stations now operating at a combined efficiency of from 86 to 88 per cent by the month, and there are industrial plants operating at 78 to 80 per cent by the month, it is obvious that any plant operating below these efficiencies is contributing to the great waste of one of the greatest of national assets.

Assuming that this average of 65 per cent is correct, and that it would apply throughout the Dominion of Canada as well, and assuming that the average efficiency of the power plants throughout the Dominion could, by more efficient means of combustion, be raised from 65 per cent to only 71.5 per cent. (certainly a matter of easy accomplishment), this would mean an economy of 10 per cent which if applied to the electrical utilities of the Dominion alone, would mean a saving of several million tons per annum. Assuming on the same basis an increased efficiency in the firing of your railroad locomotives of only 10 per cent this would mean a saving on the basis of their 1921 consumption of 879,000 tons.

There is no problem more worthy the consideration of the mechanical, the electrical, and the civil engineer today than the study of the waste of fuels in their particular localities, and the consideration of practical means for eliminating this waste. The purpose of this paper is to call attention to a practical, efficient and economical means of fuel conservation, namely, the burning of pulverized fuels in suspension. This method of using fuels not only presents a means for improved results with the present available commercial fuels, but makes possible a still greater conservation of these fuels, which must frequently be transported considerable distances, by replacing same with many of the low grade local fuels.

There were imported into Canada last year eighteen million tons of high grade coal, each ton of bituminous coal imported carried, in addition to the heavy transportation charges, a duty of fifty-three cents per ton — this in view of the fact that but a few thousand dollars, intelligently spent, could readily demonstrate the practicability of using native coals in most of the work for which this highly expensive imported coal was used. It may be said, from ample evidence based on present knowledge, that all the coal native to Canada could be successfully used in pulverized form, and that from the high sulphur coals of the Maritime provinces, through the lignites of Saskatchewan to the better grade coals of Vancouver Island, the economic value of all these vast deposits would be greatly increased by the establishment of this method of burning fuels, and it is quite possible that the peat bogs of central Canada present some potential possibilities in this connection. National pride, if not economics, should prompt the speedy development of this undertaking.

Economy of Burning Pulverized Fuel Demonstrated

The Oneida Street station and the Lakeside station of the Milwaukee Electric Railway and Light Company,

and the Brunot's Island plant of the Duquesne Light Company, have firmly and lastingly demonstrated to those responsible for the mechanical and financial success of those companies, and to their associated engineers, the economy to be derived from this method of fuel burning. A further confirmation of the correctness of their conclusions, if such were needed, is evidenced by the action of such progressive engineering firms as McClellan and Junkersfeld, Sanderson and Porter, and Dwight P. Robinson and Company all of which firms are at present charged with the responsibility for large new utility projects, and each of them are recommending and installing systems for burning pulverized fuel for their clients under widely varying conditions of operation and fuel. Such recommendations were not made by these firms without the most careful study and consideration. It would therefore seem unnecessary to bring forth further argument as to the worth, reliability, adaptability or the dependability of the burning of fuel in pulverized form. which must be acknowledged with one exception to be the ultimate method of economically utilizing the full value of any available solid fuel. This one exception is, of course, the process of low temperature distillation, wherein the lighter volatiles of the fuel are driven off at a relatively low temperature, and the residue pulverized and burned in suspension. Much thought and study is being given to this process at the present time, and it is expected that practical developments may be looked for in the near future.

TABLE A—Record of Observations on Furnace During Banked Period at Oneida Street Station

Date — August 19, 1919.	
Boiler No. 5 — Edge Moor, rated 468 nominal h.p.	
Fuel feed shut off, uptake damper closed, and auxiliary air inlets closed	9.00 p.m.
Boiler steam outlet to header closed and 175 pounds steam on boiler	9.20 "
Safety valves released about one minute	9.40 "
" " " " " "	9.55 "
" " " " " "	10.08 "
" " " " " "	10.15 "
" " " " " "	10.25 "
" " " " " "	10.38 "
" " " " " "	10.43 "
" " " " " "	10.52 "
" " " " " "	11.02 "
" " " " " "	11.09 "
" " " " " "	11.18 "
" " " " " "	11.28 "
" " " " " "	11.38 "
" " " " " "	11.48 "
" " " " " "	11.52 "
Steam on boiler 155 pounds when fuel feed started and boiler steam outlet to header opened	7.00 a.m.
Drop of steam pressure in boiler, from 9.00 p.m. until 7.00 a.m., or during 10 hours while fuel feed was off and during which time safety valves popped 15 times, for one minute each, or a total of about 15 minutes	20 pounds

In advocating the use of pulverized fuel, it should be definitely borne in mind that this is a special field of endeavour; that while the burning of coal pulverized and in suspension appears from observation of a correctly designed and properly installed system, much simpler than any other method of fuel burning, such simplicity of installation and operation was not achieved without long, difficult, and expensive study and experimentation. The development of one system required some seven years of intensive endeavour by an association of engineers of national repute, and the expenditure of nearly $700,000 to bring it to its present point of perfection. As each pulverized fuel installation is made under widely varying conditions of load, fuel, and operating conditions, each installation must be studied as a distinct engineering problem, and the work should only be entrusted to those who have shown by past accomplishment their knowledge of the subject, and ability to handle the several mechanical, physical, and economic problems involved.

Advantages in Use of Pulverized Fuel

The present day demands for higher boiler ratings, the rapidly increasing demand for energy made upon most stations, the ever-present demand upon the central station operator for greater economy in meeting such conditions, make the accomplishment of the past five years in actual commercial installations an obligation upon the forward looking engineer to give his serious consideration to the advantages which a change from his present method to pulverized fuel would effect. Where new stations are contemplated, it would appear that these advantages cannot be ignored. Some of these advantages may be summed up briefly as follows:

First.—The ability to burn any available fuel, either solid, liquid, or gaseous, in the same furnace without change, either simultaneously or separately.

Second.—The ability to secure maximum evaporation per pound of coal under all conditions.

Third.—The ability to maintain maximum capacity conditions over long periods.

Fourth.—The ability to meet widely varying capacity conditions with any available fuel.

Fifth.—The ability to maintain practically the maximum efficiency over a wide capacity range.

Sixth.—The ability to instantaneously meet any sudden peak demands without later interruption to continuous service.

Seventh.—The ability to bank over long periods with a minimum fuel loss.

The ability to burn any available fuel is of peculiar interest in many Canadian cities due to the widely varying qualities of coal which lie closely adjacent in many of the areas. The ability to maintain maximum efficiency with any available fuel throughout a wide load range is of importance in any locality under present mining and transportation conditions. What this would mean within the Dominion may be illustrated by reference to figure No. 1, taken from "An Investigation of the Coals in Canada," volume 2, issued by the Mines Branch, which shows graphically, results of boiler tests at McGill University on a list of sixty-eight coals from the various workings throughout the Dominion, and indicates an average efficiency of but little better than fifty per cent. on these fuels. This same boiler, properly equipped for burning pulverized fuel, would show an average efficiency of over eighty per cent for the same list of fuels, and none of these fuels would present any unusual difficulties, either during the process of pulverization or combustion. Increasing the efficiency of these fuels from an average of fifty per cent to an average of eighty per cent would mean a saving of sixty per cent on the basis of the present consumption.

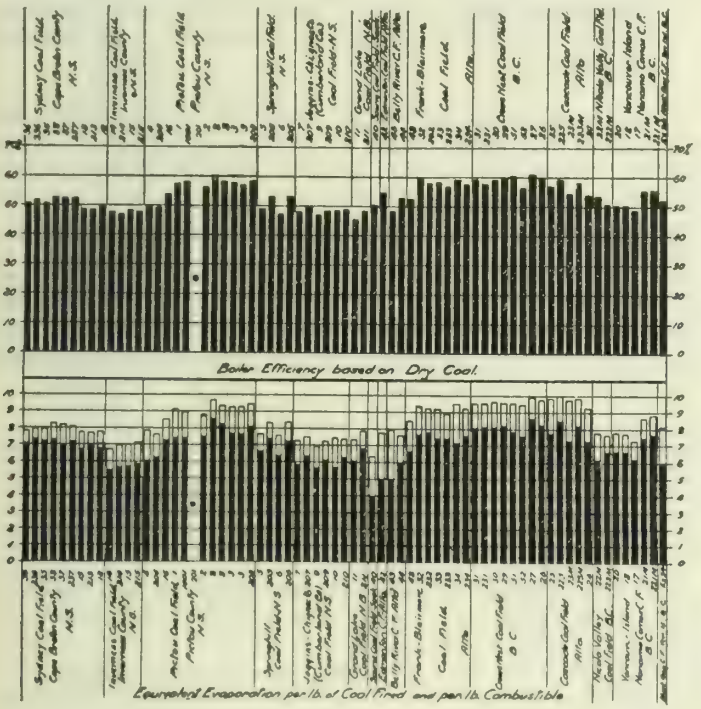
The statements as made above must not be taken as meaning that pulverization in any way betters the quality of the fuel, but finely dividing the coal permits a better mixture of the air and coal in the furnace so that combustion is quicker and more complete, with less excess of air, and these finely divided particles of coal burning in suspension in the furnace are not subject to the same hindrances from clinker and fusion that cause trouble when burning the coal in large irregular sizes. Many of the difficulties met with in burning the high sulphur coals of

the Maritime provinces would be eliminated if burned in pulverized form, as clinkering troubles due to the high sulphur content would not be met with in burning this fuel in pulverized form. In fact, some advantage would be taken of the thermal value of the sulphur content where it occurs as free sulphur.

Operating Tests with Lignite

Probably the fuel of greatest interest is lignite, which occurs in such abundant quantities and varied qualities throughout both Canada and the United States.

That lignite may now be employed in high capacity continuous operation without presenting any unusual difficulties, has, we believe, been thoroughly established by brief operating tests in at least three instances. The first was the burning of two carloads of Saskatchewan lignite on locomotive No. 1200, of the Delaware and Hudson Railroad. No test data was kept at the time, but the engineer in charge reports that combustion results were satisfactory. A second trial of the possibilities of



Results of trial No. 18 rejected on account of error in sampling.

Figure No. 1. Diagram showing boiler efficiency and equivalent evaporation.

pulverized lignite was made at the plant of Morris and Company in Oklahoma City in 1920, when six cars from the Hoyt Texas district were burned in a series of six tests. Data covering one of these tests of approximately ten hours duration is given herewith. (table B.)

The Oklahoma plant of Morris and Company runs regularly on Henrietta and McAllister screenings, which are fairly good grades of bituminous coal. No changes were made in either the preparation plant or the boiler room preliminary to the lignite test. These tests were run under the joint supervision of the engineers of Armour and Company, Swift and Company and Morris and Company.

Within the past month five carloads of Colorado lignite, which is more in the nature of a sub-bituminous coal, was burned at the Lakeside station of the Milwaukee Electric Railway and Light Company. Again there was no change in either preparation plant or boiler room

TABLE B.—Test of Possibilities of Pulverized Lignite

Lignite test No. 4, conducted by the engineers of Armour & Company and Swift and Company at the plant of Morris and Company, Oklahoma City, Okla. Duration of test, 9 hours 58 minutes. Boiler No. 16.

		Armour & Co.	Swift & Co.	Morris & Co.
Boiler				
1.	Type	Edge Moor, water tube		
2.	Heating surface	4,960	4,960	4,685
Furnace				
3.	Volume	1,485	1,485	1,485
4.	Ratio of furnace volume to water heating surface	1: 3.34	1: 3.34	1: 3.15
5.	Method of combustion	Lopulco system pulverized fuel.		
Coal				
6.	Kind of coal	Lignite		
7.	From	Mine at Hoyt, Texas		
8.	Car	M.K. & T. 30813		
9.	Size and condition	Run of mine		
10.	Weight of coal as received	42,327 lbs	42,327 lbs	
11.	Speed of feeder screw	116.3 r.p.m.	116.3 r.p.m.	
12.	B.t.u. per lb. of coal as received	6,675	6,722	
13.	B.t.u. per lb. of coal as fired	7,875	7,928	
14.	Coal consumed per hour.	4,246.8	4,246.8	
15.	Coal delivered per screw revolution	0.3004	0.3004	
Analysis of Coal as Received				
16.	a fixed carbon		31.36	
	b volatile matter		23.71	
	c moisture	33.21	33.13	
	d ash	11.92	11.80	
	e B.t.u.	6,675	6,722	
Analysis of Coal as Fired				
	a fixed carbon		37.58	
	b volatile matter		30.11	
	c moisture	21.48	19.59	
	d ash	13.12	12.72	
	e B.t.u.	7,875	7,928	
Water				
18.	Total water evaporated	204,916	204,916	
19.	Water evaporated per hr.	20,553	20,553	
20.	Equivalent water evaporated from and at 212 degs. Fahr	22,820	22,820	
21.	Factor of evaporation	1.1103	1.1103	
22.	Water evaporated per lb. coal actual conditions	4,841	4,841	
23.	Water evaporated per lb. coal from and at 212 degs. Fahr.	5,375	5,375	
24.	Quality of steam	95.54%	95.54%	
Pressures				
25.	Steam pressure — gauge.	136.3	136.3	
26.	Draft at uptake in inches of water	0.163	0.163	
27.	Draft over fire	0.032	0.032	
28.	Barometer	28.67"	28.67"	
29.	Barometer	14.1 lbs.	14.1 lbs.	
Temperatures				
30.	Feed water — degs.Fahr.	109.4	109.4	
31.	Flue gases	639.4	639.4	
32.	Outside	79.5	79.5	
33.	Boiler room	97.9	97.9	
34.	Furnace	1947.6	1947.6	
Flue Gas Analysis				
35.	1st pass CO_2	15.15	15.15	
	O_2	0.26	0.26	
	CO	0.0	0.0	
36.	Breeching uptake: CO_2	14.55	14.55	
	O_2	4.55	4.55	
	CO	0.0	0.0	
Horse power Developed				
37.	Rated h.p. of boiler	496	496	468
38.	H.p., developed from and at 212 degs. Fahr.	661	661	661
39.	Percentage of rated h.p., developed	133.2	133.2	141.2
Efficiency				
40.	Combined boiler and furnace efficiency	78.15%	77.59%	

preliminary to the test, and while no evaporative data was taken, Mr. Kreisinger has prepared some figures from his observation of the combustion conditions which are shown in table C.

The lignite used in this test was shipped from Colorado to Milwaukee, a distance of approximately one thousand miles, was for ten days en route, arriving in good shape without firing spontaneously, and while the coal used the first two days was dried down to fourteen per cent moisture, that used during the latter part of the test was not dried, and was burned as received, with approximately twenty-two per cent moisture.

Test with Alberta Anthracite

While in burning Pennsylvania anthracite, the cost of preparation is increased over bituminous, this would not be true of the anthracite of Alberta, as due to its friable nature, pulverization would be on a par with bituminous coal. In June 1916, three cars of Alberta coal were sent by the Canadian Pacific Railway to Oliphant, Pa., to be burned by the Delaware and Hudson on locomotive No. 1200, then being operated with pulverized fuel. The following is quoted from a report by A. V. Adamson, the engineer in charge of this test:—

"In June, 1916, it was arranged with the Delaware and Hudson Company to burn coal from the Canmore and Bankhead mines, located along the lines of the Canadian Pacific Railway, near Banff, Alberta. Three carloads of coal were shipped to Oliphant, Pa., of the following analysis:

	No. 1 Bankhead	No. 2 Canmore	No. 3 Lignite
Moisture,	4.24 per cent	4.06 per cent	31.31 per cent
Vol. Matter,	10.3 "	12.8 "	40.92 "
F.C.	77.71 "	76.63 "	46.77 "
Ash	12.26 "	10.57 "	42.31 "

No changes were made in the pulverizing plant in order to prepare this coal. No change was made on the locomotive for burning the coal. Considerable difficulty was experienced on the locomotive in firing the Bankhead and Canmore coals due to the low volatile content. Locomotive fire box being exposed to a large amount of water heating surface and the fire is on and off during stops, and the trouble is brought about by attempts to start up the fire after a shut-down when the fire box had cooled. Several runs, however, were made on the locomotive using a mixture of either Bankhead or Canmore coal with the lignite. The trouble was then overcome. It was found that the Bankhead and Canmore coals could be burned satisfactorily on the stationary boiler at the mining plant, which furnace had more refractory surface than was the case with the locomotive furnace, and were able to burn the coal on the boiler without any trouble. On the locomotive, we resorted to a mixture of Canmore or Bankhead with lignite, thus raising the volatile content of the fuel, and we experienced no trouble with it."

The coals from the Crows Nest Pass field would present excellent possibilities in pulverized form. These coals, together with the lignites, due to their friable nature, would probably be pulverized at slightly less expense than ordinary bituminous coal. As to the results that might be expected from the better grades of western Canadian coals, a recent test run at the plant of the Duquesne Light Company at Pittsburgh can be taken as indicative. Table D gives the results of the tests. Figure No. 2 shows a cross-section through the boiler on which these were made.

TABLE C. Boiler No. 8. Lakeside Station — Lignite Coal, February 7, 8, 9, and 10.

Time	CO_2 — 4th Pass West	Centre	East	Drafts Furn.	Breach'g	Stack	Flue Gas Temp. of	Rating H.P.	Smoke 1st Pass	Stack	Notes
3.30	13.8	14.8	14.5	.12	1.05	1.7	500	2600	Clear	Clear	Flames drive through furnace
4.00	13.2	14.6	14.0	.12	11.2	1.72	502	2550	"	"	tubes — bottom dry.
1.45	11.5	12.2	15.4					2650	Clear	Clear	Flames drive through furnace
2.00	10.4	13.0	13.6	.18	1.4	2.0	480	2700	"	"	tubes strike bottom in center.
3.00	11.0	13.2	14.8	.10	1.1	1.68	460	2400	"	"	
3.15	13.2	14.6	15.2	.08	1.2	1.7	480	2500	"	"	
3.30	12.8	13.8	15.2	.08	1.2	1.7	490	2600	"	"	Bottom dry. No slagging.
3.45	13.0	15.4	16.2	.08	1.2	1.65	490	2500	"	"	
4.00	11.0	14.0	14.6	.04	1.1	1.67	485	2200	"	"	Slight incrustation on bottom of
4.15	12.0	14.4	14.0	.04	1.1	1.6	485	2600	"	"	boiler tubes.
4.30	12.8	15.2	14.8	.04	1.1	1.6	485	2500	"	"	Comes off when tubes blown.
10.45	11.8	14.2	16.2	.08	1.1	1.6	485	2750	Slight	Clear	
11.00	13.2	14.0	15.2	.08	1.1	1.55	470	2700	smoke &	"	Flames strike bottom Brownish
11.15	15.6	14.6	15.8	.09	1.1	1.6	495	2550	sparks	"	flame at boiler tubes —
11.30	15.0	15.4	15.0	.07	1.0	1.45	490	2600	Puffs of	"	
11.45	12.5	14.4	15.8	.07	1.0	1.45	485	2600	smoke	"	No Slag.
12.00	15.0	15.4	15.8	.08	1.05	1.50	485	2600		"	
2.45	10.2	12.5	11.5	06	.95	1.35	475	2100	Clear	Clear	
3.45	13.2	14.0	15.6	..	.95	1.37	485	2400	"	"	
4.00	12.4	14.2	14.0	.06	.95	1.35	485	2400	"	"	No Slag noticed until 4.30 when
4.15	14.6	16.2	17.6	.07	.95	1.35	490	2500	"	"	viscous slag rolled down E.
4.30	15.2	16.0	18.0 / 16.4	.07	97	1.4	490	2550	"	"	side wall in small amount. Rear wall also dripped slightly.
4.45	15.4	15.6	17.0	.07	.97	1.4	490	2600	"	"	
5.00	15.8	16.4	16.0	.07	.97	1.4	495	2750	"	"	
10.45	12.8	14.8	14.4	1.0	1.0	..	485	2200	Clear	Clear	Slag dripped from rear wall and
11.00	14.4	15.4	15.8	.06	.85	..	480	2000	"	"	E. wall in small amt. at 11.45
11.15	12.0	15.0	14.2	.04	.75	..	470	1900	"	"	slight incrustation on bottom of
11.30	14.8	16.0	16.6	.03	.70	..	470	2400	"	"	lower row of boiler tubes. This
11.45	16.0	16.0	16.6	.03	.68	..	467	2400	Slight smoke	"	was removed by soot blowers.
12.00	16.0	13.8	16.6	.03	70	.	470	2250	Clear	"	No stay formed between tubes.

West burner went out at 12.30 — Indiana coal was put in at 1.00 o'clock as rating had to be maintained.
Furnace cleaned out at 1.00 and refuse wgd. — Sample of dust taken from 3rd pass. — Hoppers were about ⅞ full.

Very definite results could be established by the Department of Mines in co-operation with engineering firms who have established themselves as doing practical work along correct engineering lines in the combustion of pulverized fuels. Such work in co-operation, would not involve excessive expense, and could be so carried on as to promptly and thoroughly demonstrate to the industries and utilities the value and possibilities of this

TABLE D.—Summary of Principal Results of Seven Tests made on a 822 h.p. Sterling Boiler, fired with powdered coal.

Boiler — Stirling Class M — 822 h.p. Superheating surface.....341 sq. ft. Water heating surface.....Boiler — 8,220 sq. ft.
Screen — 180 sq. ft. Total — 8,400 sq. ft. Total h.p. — 8,400

Test number.	1	2	3	4	5	6	7
Date — 1922	9/11–12	9/12–13	9/13–14	9/15–16	10/6–7	10/7–8	10/8–9
Duration — hours	23.1	25	23.9	23.2	19.1	24.5	20.7
Rating — per cent	197.0	201.4	253.2	254.8	151.7	303.5	279.0
Efficiency — per cent	82.0	81.6	77.4	78.2	83.4	78.8	75.8
Total coal as fired — lbs.	124,900	134,258	166,294	163,192	78,552	205,742	166,822
Total dry coal — lbs.	119,280	129,881	161,754	157,317	75,606	199,940	160,850
Total water fed to Blr. lbs.	1,108,281	1,228,284	1,482,948	1,456,567	733,187	1,832,617	1,406,585
Coal per hr. as fired lbs.	5,407	5,370	6,966	7,010	4,117	8,397	8,071
Coal per hr. dry lbs.	5,164	5,195	6,776	6,758	3,488	8,161	7,825
Water per hr. lbs.	47,977	49,131	62,126	62,567	38,420	74,800	68,007
Pressures							
Barometric in. mercury	29.09	29.18	29.17	29.16	29.22	29.05	29.26
Boiler gauge lb./in.	186.8	187.2	190.4	191.1	185.4	189.7	189.0
Superheater G. lb./in.	183.1	182.9	182.6	183.0	183.5	180.3	181.0
Air at feeders in. water	13.6	15.2	15.4	14.7	12.6	14.5	16.5
Drafts							
furnace	0.05	0.10	0.10	0.10	0.08	0.10	0.10
at damper	0.27	0.29	0.58	0.53	0.15	0.90	0.80
Temperatures Deg. F.							
feed water	101.7	102.9	105.8	107.4	99.5	102.1	96.7
lat. steam	382	382	384	384.1	381.9	383.5	383.1
superheated steam	423	420.8	414	415.3	418.0	399.3	411
flue gases	578.5	585.5	679	670	513	731.7	710
air to blower		145	148	143.4	146	142.9	133
boiler room	79	78	82	84	75	81	74
basement	92	91	86	86	86	83	75
Water per lb (as fired)	8.87	9.15	8.92	8.93	9.30	8.92	8.43
of coal (dry)	9.29	9.47	9.17	9.26	9.71	9.16	8.74
Total heat of steam B.t.u.	1,155.0	1,152.9	1,145.5	1,144.0	1,153.4	1,140.4	1,153.2
Total heat absorbed per lb. dry coal fired — B.t.u.	10,729	10,918	10,505	10,593	11,199	10,446	10,079
Efficiency — per cent	82.0	81.6	77.4	78.2	83.4	78.8	75.8
Capacity — per cent	197.0	201.4	253.2	254.8	151.7	303.5	279.0
Analyses							
flue gases CO_2 %	15.6	15.3	14.95	15.15	15.7	14.5	14.4
flue gases O_2 %	3.6	3.5	4.2	3.9	3.5	4.8	5.0
flue gases CO_2 %	0	0	0	0	0	0	0
ash %	12.4	11.3	9.96	10.8	10.61	10.82	11.13
Coal sulphur %	2.22	2.6	2.27	2.17	2.61	2.47	2.97
Dry basis — carbon %	68.47	74.19	75.68	74.97	75.05	75.00	73.86
hydrogen %	5.73	5.08	5.09	5.15	5.12	5.10	4.99
nitrogen %	.60	.49	.55	.49	1.18	.97	1.40
oxygen %	10.58	6.51	6.45	7.04	5.43	5.64	5.65
B.t.u.	13,090	13,455	13,560	13,543	13,414	13,273	13,296
Moisture — as fired %	2.22	2.17	1.56	2.30	2.68	2.12	2.56
Fineness thru 20 mesh %	100.0	100.0	99.0	100.0	99.0	100.0	100.0
" " 50 "	94.8	94.2	92.2	93.2	93.0	94.0	94.5
" " 100 "	82.9	84.7	74.0	80.0	79.0	77.5	80.5
" " 200 "	62.2	64.0	57.3	57.5	55.0	52.5	56.5
	B.t.u.	B.t.u.	B.t.u.	B.t.u.	B.t.u.	B.t.u.	B.t.u.
Heat absorbed by boiler	10,729	10,918	10,505	10,593	11,199	10,446	10,079
Heat lost — moisture in coal	29	29	21	31	34	29	35
Heat lost — hydrogen in coal	662	589	662	609	576	625	607
Heat lost — dry flue gases	1,364	1,508	1,874	1,778	1,290	2,100	2,033
Heat lost — combustible in gases	0	0	0	0	0	0	0
Heat lost — combustible in ashes	7	9	8	9	0	0	0
Heat lost — combustible in flue dust radiation and unaccounted	299	424	491	492	315	78	542
	13,090	13,455	13,560	13,543	13,414	13,273	13,295
	%	%	%	%	%	%	%
Heat absorbed by boiler	82.0	81.2	77.4	78.24	83.4	78.8	75.8
Heat lost — moisture in coal	0.2	0.2	0.15	0.2	0.25	0.22	0.3
Heat lost — hydrogen in coal	5.0	4.3	4.9	4.5	4.3	4.66	4.5
Heat lost — dry flue gases	10.4	11.1	13.84	13.1	9.6	15.78	15.3
Heat lost — combustible in gases	0	0	0	0	0	0	0
Heat lost — combustible in ashes	0.05	0.05	0.06	0.06	0	0	0
Heat lost —combustible in flue dust radiation and unaccounted	2.35	3.15	3.65	3.9	2.45	.54	4.1
	100	100	100	100	100	100	100

The heat balance shows test No. 6 to be 2½ to 3 per cent too high in efficiency. This was due in part to priming when the safety valve popped. There was also a suspicion that there was priming at times through the superheater.

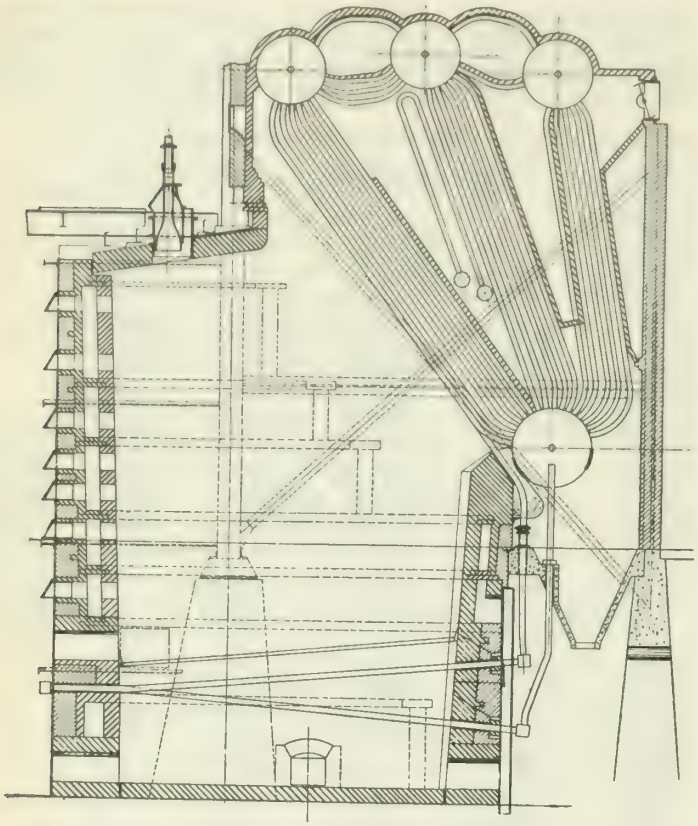


Figure No. 2. 822 B.H.P. Stirling Boiler with Lopulco Hollow Wall Furnace at Brunot Island Plant of Duquesne Light Company, Pittsburgh.

method of firing when used in conjunction with the fuels of the Dominion. Such co-operative work has been entered into by the United States Bureau of Mines, so that to-day the United States occupies the pre-eminent position in the field of pulverized fuel research, as does Canada in the hydro-electric field.

Practicability of Burning any Fuel in the Same Furnace

The practical value of the ability to burn any available fuel efficiently in the same furnace is demonstrated at the plant of Morris and Company, which is so strategically situated that coal, fuel oil, or natural gas are available as fuel, and either of these fuels may be burned at will — a change from one to the other can be made in about five minutes time. They are thus in an enviable position, through their ability to take advantage of market conditions.

The River Rouge plant of the Ford Motor Company, which is equipped with four Ladd boilers, each of 2,640 h.p., rated capacity, burning a combination of blast furnace gas and powdered coal, is an impressive demonstration of this feature. The base fuel at this plant being blast furnace gas, a waste product, of which there is only sufficient quantity for a small portion of their requirements, the lack of sufficient supply of this waste fuel is made up with pulverized coal. The boiler furnaces are so designed that blast furnace gas and pulverized coal may be burned either separately or simultaneously. During the recent coal strike, pulverized fuel, blast furnace gas, coke oven gas and fuel oil were burned simultaneously on the same boiler. In the past, coke screenings and coal tar have been used.

The ability to meet sudden high load conditions, and then continue uninterrupted service has been repeatedly demonstrated at the Ford plant, the most recent demonstration of this being on January 27th, when three boilers were in operation, — Nos. 3 and 4 operating at approximately 240,000 pounds of steam per hour, and No. 1 at 200,000 pounds per hour. At about noon, due to some pump troubles, Nos. 1 and 4 lost their water. No. 3 picked up the whole load and for more than thirty minutes developed steam at the rate of over 350,000 pounds per hour.

The rapidity of this pick-up, and the resumption of service are graphically shown on chart, figure No. 4. The evaporation from the boiler during this peak is not exactly known, as the firmness of the line during the thirty minute interval would indicate that the pen of the Bailey meter was riding against the rim of the case. The 350,000 pounds evaporation, however, would repre-

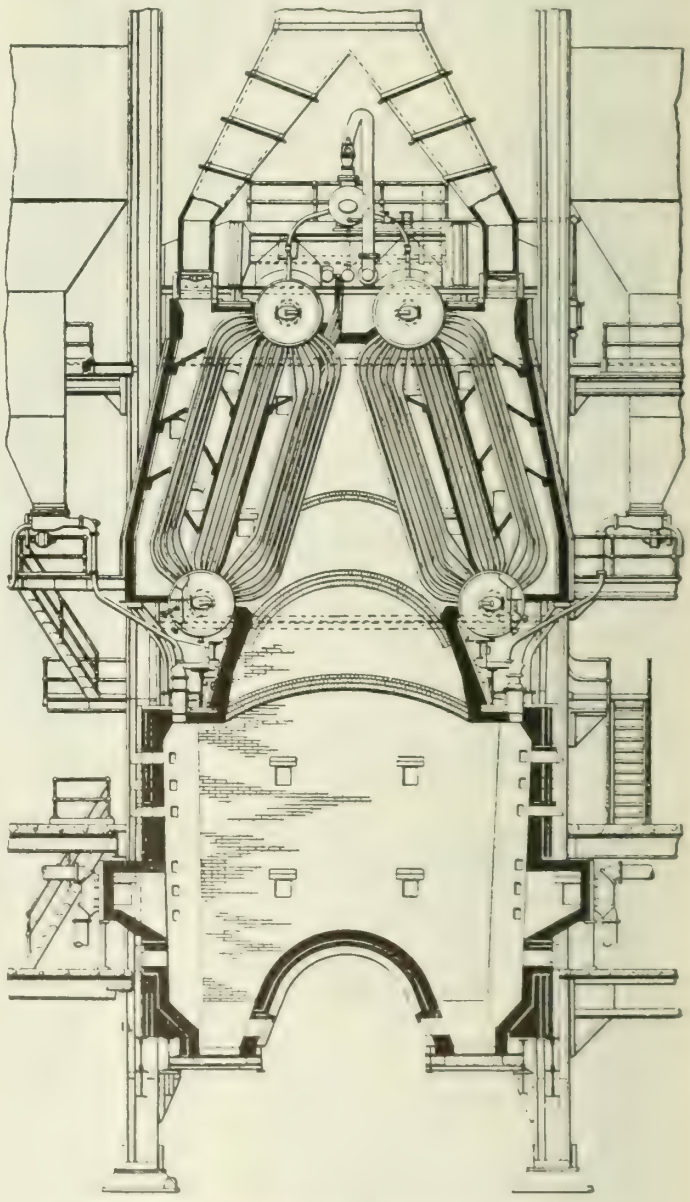


Figure No. 3. — 2640 B.H.P. Ladd Boiler with Lopulco Equipment for burning pulverized fuel and blast furnace gas at River Rouge Plant of Ford Motor Co., Detroit.

sent approximately 12,000 boiler horse power. We believe this to be a world's record for one boiler.

The ability to remain on the line for longer periods without any interruption to service is a feature of pulverized burning that should particularly appeal to central heating plant operators. One boiler at the Lakeside plant of the Milwaukee Electric Railway and Light Company had been on the line continuously at ratings from 100 to 250 per cent without interruption or stoppage of any kind, when the writer last had knowledge of it, for a period of eighteen weeks, and was apparently in good operating condition at that time. The boilers at the Oneida Street station of the Milwaukee Electric Railway and Light Company, which is a central heating plant — heating practically all of the downtown business section of Milwaukee, and some of the residence section — have been carried right through the winter without interruption to service of any nature due to pulverized fuel.

Principal Considerations in Use of Powdered Fuels

There are several questions that seem to predominate any powdered fuel discussion. They may be summed up: *First.*—Is it necessary to dry the coal? *Second.*—How finely must the coal be pulverized? *Third.*— Is it harder on the refractories than stokers? *Fourth.*—Have the difficulties with slagging been overcome? *Fifth.*—What becomes of the ash? *Sixth.*—Cost of preparation.

Is it Necessary to Dry Coals?

Speaking generally, and from a combustion standpoint, it is not necessary to dry the coal. However, from a purely mechanical standpoint, the drying of the coal is advisable in order to maintain the capacity of the grinding equipment. The capacity of any of the several types of mills is affected directly in proportion to the moisture content of the fuel. Screen type mills do not operate satisfactorily on coals of over three per cent moisture content, and while the air separation type mills will operate satisfactorily up to ten to fourteen per cent moisture, the capacity drops off rapidly above five per cent. (see figure No. 5.) In the earlier installations it was necessary to use a large, cumbersome, and inefficient rotary dryer, which not only required considerable structural space, but was dirty in operation.

There has been developed a waste heat dryer which has few moving parts, occupies space that would not be utilized for other purposes, is flexible in design, cleanly in operation, uses the stack gases for drying, and present indications are that it requires but three kilowatts per ton for operation. With the development of this dryer, it is thought that it will be found advisable to include dryers in practically every case where the coal will run above five per cent moisture, thereby guaranteeing at all times full capacity from the mills.

It might be well at this point to bring up the question that is very much discussed in connection with powdered coal burning, namely, the relative merits of the so-called storage bin, and feeder system as against the direct firing of coal from the mill to the boiler. The advocates of the latter system claim for this method of firing that its initial cost is less, and that it is unnecessary to dry the coal. It is just as necessary to dry the coal for this method of firing as it is for the bin and feeder system for the reason previously stated that the mill of whatever type, whether used for direct firing or for storage in a bin, will be affected in just the same manner by the moisture in the coal, and if it is in the direct firing system that the cost of drying would more than offset the reduced capacity in the mill, the same would be true in a storage system.

There is a very definite field for the unit system, but it is not thought that there will be a field for it in either central stations or central heating plants or other work calling for absolute dependability, flexibility, and for the ultimate efficiency. There are certain inherent defects that prevent its use in this particular line of endeavour. It would be well to bear in mind that a unit system for work of any considerable size is not less expensive than a properly designed and installed storage system. It must also be borne in mind that with a bin and feeder system, storage is provided in the pulverized fuel bin for carrying the boilers over peak periods. This avoids a peak demand on the pulverizing plant at the same time the peak demand comes on the power plant. With the unit system this is not possible and the units must be installed of sufficient size to meet any momentary peak and naturally the peak demand on the pulverizing plant is co-incident with the peak demand on the station.

How Finely Must Coal be Pulverized ?

In the earlier development of any project, there arise certain standards, the genealogy of which would be hard to trace. It became customary in the earlier days of powdered coal development for a bright young salesman

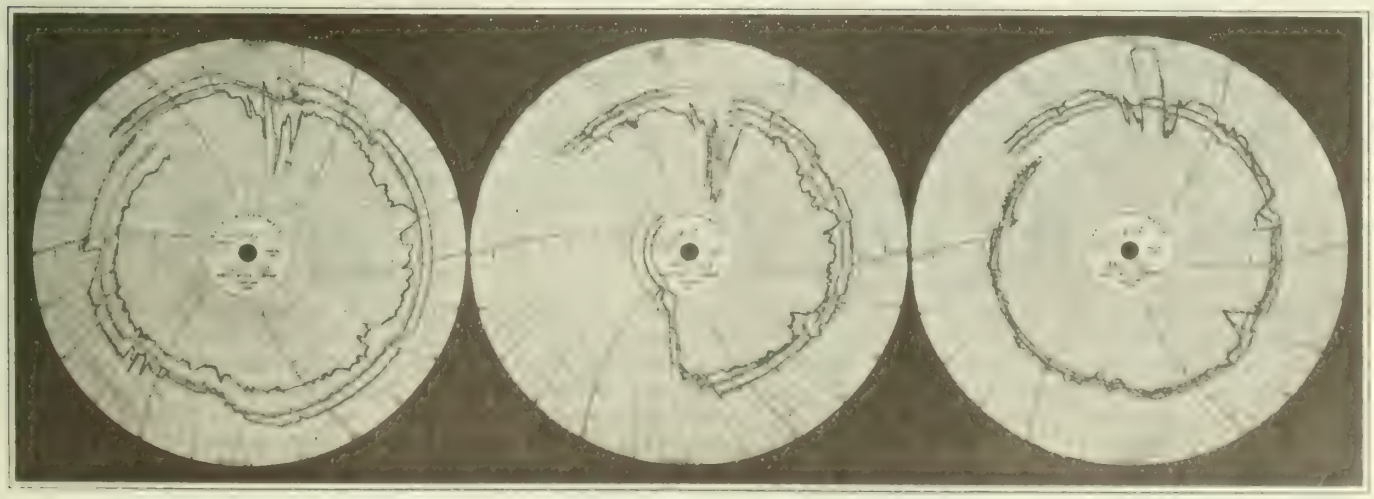


Figure No. 4

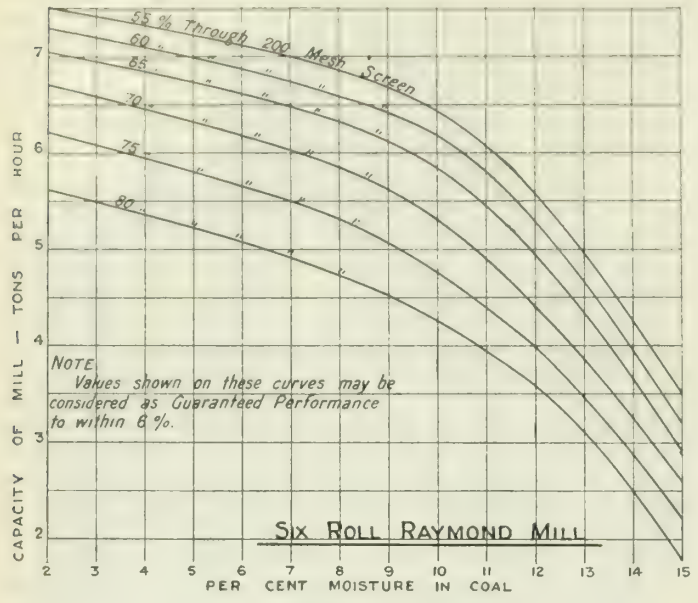


Figure No. 5

when asked: "How finely must the coal be pulverized?" to say: "Ninety-five per cent through a 100 mesh, and eighty per cent through a 200-mesh." Where this standard originated has never been discovered. The present day knowledge, based on actual tests, indicates that when coal is ground so that only sixty-five per cent will pass through a 200-mesh screen, there is no apparent change in the quality of combustion. The high efficiencies that have been obtained at Milwaukee, at Pittsburgh and at the Ford plant at Detroit, have been obtained with coal of this texture. The burning of coarser coal naturally increases the capacity of the mills and reduces the cost of preparation, as a much greater amount of power is used in producing the extreme fines than in the coarser products.

Is it Harder on the Refractories than Stokers?

Emphatically, no. In all of the eight installations mentioned here and now in operation, some of which have been running for nearly five years, it has been found that a very decided reduction in the maintenance cost of refractories has been produced. It is regrettable that we are not able to offer definite figures covering this, but it must be appreciated that such figures are exceedingly hard to obtain, as they are generally included in other maintenance charges of the power station. It might be stated that the Allegheny Steel Company ran furnaces under 330 h.p., Wickes boilers for upwards of four years with nothing but minor repairs. The Lima locomotive works have had boilers operating for some three and a half years with but minor repairs. The Oneida street plant of the Milwaukee Electric Railway and Light Company, operated boilers approximately three and a half years before it was necessary to rebuild, and with but minor repairs during that time.

The emphatic statement that pulverized fuel is not more destructive of refractories than stokers, contemplates the installation of a properly designed and equipped furnace, and the adoption of correct methods for introduction of the coal into the furnace and supplying the necessary combustion air.

There are two refinements in connection with furnace design for pulverized fuel burning that may be mentioned at this point. One of these has done much to increase the life of the refractories. The other is of considerable aid in burning undried coals and of slight advantage in increasing the efficiency. The first is the development of a hollow wall furnace, wherein the secondary air for combustion is brought in at the rear of the furnace, passed through the side walls and enters the furnace through openings in the front of the chamber. This raises the temperature of the entering air in the upper part of the furnace to about 700 degrees, and in the lower part to about 300, at the same time tending to reduce the temperature of the side walls and losses from radiation as well as to improve the combustion process. The second feature is the pre-heating of the air that is used for conveying coal from the feeder to the burner by passing same either through the side walls or under the bottom of the furnace. In some of the earlier installations where the coal was only partially dried, trouble was experienced from condensation in the bins, which would run down along the sides and form a sort of slush in the feeder. The preheating of the air passing through the feeder keeps it at such a temperature that this condensate does not form in the bottom, and has greatly facilitated the firing of undried coal.

Have the Difficulties with Slagging been Overcome?

Such difficulties as may have occurred in the early development with the formation of slag on the side walls and bottom of the furnace when using certain grades of coal have been very completely overcome by the development of a water screen in connection with powdered coal firing. This water screen which is shown in figure No 2, consists of a series of pipes connecting either with the header or the water drum of the boiler through down pipes to water boxes near the bottom of the furnace. From this header, pipes pass through the furnace and into another header, from which the circulation is continued to the drum or to the front header of the boiler.

The water screen is perhaps the most valuable development that has been made in connection with the burning of pulverized fuel. It was found at times in burning low grade fuels such as Illinois and Indiana screenings, containing a high sulphur content with a low fusing point ash, that the ash which was precipitated to the bottom of the furnace would be fused in a conglomerated mass which when solidified would present some difficulties in removal. The water screen keeps the temperature at the bottom of the furnace below the fusing point and permits the easy removal of this debris. The formation of slag was never a serious problem when running at usual ratings, but with the present day tendency to three hundred and four hundred per cent it would be found impossible with any but the very highest grade fuels to operate at any such capacity maintaining a high CO_2, and a high efficiency without the use of a screen. The screen also adds considerable capacity to the boiler at a very low first cost, and presents no difficulties of operation or complication of performance in the boiler.

What Becomes of the Ash?

Perhaps we who have been interested in the development of pulverized fuel burning have been just a trifle negligent in permitting this question to assume the pre-eminence that it has been given by certain propagandists. A certain definite portion of the ash goes up and out of the stack just as does a certain definite portion of the ash in stoker operation. It has been assumed, probably correctly, and has been stated broadcast that thirty per cent of the ash in the pulverized fuel installa-

tions goes up through the stack. Recent stoker tests made by a large central station in one of the largest American cities revealed that three per cent of the coal as fired went up through the stack. If thirty per cent of the ash from a pulverized fuel installation goes up through the stack, and ten per cent of the coal is ash, would not that be equivalent to three per cent of the coal as fired having disappeared through the stack? If this assumption is correct, it would be proper to analyze the character of the stack emission. That being emitted from a stoker stack is in the form of heavy coke cinders that fall within short radius of the plant, and is said at times to be considered a nuisance.

The emission from a powdered coal stack is a very finely divided, flocculent powder, containing absolutely no grit, which has been divided to a state before entering the boiler so that sixty-five per cent of the particles entering the furnace were smaller than one-four-hundredth of an inch, and if the coal contained ten per cent ash, the particles composing the residue being emitted from the stack are not greater than one-four-thousandths of an inch, which is so light that it would be carried by the lightest zephyr to a great distance, and which has not in my seven years of experience presented any nuisance or difficulty in any of the installations with which I am familiar, though some of these installations are in the heart of business and shopping districts.

Should this stack emission in any plant develop into a nuisance, means can be offered for eliminating the nuisance and reducing this stack emission to a point where it could not be considered a nuisance, even in the finest residential section.

Cost of Preparation

Many statements have been made in the past as to the excessive cost of powdered coal installations and the high cost of operation. It is not possible to make broad general statements concerning the cost of pulverized fuel installations, nor is it possible to make general statements covering cost of operation There have from time to time been published tabulations purporting to show the cost of pulverized fuel installations per unit either of coal fired, or steam produced. Such statements are most erroneous, and misleading if applied generally, as each separate pulverized fuel installation is made under such widely varying conditions as to physical and operating limitations that the cost of one plant would have no bearing on the cost of another. The governing factors are the kind and quality of coal to be used, the load to be served, and the type of building construction to be employed.

In determining the choice of pulverized coal burning as compared with other methods of combustion, it is simply a matter of comparing capital expenditure against results and it has been found repeatedly that the investment required for the pulverized coal plant as compared with any other method of solid fuel burning is easily warranted by the return produced. In changing over old plants, it is a matter of the same comparison of the capital expenditure required as against the results to be obtained, and in most plants when considered in this relation, it has been found that the change could easily be justified.

As to the cost of operation, it may be stated generally that it will cost no more to prepare and burn coal in pulverized form than to prepare and burn coal on multiple retort stokers as the cost of preparing the coal is offset by the cost of operating the forced draft apparatus on the multiple retort stokers.

The cost of preparation is a feature of pulverized fuel burning that has been greatly magnified in the eyes of advisory engineers, due to the fact that most papers presented before engineering societies purporting to cover the burning of pulverized fuel, have related principally to the mechanical features of preparation plants, and have touched but lightly upon the combustion end of the question. This continual discussion of preparation plants, due, no doubt, to a lack of knowledge of the combustion end, has greatly magnified in the eyes of advisory engineers the importance of the preparation end of pulverized fuel burning, and has been responsible for many of the erroneous ideas that prevail generally as to the cost of this method of fuel burning.

The preparation cost may be divided into three items:—*First:* interest and depreciation. *Second:* labour. *third:* power.

General figures covering the first item would be extremely misleading, as the cost of pulverizing plants due to the varied nature of the conditions to be met, are so widely different that one installation could have no possible bearing on another. The conditions surrounding the employment of labour are again so widely varied, and the design of the plant would enter into this to such an extent that general figures are of little value. The power consumption, however, may be taken as a fixed item, and divided as follows:—

Power of mills	12.5	k.w per ton
Power of conveyors	1.0	"
Power of dryers	2.7	"
Power for fans	3.0	"
Power for feeders	0.8	"
	20.0	

While we do not like to offer general figures as to cost of pulverized coal firing, it may be permissible to give specific data. Table E includes complete figures covering the cost of steam production in one plant, of 3,000 h.p., over the period of one year. As to capital expenditure required and comparative operating cost for a new plant, a report recently made by Henry Kreisinger covering a contemplated installation burning high grade eastern coal is submitted herewith. His conclusions in the report have been accepted by the operating and consulting engineers of the firm for which it was made.

TABLE E—Yearly cost figures of producing 1000 lbs. of steam in a plant of 3000 h.p. boiler capacity.

Kind of coal — Bituminous screenings.		
Moisture as received	5.2%	
Volatile matter	33.4%	
Fixed carbon	48.3%	
Ash	13.0%	
B.t.u. (as received)	11,771	
B.t.u. (dry basis)	12,414	
Total steam made	854,158.17	M lbs.
Evaporation from and at 212 deg. F	9.75	" "
Cost of coal per ton f.o.b. plant	5.13	
Total tons burned	43,703	
Cost of fuel	224,709.39	
Cost of repairs	7,216.00	
Cost of supplies	7,271.88	
Cost of water	13,330.30	
Cost of labour	23,680.52	
Total operating costs	276,207.99	
Cost per 1000 lbs. steam	0.324	
Total investment at 20%	52,799.66	
Investment charge per 1000 lbs. steam	0.061	
Total annual cost	329,007.65	
Net cost per 1000 lbs. steam	0.385	

Operating cost of unloading, crushing, drying, pulverizing and firing pulverized coal in a 3,000 horse power plant, including boiler washing and ash handling from records for month of January, 1920 —

Labour			Cost per month
Unloading (cars to track hopper) about 50% of cars were of bottom dump type, balance had no dump and coal had to be shovelled over side into track hoppers	622 hrs. at	40c.	—$248.80
Mill operator (day)	208 "	60c.	124.80
" " helper (day)	208 "	40c.	83.20
" " (nights)	208 "	50c.	104.00
" " helper (nights)	208 "	40c.	83.20
Fireman	720 "	51c.	367.20
Boiler washer and cleaner	416 "	40c.	166.40
Repair man (Acting foreman of washer and cleaner)	208 "	60c.	124.80
Ash handler	208 "	40c.	83.20
Total			$1385.60

Power			
Power consumed by pulverizing mills	55,440 kw. at	1c.	554.40
" " " dryer	315 "	"	31.50
" " " elevator, conveyor and coal feeding equipment	10,450 "	"	104.50
Total			$690.40

Miscellaneous			
Coal used in dryer furnace	26.8 tons at	$4.80	128.60
Lubricant oil at 46c. per gal. Grease @ 10c. per lb			47.25
Total			$175.85

Summary of cost of preparing coal and firing boiler

Total coal burned during the month		3150 tons.
Total labour costs per ton of coal fired—	Item 1 to 9 inclusive	44c.
" power costs " " " " —	Item 10 " 12 "	22c.
" miscellaneous " " " " —	Item 13 and 14	5c.
Total cost of labour, power and miscellaneous items for unloading, drying, pulverizing, conveying, firing boiler, washing and ash handling per ton of coal fired exclusive of overhead		71c

Summary of cost of preparng coal including power costs for feeding to furnace.

Total coal burned during month		3,150 tons
" labour costs per ton pulverized —	Item 1 to 5 inclusive	20c.
" power " " " " " —	Item 10 to 12 "	22c.
" miscellaneous " " " —	Item 13 and 14 "	05c.
Total cost of labour, power and miscellaneous items for unloading, drying, pulverizing, and conveying pulverized coal from car to boiler furnace exclusive of overhead		47c.

In conclusion it may be stated that any Canadian coals would present excellent possibilities for commercial and industrial use when pulverized and burned in suspension. That the pulverization of these fuels would:— 1. Guarantee efficient operation with any type of fuel under widely varying load conditions. 2. Permit advantage being taken of market conditions, as the use of either gaseous, liquid or solid fuels in the same furnace is practicable. 3. Permit the plant to be operated at uniformly higher continuous rating than is possible with any other method of firing. 4. Make plant much more responsive to fluctuating load conditions. 5. Insure continuity of operation. 6. Reduce labour. 7. Reduce stand-by loss. 8. Reduce both boiler and furnace maintenance, and by reduction of arduous manual labour permit the use of higher grade men, thereby insuring more intelligent boiler room operators.

Electrons, Atoms and the Ether

An outline of the present knowledge of the subject resulting from recent investigations.

W. B. Cartmel, M.E.I.C.

Fellow of The American Physical Society.

Transmission Engineer, Northern Electric Company, Ltd.

Paper read before the Montreal Branch, The Engineering Institute of Canada, March 30th, 1923.

(Continued from May 1923 issue, "The Engineering Journal")

We will now consider some somewhat similar experiments on solid substances. Two of Rutherford's pupils, Geiger and Marsden, observed the effect of thin metal plates on a stream of swiftly moving alpha particles. They found that a beam of alpha particles was broadened by passing through a thin sheet of metal. Due to some of the particles passing so closely to the nucleus, a few are bent through quite a large angle and some are even turned back just as a comet coming into our solar system is sometimes turned back, describing a parabola with the sun at its focus. Figure No. 15 is a diagram showing roughly how a thin sheet of metal a few molecules thick bends the stream of alpha particles through different

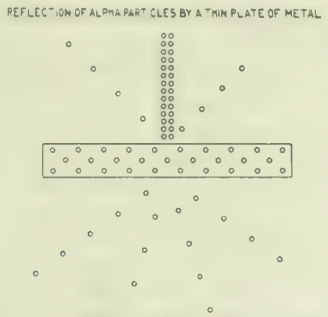


Figure No. 15

angles. Professor Rutherford computed the chance of an alpha particle being bent through a certain angle, then from measurements of the number of alpha particles bent through different angles, it was possible to determine the electrical charge on the nucleus of the atom of the metal of which the plate was composed. In this way he was able to show approximately that the number of positive charges on the nucleus was equal to half the atomic weight. This is tantamount to saying that the number of electrons surrounding the nucleus is equal to half the atomic weight of the atom, because as we know, the number of outer electrons must be equal to the number of positive charges on the nucleus.

How the Structure of Atoms was Discovered

More evidence as to the number of charges on the nucleus was obtained from X-ray spectra. It has already been shown how a spectrum of light may be produced by means of a grating ruled with fine lines. The number of lines in the grating actually used was 14,480 lines per inch. It has not been found possible to make such a grating for use with X-rays, one reason being that X-rays are light of such very short wave-length; (about one ten thousandth that of ordinary light). However, it has been found that a crystal, such as iceland spar, may be used as a grating for use with X-rays because of the molecules of the crystal being arranged in equidistantly space drows. An Oxford student named Moseley, who sad to relate, was shot to death in the trenches during the war, was able to throw a good deal of light on the structure of atoms by means of X-ray spectra. He compared the spectra of X-rays from different substances. You will remember how X-rays are produced in the X-ray tube (see figure No. 10). Electrons impinge with an enormous velocity on the anti-cathode and their sudden stoppage gives rise to X-rays. Moseley used different substances for the anti-cathode in the X-ray tube and examined the spectra of the X-rays produced in each case. Now the deviations produced by a grating are inversely proportional to the wave-length, and Moseley was thus able to find the wave-length of the X-rays. Moseley found a very simple relation between the wave-length of the X-rays and the atomic weight of the element.

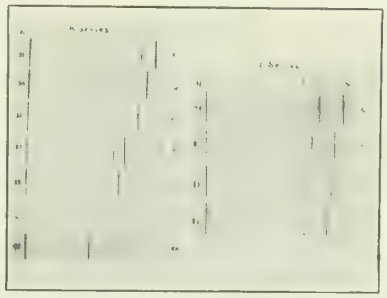


Figure No. 16

There are found to be three series of X-ray wave-lengths, the *K* series, the *L* series and the *M* series. Some spectra in the *K* and *L* series are shown in figure No. 16. It will be seen from these spectra how uniformly the wave-length decreases with increase in atomic weight. More precisely stated, the wave-length varies inversely as the square of what Moseley called the atomic number. This was correlated by Moseley with what had been discovered from the scattering of alpha particles, in that the charge on the nucleus was approximately equal to half the atomic weight, and Moseley was led to the important generalization that the atomic number of an element is the number of electrons surrounding the nucleus of its atom. Thus we have for a few of the lighter elements.

Element	Atomic Weight	Atomic Number
Helium	3.99	2
Carbon	12.00	6
Nitrogen	14.01	7
Oxygen	16.00	8

and we can see that hydrogen which is lighter than helium must have the atomic number one.

Direct Evidence in regard to the Structure of Atoms given by Radio-Activity

The conception of atomic number has thrown light on Mendeleeff's table of the elements. Mendeleeff, a Russian chemist showed many years ago that the properties of the elements were periodic functions of their atomic weights, and that a table could be made up, arranging the elements in groups having similar properties

(figure No. 17). From this table we can see that the alkali metals, lithium, sodium, potassium, rubidium and caesium, which all have similar properties, naturally fall into the same group. Similarly, with chlorine, bromine and iodine which are found in group VII. Moseley's generalization shows that it is only possible to have ninety-two elements from hydrogen to uranium. Of these all but six are already known. Those missing are two of the rare earth group (elements 57 to 72), an analogue of rubidium in group one, and two analogues of manganese and one of iodine in group VII.

The conception of atomic number has been confirmed and extended by discoveries in radio-activity, which have proved that the properties of the elements depend on the number of electrons surrounding the nucleus. In the early days of radio-activity it was found that by the emission of alpha particles and electrons (or beta particles as they were called at that time) radium changed into other substances. Radium changed into emanation which in its turn changed into radium *A*, radium *B*, radium *C* etc., and these substances are now known to be elements. Radium emanation was originally given a very non-committal name possibly because it was so mysterious, but is now known as a gas called niton, while the other substances into which it breaks up are known to be the elements polonium, bismuth, and lead. To examine these a little more closely we will put them in tabular form thus:

Radio-active Transformations

	Name of Element	Atomic Number	Atomic Weight	Half Value Period
Radium	Radium	88	226.2	1650 years
Emanation	Niton	86	222.2	3.5 days
Radium A	Polonium	84	218.2	3 minutes
Radium B	Lead	82	214.2	26.8 minutes
Radium C	Bismuth	83	214.2	19.5 minutes
Radium C′	Polonium	84	214.2	
Radium D	Lead	82	210.2	16.5 hours
Radium E	Bismuth	83	210.2	5 days
Radium F	Polonium	84	210.2	136 days
Radium G	Lead	82	206.2	

In the above we see that the properties of the substance (hence the name of the substance) depend on the atomic number and not on the atomic weight. For instance, radium *B* and radium *D* and radium *G* are all of them lead having the same chemical and physical properties as ordinary lead. One of them, radium *G* cannot be distinguished from ordinary lead in any way except by a determination of its atomic weight, the atomic weight of ordinary lead being 207.2; the other two, radium *B* and *D*, differ from radium *G* and from ordinary lead in

PERIODIC TABLE OF THE CHEMICAL ELEMENTS, 1923

	Group O	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII		
1 Hydrogen 1.008	2 Helium He 3.99	3 Lithium Li. 6.94	4 Beryllium Be. 9.1	5 Boron. B. 11.0	6 Carbon C. 12.00	7 Nitrogen N. 14.01	8 Oxygen O. 16.00	9 Fluorine F. 19.0			
	10 Neon Ne. 20.2	11 Sodium Na. 23.00	12 Magnesium Mg. 24.32	13 Aluminium Al. 27.1	14 Silicon Si. 28.3	15 Phosphorus P. 31.04	16 Sulphur S. 32.07	17 Chlorine Cl. 35.46			
A	18 Argon A. 39.88	19 Potassium K. 39.10	20 Calcium Ca. 40.07	21 Scandium Sc. 44.1	22 Titanium Ti. 48.1	23 {Vanadium V. 51.0}	24 Chromium Cr. 52.0	25 Manganese Mn. 54.93	26 Iron Fe. 55.84	27 Cobalt Co. 58.97	28 Nickel Ni 58.68
B		29 Copper Cu. 63.57	30 Zinc Zn. 65.37	31 Gallium Ga. 69.9	32 {Germ'ium Ge. 72.5}	33 Arsenic As. 74.96	34 Selenium Se. 79.2	35 Bromine Br. 79.92			
A	36 Krypton Kr. 82.92	37 Rubidium Rb. 85.45	38 Strontium Sr. 87.63	39 Yttrium Yt. 89.0	40 Zirconium Zr. 90.6	41 {Niobium Nb. 93.5}	42 Molybd'um Mo. 96.0	43 ———	44 Ruthenium Ru. 101.7	45 Rhodium Rh. 102.9	46 Palladium Pd. 106.7
B		47 Silver Ag. 107.88	48 Cadmium Cd. 112.40	49 Indium In. 114.8	50 {Tin Sn. 119.0}	51 Antimony Sb. 120.2	52 Tellurium Te. 127.5	53 Iodine I. 126.92			
A	54 Xenon Xe. 130.2	55 Caesium Cs. 132.81	56 Barium Ba. 137.37	57 Lanthanum La. 139.0	58 Cerium Ce. 140.25	59 Praseodymium Pr. 140.6	60 Neodymium Nd. 144.3	61 ———	62 Samarium Sa. 150.4		
	63 Europium Eu. 152.0		64 Gadolinium Gd.157.3		65 Terbium Tb. 159.2	66 Dysprosium Dy. 162.5		67 Holmium 163.5	68 Erbium Er.167.7		
	69 Thulium Tm. 168.5	70 Ytterbium Yb. 172.0		71 Lutecium Lu. 174.0	72 {Hafnium 180}	73 {Tantalum Ta. 181.5}	74 Tungsten W. 184.0	75 ———	76 Osmium Os. 190.9	77 Iridium Ir. 193.1	78 Platinum Pt. 195.2
B		79 Gold Au. 197.2	80 Mercury Hg. 200.6	81 Thallium Tl. 204.0	82 Lead Pb. 207.20	83 Bismuth Bi. 208.0	84 Polonium (210)	85 ———			
A	86 Radium Emanation (222)	87 ———	88 Radium Ra. 226.0	89 Actinium	90 Thorium Th. 232.12	91 Uranium X_2 (Brevium)	92 Uranium U. 238.18				

The figures above the name of the element are the atomic numbers, and those below the atomic weights.
Only the five spaces marked ——— are vacant places

NOTE.—At the time the paper was read there were actually six vacant places but the recent discovery of Hafnium by Coster and Hevesy has reduced the number to five. Hafnium is so called after Openhagen. It is contained to the extent of 5% or 10% in Zirconium minerals, and is an analogue of Zirconium and Titanium.

Figure No. 17

being radio-active. Radio-activity has therefore, given us a means of distinguishing between certain substances which are chemically identical but have different atomic weights. Frederick Soddy, formerly professor of chemistry at McGill University, has given the name of isotopes to substances which are chemically identical but have different atomic weights. From the above table we see that radium having an atomic weight of 226.2 has an alpha particle shot out from its nucleus, the loss of which changes the atomic weight to 222.2. Since the lost alpha particle has two positive charges, the nucleus now has two fewer positive charges, hence in order for the atom to be electrically neutral there are two fewer outer electrons and the atomic number becomes 86. This changes the chemical nature so that the atom of the metal radium becomes the atom of a gas niton; similarly niton changes into polonium and the polonium or radium *A*, changes into lead or radium *B*. These changes from radium to radium *B* are all due to alpha particles having been released from the nucleus. At this point a different kind of change takes place, the radium *B* loses an electron from its nucleus so that there is no measurable change in atomic weight and the same is true of radium *C*. However, since there is a loss of an electron from the nucleus changing its charge by one unit, there will therefore be one outer electron more, and the atomic number will be greater. Radium *C'* however, evidently gives out an alpha particle, for there is a change of atomic weight. We see therefore that when an alpha particle is emitted, the atomic weight goes down four points and the atomic number down two, while the emission of an electron which does not appreciably affect the atomic weight moves the atomic number up one. The last column of the table, showing the half value period has been added in order to give an idea of the rapidity of the changes. To illustrate the meaning of this, if a given amount of pure radium were taken, in 1650 years only half of it would still be radium; similarly in 3.5 days a given quantity of pure niton would have diminished by one half, the remainder being charged into polonium and other substances. No half value period is shown for radium *C'* because the change is practically instantaneous. Radium *G* on the other hand, which is the end product of these transformations, if it changes at all, changes so slowly that it has not been found possible to observe the change. The radio-activity of uranium is so slow that it has five thousand million years for half value period, while on the other hand, radium *C'* changes so rapidly that the half period value has been estimated at a millionth of a second. In the case of ordinary elements not classed as radio-active, the stability of the atom is so great that no change from one element to another has been observed, except in the case of potassium and sodium in both of which a slight radio-activity has been noticed.

As previously stated there are a number of kinds of lead formed from the decomposition of the radium atom, two of them unstable, and one a final and stable product. We have seen that this differs slightly in atomic weight from ordinary lead. There is a third lead of a stable kind which belongs to another radio-active series, that is to say the thorium series. The approximate values of the atomic weights of these three leads are: radio lead 206, thorio lead 208, and ordinary lead 207. Ordinary lead is probably a mixture of radio lead and thorio lead.

The Discovery of Isotopes of Ordinary Substances

Radio-activity having brought to our notice the fact that the same substance might have different atomic weights, in other words having indicated the existence of isotopes, it was natural to suppose that there were isotopes of ordinary stable substances, non-radio-active. This was first demonstrated in the case of the elementary gas neon, by Sir J. J. Thomson, who showed that neon is composed of two isotopes having atomic weights 20 and 22, the atomic weight of ordinary neon (20.2), being accounted for by its being a mixture of the two isotopes in such proportion as to give its atomic weight. Thomson took ordinary neon gas and determined the atomic weight of constituent particles by his method of positive ray analysis which will now be described. This method consists of sending a discharge through a tube containing a rarified gas, obtaining in the tube a fine stream of positively charged particles of the gas, and then deviating this stream by means of electromagnetic and electrostatic fields. The amount of deviation produced, will depend on the mass of the particles and on their charge, which can be separately determined.

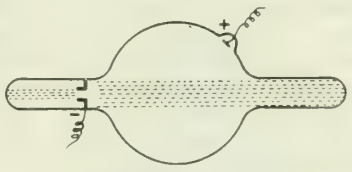


Figure No. 18

To illustrate the method consider the discharge tube shown in figure No. 18 which represents a tube filled with helium under very low pressure. The stream of electrons shot out normally from the cathode proceeds towards the right in straight lines past the anode towards the end of the tube. The cathode of this special tube being perforated, positively charged particles of the helium gas in the tube shoot backwards; (towards the left in the figure). The stream of electrons is bluish and the stream of positively charged particles orange coloured in the case of helium gas, as shown on the lantern slide. In Sir J. J. Thomson's experiments the stream of positively charged particles was driven through a long fine tube and the resulting fine stream of particles, acted on by both magnetic and electric fields, producing parabolic curves. The stream of particles was received on a photographic plate which gave a permanent record of the curves. Measurements made on these plates gave data from which the mass of the particles could be determined. This method of positive ray analysis has been radically modified by Aston who has been able to make very accurate measurements of atomic weight by his method. Aston's work has led to a very considerable extension of our knowledge of isotopes. This work has shown already that the atomic weights of the elements are whole numbers when the element does not consist of isotopes, except in the case of hydrogen whose atomic weight determined on single atoms (1.008) is the same as found by determinations made on a mass of the gas. Some substances he found had a number of isotopes, for instance krypton whose atomic weight given as 82.92 is found to consist of isotopes having atomic weights 78, 80, 82, 84 and 86.

Modern Science and the Transmutation of Metals

The preceding outline of our present knowledge of the make-up of the atoms of the elements leads to the possibility of the transmutation of metals. All that is necessary to change one element into another is to change the number of outer electrons. We see in the case of krypton that there are six different kinds of atoms, probably differing from one another in the number of hydrogen and he-

lium atoms in their nuclei, but all having the same nuclear charge hence the same number of outer electrons. Aston has also found that there are atoms having the same atomic weight but a different number of outer electrons. These atoms have different chemical properties and are known as isobares. We have already seen in discussing radio-active transformations that radium *B*, *C* and *C'* having the properties respectively of lead, bismuth and polonium all have the same atomic weight 214.2 and similarly with radium *D*, *E* and *F* which all have the atomic weight 210.2. These facts show clearly that if we could change in any way the number of outer electrons in the atoms of any substance we would make a corresponding change in its properties. Referring to figure No. 17, we see that the atomic number of mercury is 80 and of gold 79 so that in order to make gold from mercury all that is necessary is to remove one of the outer electrons from an atom of mercury. This possibility has recently led some people to suppose that the philosopher's stone has been discovered at last and that the transmutation of metals is now possible. This however, is far from the truth. If it were possible to convert other metals into gold as was recently stated to have been done in Germany, we could obtain a supply of heat energy that would be far more valuable than the gold produced. The possibility of transmutation was seen about fifteen years ago by Sir William Ramsay, a very distinguished English chemist. Having in mind the enormous velocities with which alpha particles are shot out of radio-active substances he saw a new method of attack in acting on previously unchangeable elements. He used the radio-active gas called radium emanation or niton which was one of the most strongly radioactive substances available. Allowing this substance to act on copper sulphate he thought he obtained traces of lithium and sodium. His results however, were afterwards shown to be in error. More recently Sir Ernest Rutherford has attacked the problem in a different way. Rutherford used a still more powerful radio-active substance than radium emanation viz; radium *C*, which disrupts so violently that, as seen in the table previously given, in 19.5 minutes half of a given quantity of pure radium *C* will have changed into something else. The velocity with which alpha particles are ejected from this substance is so great that they will travel through 7.06 centimeters of air before coming to rest. In Rutherford's first experiments the light gases such as hydrogen, nitrogen, carbon dioxide, etc., were experimented with. A speck of radium *C* was used as a centre of emission and from this a stream of alpha particles was sent through the gas. Out of a large number of swift alpha particles encountering millions of atoms an occasional one would hit the nucleus of an atom. In the case of hydrogen, the nucleus being the proton whose mass is approximately one-fourth that of the alpha particle, its nucleus is sent forwards, by the force of the impact with a velocity greater than that of the alpha particle that struck it. This swiftly moving proton will cause a flash on a screen of zinc sulphide just as an alpha particle will, and by observing the range of the proton an idea of its velocity is obtained. In the case of other gases experimented on, such as nitrogen, fluorine, and air, it was found that hydrogen atoms or protons were knocked out of them also, but Rutherford was unable to knock hydrogen atoms out of carbon dioxide or out of oxygen. (Some swift hydrogen atoms did appear in the experiments but from the small quantity produced and from their general behaviour these were thought to have come out of the radium *C*.) Rutherford's results are interesting not only because they are the first successful attempts to change one element into another, but also because they give us an insight into the structure of the lighter elements. The lack of hydrogen in the nuclei of oxygen and carbon dioxide shows that the nucleus of the oxygen atom, of atomic weight 16, contains 4 alpha particles, and that of carbon of atomic weight 12, is made up of 3 alpha particles. Nitrogen however, (atomic weight 14) with which Rutherford has been very successful in obtaining swift hydrogen atoms, contains in its nucleus 3 alpha particles and 2 protons, and the nucleus of fluorine (atomic weight 19) is composed of 4 alpha particles and 3 protons. Similarly for the other elements mentioned above, the numbers given are possible arrangements of alpha particles and protons that will give at the same time the proper atomic weight and atomic number, and probably the only arrangements that will do so. Very recently Sir Ernest Rutherford and Dr. Chadwick have succeeded in knocking hydrogen atoms out of carbon, fluorine, aluminum, sodium and phosphorus.

What has the Future in Store for Us?

Painstaking experiments by Professor Rutherford and by other physicists all over the world are still taking place with the object of extending our knowledge of the problems discussed in this paper. There still remains the great outstanding problem as to the precise nature of the ether. Is it a continuous fluid as was at one time supposed or does it consist of very minute particles even smaller than the electron, which has a diameter of only twenty-seven millionths of an Angstrom Unit, or are these ether particles perhaps even enormously smaller than the proton which is two thousand times smaller than the electron? Will investigations as to the nature of the ether open up the way to some new practical application, just as the study of the electron led to the development of the wonderful vacuum tube that has revolutionized radio telephony and which may perhaps revolutionize power engineering, not to mention the discoveries of radium and X-rays which also resulted from investigations which led up to the discovery of the electron? Or will some way be discovered of breaking up the nuclei of atoms so as to unlock the boundless energy stored up in them?

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By-laws Amended

The result of the ballot submitted to the membership on the proposed changes in the by-laws of *The Institute* shows that all amendments have carried by a substantial majority. The final result gives the total number of valid ballots as nine hundred and seventy-three; in favour of all amendments, six hundred and fifty; against all amendments, one hundred and fifty-three; and mixed votes, one hundred and seventy. The actual percentage in favour of the various clauses varies from seventy-one per cent for section twelve, to eighty-three per cent for sections one, three and four, the percentages for the other clauses varying between those limits. The amendments, therefore, as published on page ninety-five of the February *Journal*, are now part of the by-laws of *The Institute*, and will be included in the year book to be issued shortly.

The provisions relating to branch membership will go into effect as soon as the distribution of territory has been made and approved by Council. Until this is done it will be impossible to ascertain the actual branch membership, and therefore, the Council representation.

There was opposition to the changes owing to the fact that the proposals gave Montreal and Quebec province a much smaller representation on Council than heretofore, and a smaller proportional representation than any other province. The members of *The Institute* residing outside of Quebec province will recognize that the situation will need remedying and will no doubt vote in favour of a change to give a more equable distribution of Council representation and still have every branch represented, as was recommended by the Committee on Policy.

National Conference on Education and Citizenship

As an illustration of the ever broadening sphere of activity of *The Institute*, it is of more than passing interest to note that *The Institute* was officially represented at the recent Conference on Education and Citizenship held in Toronto, April fourth to eighth, by the president and secretary. The president reported at the last council meeting that he believed that the convention was sufficiently important, both from the desirability of the objects, the pre-eminence of the speakers, and the importance of the subjects discussed, to fully justify Council's action in having been officially represented. President Francis stated that he believed that *The Institute* can most heartily subscribe to the work of the National Conference on Education and Citizenship and become actively and definitely associated therewith. The daily press gave considerable attention to the conference so that it is doubtless familiar to all members of *The Institute*.

One session was devoted to a survey of present day conditions and an inquiry into the adequacy of education as an all important factor in assuring the progress of civilization. The following day was devoted to emphasizing the essential place of the English language and its literature in education, sessions being held both in French and in English. Another day was devoted to affirming that the purpose of education is the development of character, expressed in personality of the one hand, and terms of service on the other.

The objects of the conference were:—

1. To emphasize the necessity of a greater degree of idealism and spirituality in education, since persistence in our present competitive and secular methods must lead to western civilization eventually destroying itself.

2. To stimulate a Dominion wide interest in education as a means to life and not for the purpose of livelihood; to demonstrate the need for a re-statement of values and to seek the removal of the emphasis now placed on the material aspects of life to the almost complete neglect of the spiritual.

3. To endow the ideas "education" and "citizenship" with a unity of meaning and purpose for the nation and to impress in the hearts and minds of the people the ideal of a fulness of life attainable by all.

4. To demonstrate the continuity of the entire educational process — through its three great and inseparable agencies, the home, the school, the church — for the development of character as self-expression, of citizenship as national character expression.

5. To discuss proposals for the improvement of education in the Dominion, which could be more readily effected by co-operation among existing agencies and by the active interest and support of public opinion.

6. To pave the way for annual public conferences of a more professional character at which detailed discussion and enquiry can be entered into on the great educational problems of the day, and on educational development and experiment in other parts of the world.

7. To consider suggestions for the re-organization of the National Council on Educational and for its subsequent policy.

Engineering Legislation Analyzed

Councillor C. C. Kirby, M.E.I.C., has prepared a comparison of the various engineering acts in effect in Canada, which is published herewith as a handy reference in comparing the similarity or differences of the various acts and their scope and limitations.

There are now seven of the eight major provinces in which legislation is in effect, Saskatchewan being the only one without any.

The definition of what constitutes *professional engineering* and the *practice of a professional engineer* has been attempted in rather varied terms in the several provinces. All define what kind of work shall comprise professional engineering to a greater or less degree. Alberta, Manitoba, British Columbia and Nova Scotia expressly except the participation of a contractor, foreman, superintendent, etc. New Brunswick qualifies the definition by using the term "in a professional capacity." Quebec exempts the work done by a skilled artisan or workman and work of government colonization roads or ordinary roads in rural municipalities. Nova Scotia limits the application of the definition to work involving an expenditure of at least $25,000. British Columbia exempts work costing less than $3,000 and not involving public safety and also work privately owned by the person doing it.

The Work of Architects

British Columbia specially exempts architects.

Quebec and Manitoba. Do not include any buildings in their definition clauses.

Nova Scotia specifies the particular kind of buildings considered as engineering.

New Brunswick specifies factories and industrial works as engineering.

Ontario specifies industrial works as engineering.

Alberta specifies steel and concrete structures, and all buildings for the proper housing or operating of beforementioned engineering works.

Division of Engineering into Branches

Alberta specifies civil, electrical, mechanical and mining.

British Columbia, Nova Scotia, New Brunswick — Do not mention the branches in act or by-laws.

Ontario adds chemical.

Quebec uses the term "civil engineering", in which it includes railway, municipal, hydraulic, mechanical, mining and electrical.

Restriction of the use of the title "Professional Engineer"

Alberta and Ontario use term "registered professional engineer."

Quebec restricts the use of the title "civil engineer" or any title implying membership in the Corporation of Professional Engineers of Quebec.

British Columbia, Manitoba, New Brunswick and Nova Scotia restrict the title "professional engineer".

Elections of Council

In Alberta and Ontario — Councillors represent branches of engineering and are elected by branch members.

In New Brunswick — Councillors represent districts and are elected by vote at large.

In Quebec — Councillors represent districts and are elected by district members.

In Manitoba, British Columbia and Nova Scotia — Councillors are elected at large.

Admission of Residents to Membership

All provinces except Quebec allow admission without examination at the discretion of the council. Quebec allows this in the case of persons holding a diploma of C.E., or degree of Bachelor of Applied Science from any recognized school or university or any member of other engineering society or corporation of professional engineers of like importance.

Privilege of Transfer of Membership from one Province to Another

Is allowed by all provinces.

Fees for Transfer from one Province to Another

Manitoba, New Brunswick and Nova Scotia are the only provinces which follow the lines of the "model act" and permit such transfer without payment of any fees for the current year to members who have paid their fees in the provinces from which they transferred.

Alberta requires an entrance fee of $10.00.

British Columbia requires a $5.00 registration fee, but no annual fee for the year.

Quebec and Ontario require ordinary fees to be paid.

Licence for Non-Residents

All provinces except Quebec grant a license to full practice to residents of other provinces who are members of similar associations.

Quebec grants a license to practise on consideration that the actual engineering work planned be carried out in collaboration with a Quebec member.

Manitoba, New Brunswick and Nova Scotia require a nominal fee of $1.00 from members of other similar associations.

Alberta $5.00, Quebec $10.00, Ontario $5.00, British Columbia $5.00.

License Fees to Non-Residents, Not Members of Similar Associations

Ontario $5.00, Alberta $5.00, British Columbia $15.00, Manitoba $25.00, New Brunswick $25.00, Nova Scotia $20.00, — $50.00, Quebec $10.00.

Practice without License or Fee

All provinces except Quebec and Alberta allow persons who are employees of governments or corporations doing inter-provincial business and who are also members of similar associations in their home provinces to practise without fee or license.

Alberta requires a license to such persons but no fee.

Annual Fees

Alberta $10.00, British Columbia $15.00, Manitoba $5.00, Ontario $5.00, New Brunswick $5.00, Nova Scotia $5.00, Quebec $10.00.

Use of Personal Seal

In Alberta, British Columbia, Manitoba, Nova Scotia and Ontario personal seal is compulsory.

In New Brunswick use of seal is optional.

In Quebec use of seal is not specified at all.

Minimum Age for Registration

Alberta 25 years with 8 years experience or 6 with college training.

British Columbia	23	years	with	6	years	experience.
Manitoba	21	"	"	4	"	"
New Brunswick	23	"	"	6	"	"
Ontario	21	"	"	5	"	"
Quebec	21	"				
Nova Scotia	no limit.					

Penalties

For Practising without Registration or license.

Alberta — none; British Columbia $50 — $300; Manitoba $200; New Brunswick $100 — $200; Nova Scotia $100 — $200; Quebec $100 — $200; Ontario — none.

For Assuming Title of "Professional Engineer", etc.

Alberta $50 — $100; Ontario $100 — $200. Other provinces same as above.

Work of Assistants

New Brunswick and Nova Scotia adopted the "model act" clause "assistants working under the direct supervision of a professional engineer shall not be deemed to be practising as professional engineers when so engaged."

Manitoba. "Graduates or undergraduates of recognized engineering colleges, when registered with the association may do engineering work under the guidance of a professional engineer who assumes responsibility for their work."

Ontario and British Columbia. "Any person acting as an assistant to a professional engineer where such person is directly responsible for the technical quality of the work must be a professional engineer. Any person may therefore acts as an assistant to a professional engineer. Any person may therefore act as an assistant to a professional engineer and shall not be deemed to be practising professional engineering when so engaged."

Quebec and Alberta have no clauses dealing with assistants.

Scale of Fees for Professional Services

Quebec has the power to establish fees for professional services subject to approval of Lieut.-Governor in Council.

Joint Examination Board

All provinces except Quebec and Alberta have similar clauses giving the council power to delegate their powers to a joint examining board set up between one or more of the other provinces.

Alberta has its examining board appointed by the Senate of the University of Alberta.

Restriction of Activities of Associations

New Brunswick, Nova Scotia and Alberta have provisions in their acts by which the activities of the associations are limited to the functions of administering the act only.

Institute Year Book

The Year Book of *The Institute* will be mailed to all corporate members about the middle of June. Any Junior or Student of *The Institute* desiring a copy will receive one by sending a written request to the headquarters office.

The delay in issuing the Year Book this year was due to the fact that it was necessary to incorporate the changes in the by-laws, these changes not having been finally ratified until the meeting of Council held on May twenty-ninth.

Besides the usual list of members and officers the Year Book will embody all of the professional engineering acts in existence in Canada, with all modifications that have been made since the last issue.

OBITUARIES

William Scott, M.E.I.C.

The deepest regret is expressed at the news of the death of William Scott, M.E.I.C., at Southsea, England, on March 5th, 1923 in his fifty-fourth year. The late Mr. Scott was one of *The Institute's* outstanding members in railway and development work in Newfoundland, and at the time of his death he was vice-president and general manager of the Anglo-Newfoundland Development Company, Limited, at Grand Falls, Newfoundland. He was born at St. Andrews, Scotland in 1868 and received his early education at Madras College, St. Andrews and as a pupil of William D. Sang, civil engineer, Kirkcaldy, Scotland from 1883 to 1888. He came to Canada in 1888 and was engaged in railway location and construction, his first work being with the Ottawa and Gatineau Valley Railway for a short period and later as leveller on location at Mattawa, Ont., and still later on location and construction of the Port Arthur, Duluth and Western Railway.

In 1892 he joined the Reid-Newfoundland Company and was engaged in railway location for some four years after which he devoted his time to the timber and mineral interests of the company. When the Anglo-Newfoundland Development Company was formed he was appointed chief engineer in 1905 and during the next nine years directed the railway construction from Grand Falls to the seaport, and the construction of the hydro-electric and paper mill plants at Grand Falls where he was manager and director of the plant until appointed general manager and vice-president of the company.

Mr. Scott was elected a Member of the Canadian Society of Civil Engineers on May 17, 1906.

Richard Drummond, A.M.E.I.C.

Richard Drummond, A.M.E.I.C., for a number of years chief draughtsman to the Boving Hydraulic and Engineering Company, Limited, died of flu-pneumonia on February 9th, after an illness of five days.

The late Mr. Drummond was educated in Campbellton Academy, mechanics and chemistry, 1906 to 1908, and in Glasgow and West of Scotland Technical College 1912 to 1913. In 1906 he was apprenticed to Andrew Gifen and Sons, Campbellton, and completed his apprenticeship with Alex. Stephen and Sons, shipbuilders, Glasgow. In 1911 he was draughtsman with the Chesters Renfrew Engineering Company, Renfrew, Scotland, on mining machinery, and later occupied a similar position with the Glasgow Nut-lock and Engineering Company, on gas and oil engines.

In 1913 he came to Canada and joined the engineering staff of the Boving Hydraulic and Engineering Company Limited, Lindsay, Ont., as draughtsman, later becoming chief draughtsman for the company, which position he held for a considerable period.

Mr. Drummond became an Associate Member of *The Institute* on December 30th, 1920.

Welcome to A.S.M.E.

Visiting Engineers from the United States entertained by Canadian Confreres

The spring meeting of the American Society of Mechanical Engineers, held in Montreal, offered an opportunity of an exchange of fraternal visits such as is seldom afforded. On receiving the announcement that the American Society of Mechanical Engineers was to hold its spring meeting in Canada, the Council of *The Institute* recognized that it would be an occasion of fostering and furthering the already pleasant relationship existing between the two bodies. The Montreal branch was asked to take part in connection with local arrangements and a general invitation was received from the secretary of the A.S.M.E. to the entire membership of *The Institute* to participate in all functions.

The Canadian arrangements were under the direction of H. H. Vaughan, M.E.I.C., vice-president of the A.S.M.E., while the entire technical programme, which was of the usual high order of the A.S.M.E. was arranged directly from their headquarters' office, some of the outstanding papers being presented by Canadian engineers.

From the start our American friends were made to feel that they were welcome and several of the functions demonstrated to a notable degree the friendship that exists. Of these the dinner, tendered by the President and Council of *The Institute* to the President and Council of the A.S.M.E., was a unique and pleasant gathering, cementing friendships and increasing to a greater extent the harmonious relationship that has heretofore been inevidence. At the smoker, the committee of the Montreal branch showed that, as entertainers, the Montreal men are not easily surpassed.

JOHN LYLE HARRINGTON

In his address of welcome President Francis struck a happy keynote and it is confidently expected that our fellow engineers from the United States will feel that they were indeed welcome in our midst.

The President of the American Society of Mechanical Engineers, John Lyle Harrington, is a man who graces the position, and who is a leader in engineering activity in the United States. He was born in Lawrence, Kansas, in 1868, and was educated at the University of Kansas, receiving the degrees A.B., B.S., and C.E. He has had an extensive engineering career, having held at different times the following positions: designer for the Berlin Iron Bridge Company; assistant chief engineer of the Bucyrus Company, South Milwaukee; assistant engineer of bridges and buildings for the Baltimore and Ohio Railroad, and chief engineer and manager of the Locomotive and Machine Company of Montreal. For three years he was executive engineer of the C. W. Hunt Company of West New Brighton, N.Y. He was also in business with Mr. J. A. L. Waddell of Kansas City. At present Mr. Harrington is with the firm of E. E. Howard and L. R. Ash, consulting engineers, Kansas City, Mo.

President Harrington has a vision of the engineer's place in modern life, and firmly believes that it is the engineer's duty to take a more active part in politics. In this connection he has said of the engineer:—

"Why should he pass on incompletely, as he must, to another mind his knowledge of the work to be done in order that the other mind may take that imperfect knowledge that he receives and make use of it to the benefit, or the detriment, as he sees fit, of the community he is attempting to serve? It is high time, in my judgment, that the engineer enter politics as a profession, that he take a part in the government of his city, that he recognize that it is an engineering matter, and that he stand with his fellows in doing it. The members of other professions stand together in their contact with governmental work; that is particularly true of the legal profession, and if you don't believe it is of the medical profession, touch the medical laws. Doctors and lawyers each stand together and act as a unit. The engineer acts only as an individual. Our engineering societies say, 'Hands off of politics,' and as they are organized they are probably right. That doesn't, however, prevent engineers from standing by each other and carrying into the government the detailed knowledge of engineering which is so essential to the proper carrying out of its functions. The errors in our city governments are vastly less errors of judgment than they are errors of purpose. The cities are made a profitable venture to those who undertake politics as a profession. They have not the technical knowledge, and they have not the honesty of the technical man in the conduct of the city's affairs, but they are easily in the place of importance because they have no rivalry in it, because, as I said, the engineer feels that politics is not a thing for him to deal with, that it is his function to be modest, to sit behind the scenes and furnish the technical knowledge to others.

I earnestly hope that we may shortly develop that professional consciousness, which is still to a very large degree absent in the engineering profession, which will force us to take our place in governmental matters, which will force us to take our responsibilities, to recognize the unpleasant duty and perform it, to go forward and face the situation,to fight it out in the disagreable manner of politics, for politics is, as a rule, disagreable.

Engineers do not like to contest. We have not the sense of pleasure in it that a good lawyer has, because a large part of his work is to contend with others. The engineer doesn't like to contend, he likes to build. He is progressive in his whole idea and his dislike for contention keeps him out of the battle. But he must face the fact that before this country achieves what belongs to it in the way of clean, sure, economical government, he must face the disagreable, he must join together with other engineers, and, as a profession, face the situation, and do his part politically."

The Secretary of the American Society of Mechanical Engineers, Calvin W. Rice, besides being a super-secretary, is one of the best known engineers in America, and takes place second to none as a leader in the encouragement of friendly relations between American engineers and those in other countries. He represented *The Engineering Institute of Canada* at the great world conference held in South America a year ago, an account of which he gave in a travelogue on the afternoon of the first day of the meeting. He has many friends in Canada and he made many more on his recent visit. He has built up, not only a splendid internal organization in the headquarters of the A.S.M.E., but from his energy and activity has resulted one of the strongest and most active engineering organizations in the world. He is always welcome amongst his Canadian brethren who would be glad to see him more often.

Graduates of 1923

Congratulations are in order to the following students of *The Institute* who have recently completed their courses at Queen's and Toronto universities.

Queen's University

Degree of B.Sc. (with honours).

Chalmers, Andrew Edward, B.Sc., (Civ.), Toronto, Ont.
Ennis, Leo Earl, B.Sc., (Civ.), Kingston, Ont.
Geiger, Douglas George, B.Sc., (Met.), Kingston, Ont.
Lockett, Lawrence Wilfred, B.Sc., (Me.), Kingston, Ont.
Meathrell, John Nicholas, B.Sc., (Civ.), Ingersoll, Ont.
Monteith, Alex. Crawford, B.Sc., (El.), Powassan, Ont.
Morrison, Neil Arthur, B.Sc., (Me.), Creemore, Ont.
McAuley, Patrick Harold, B.Sc., (El.), Trenton, Ont.
Naylor, John Boyd, B.Sc., (El.), Madoc, Ont.

Degree of B.Sc.

Corneil, Frederick Maurice B.Sc., (Civ.), Omemee, Ont.
Currie, Victor Robert, B.Sc., (Civ.), Lanark, Ont.
Hansen, Carl Andrew, B.Sc., (Civ.), Keewatin, Ont.
Holdcroft, William Peter Roe, B.A., B.Sc. (Civ.). Havelock, Ont
Marlatt, Charles Ewart, B.Sc., (Civ.), Trail, B.C.
Reynolds, William Melville, B.Sc., (Civ.), Aurora, Ont.
Robinson, Denis Owen, B.Sc., (Civ.), St. Thomas, Ont.
Rousell, Frank, B.Sc., (Civ.), Cainsville, Ont.
Schaeffer, Joseph Godfrey, B.Sc., (Civ.), Humboldt, Sask.
Swift, Earle Raymond, B.Sc., (Civ.), Kingston, Ont.
Warner, George Walter, B.Sc., (Civ.), Moosomin, Sask.

Askin, Robert James, B.Sc., (Me.), Irma, Alberta.
Burns, Robert Philip, B.Sc., (Me.), Montreal, Que.
Climo, Cecil, B.Sc., (Me.), Cobourg, Ont.
Dawson, William Ash, B.Sc., (Me.), Barrie, Ont.
Halliday, James Harold, B.Sc., (Me.), Renfrew, Ont.
Harvie, Allin Clifford, B.Sc., (Me.), Port Colborne, Ont.
Long, Clarence Robert, B.Sc., (Me.), Orillia, Ont.
Moulton, Reginald Heath, B.Sc., (Me.), Coaticook, Que.
MacKay, Ross, B.Sc., (Me.), Toronto, Ont.
Rapley, Blake Parker, B.Sc., (Me.), London, Ont.
Saunders, John Bruce, B.Sc., (El., 1922), (Me.), Kingston, Ont.
Sully, Elmo Albert, B.Sc., (Me.), Metcalfe, Ont.

Affleck, William Eldridge, B.Sc., (El.), Dutton, Ont.
Batzold, Harold Alexander, B.Sc., (El.), St. Thomas, Ont.
Bracken, William Donald, B.Sc., (El.), Seeley's Bay, Ont.
Collyer, Ernest B.Sc., (El.), London, Ont.
Hicks, Alva, B.Sc., (El.), Picton, Ont.
Jones, Vernon Chester, B.Sc., (El.), Jordan Station, Ont.
Moorhead, Lloyd Carleton, B.Sc., (El.), Ottawa, Ont.
Macgillivray, Malcolm Stuart, B.Sc., (El.), Kingston, Ont.

University of Toronto

Degree of B.A.Sc. (with honours).

Bell, Arthur Armstrong, B.A.Sc., (Chem.), Toronto, Ont.
Bunting, William Russell, B.A.Sc., (El.), Niagara Falls, Ont.
Cockshutt, Clarence Foster, B.A.Sc., (Mi.), Brantford, Ont.
Conklin, Alfred Norman, B.A.Sc., (Chem.), Toronto, Ont.
Drummond, Peter Rob, B.A.Sc., (Met.), Toronto, Ont.
Evans, Meyler Gwyn, B.A.Sc., (Me.), Toronto, Ont.
Farncomb, Hugh Frederick, B.A.Sc., (Mi.), Toronto, Ont.
Galbraith, Reginald Arthur Harvey, B.A.Sc., (El.), Toronto, Ont.
Hewgill, Russell, B.A.Sc., (Chem.), Toronto, Ont.
Inglis, John Gordon, B.A.Sc., (El.), Toronto, Ont.
Langford, George Burwash, B.A.Sc., (Mi.), Toronto, Ont.
Lawton, Frederick Lewis, B.A.Sc., (El.), Cookstown, Ont.
Lewis, Clayton Ellwood, B.A.Sc., (Civ.), Toronto, Ont.
McIntosh, James Harrington, B.A.Sc., (Chem.), Victoria, B.C.
McMillan, Roy John, B.A.Sc., (Chem.), Toronto, Ont.
McQueen, Andrew William Fraser, B.A.Sc., (Me.), Ottawa, Ont.
Miller, Wilfrid Laverne, B.A.Sc., (El.), Lawrence Station, Ont.
Nattress, David Irving, B.A.Sc., (El.), Sault Ste. Marie, Ont.
Robertson, Harold Foster, B.A.Sc., (Chem.), Brantford, Ont.
Rose, Hugh Grant, B.A.Sc., (Civ.), Ottawa, Ont.
Schultz, Francis Harold, B.A.Sc., (Civ.), Brantford, Ont.
Smye, Gordon Renfrew, B.A.Sc., (Chem.), Galt, Ont.
Strudley, Donald Bell, B.A.Sc., (Me.), Toronto, Ont.

Degree of B.A.Sc.

Abernethy, Wilson Walter, B.A.Sc., (Civ.), Toronto, Ont.
Ball, Francis Caldwell, B.A.Sc., (Civ.), Toronto, Ont.
Bateman, Joseph Wilberforce, B.A.Sc., (El.), Peterborough, Ont.
Beckett, Reginald Walter, B.A.Sc., (El.), Hamilton, Ont.
Bennett, Willard Erlandson, B.A.Sc., (Civ.), Toronto, Ont.
Bowyer, Clayton Musgrove, B.A.Sc., (Mi.), Toronto, Ont.
Browne, John Howard, B.A.Sc., (El.), Toronto, Ont.
Button, Edward William, B.A.Sc., (El.), Toronto, Ont.
Byram, Arthur Tennyson, B.A.Sc., (Civ.), Toronto, Ont.
Cain, Leo Alfonsus, B.A.Sc., (El.), Toronto, Ont.
Campbell, Thomas Lorne, B.A.Sc., (Chem.), Elmvale, Ont.
Carley, Forest Cecil, B.A.Sc., (Me.), Toronto, Ont.
Carnahan, Edmund Haynes, B.A.Sc., (Chem.), Toronto, Ont.
Carr, William Harding, B.A.Sc., (El.), Barrie, Ont.
Carruthers, Vivian Hallam Hillocks, B.A.Sc., (Civ.), Toronto, Ont.
Carson, Charles Terry, B.A.Sc., (Chem.), Oakville, Ont.
Churchill, Thomas Charles Deane, B.A.Sc., (El.), Toronto, Ont
Coulter, Hugh John, B.A.Sc., (Chem.), Windsor, Ont.
Cowan, Elijah, B.A.Sc., (Me.), Toronto, Ont.
Dunlop, Pius James, B.A.Sc., (Mi.), Toronto, Ont.
Dyer, Joseph Wilson, B.A.Sc., (Me.), Toronto, Ont.
Elliott, Frank Wallace, B.A.Sc., (El.), Toronto, Ont.
Ellis, Franklin Alexander, B.A.Sc., (Met.), Toronto, Ont.
Fairbairn, Phys Aikins, B.A.Sc., (Me.), Toronto, Ont.
Fardoe, Harry Richard, B.A.Sc., (El.), Toronto, Ont.
Farley, John, B.A.Sc., (Me.), Toronto, Ont.
Forster, Irwin Hickson, B.A.Sc., (Me.), Toronto, Ont.
Fraser, John McGeary, B.A.Sc., (Me.), Aurora, Ont.
Graham, Hugh John, B.A.Sc., (Civ.), Toronto, Ont.
Gray, Albert Scanlon, B.A.Sc., (El.), Toronto, Ont.
Guenther, William Frank, B.A.Sc., (El.), Toronto, Ont.
Hamilton, Keith Campbell, B.A.Sc., (Chem.), Galt, Ont.
Harrison, James Arthur, B.A.Sc., (Civ.), Toronto, Ont.
Higbee, John Carveth, B.A.Sc., (Civ.), Toronto, Ont.
Hueston, Robert Montgomery, B.A.Sc., (Me.), Toronto, Ont.
Huggins, Francis William, B.A.Sc., (Met.), Toronto, Ont.
Irwin, Karl Webster, B.A.Sc., (Civ.), Toronto, Ont.
Johnston, Oswald Daniel, B.A.Sc., (Chem.), Toronto, Ont.
Kennedy, Henry Lyle, B.A.Sc., (Me.), Toronto, Ont.
Kennedy, Wallace Murray, B.A.Sc., (Me.), Toronto, Ont.
Kent, Wilbur Horatio, B.A.Sc., (El.), Hamilton, Ont.
Kesteven-Balshaw, Humphrey, B.A.Sc., (Chem.), Toronto, Ont.
Leslie, Roy Campbell, B.A.Sc., (Civ.), Windsor, Ont.
Low, Robert St. Clair, B.A.Sc., (Chem.), Toronto, Ont.
McBride, Ernest Willard, B.A.Sc., (Chem.), Toronto, Ont.
McIntyre, Vernard Howard, B.A.Sc., (Arch.), Toronto, Ont.
McKay, Hugh Alexander, B.A.Sc., (Civ.), Toronto, Ont.
MacLellan, John, B.A.Sc., (El.), Toronto, Ont.
McLelland, William James, B.A.Sc., (Civ.), Hamilton, Ont.
Morris, Hubert Mervyn, B.A.Sc., (Met.), Petrolia, Ont.
Morrison, Robert George Kerr, B.A.Sc., (Mi.), Toronto, Ont.
Nablo, Harold William, B.A.Sc., (El.), Cayuga, Ont.
Norris, Charles Adam, B.A.Sc., (Civ.), Grand Ligne, Que.
Paget, James Alan, B.A.Sc., (Civ.), Huntsville, Ont.
Pinel, William Gordon, B.A.Sc., (Civ.), Toronto, Ont.
Price, Lloyd Merlin, B.A.Sc., (Chem.), St. Thomas, Ont.
Reid, Anthony Meredith, B.A.Sc., (Civ.), Toronto, Ont.
Rossiter, Roger Earl, B.A.Sc., (El.), Sault Ste. Marie, Ont.
Rundle, Wilmot Llewellyn, B.A.Sc., (El.), Toronto, Ont.
Schinbein, Edler Elias, B.A.Sc., (Me.), Conestoga, Ont.
Smith, George Westwood, B.A.Sc., (Civ.), Weston, Ont.
Smith, James Morrison, B.A.Sc., (Civ.), Durham, Ont.
Snow, Royle Burleigh Longueville, B.A.Sc., (El.), Muskoka, Ont.
Stokes, LaVerne Franklin, B.A.Sc., (Civ.), Toronto, Ont.
Thorpe, George Morrison, B.A.Sc., (Mi.), Toronto, Ont.
Turner, John Wilfred, B.A.Sc., (Chem.), Craigrst, Ont.

The list of graduates of McGill University will appear in the July issue of *The Engineering Journal.*

Central Electric Stations in Canada

The Directory of Central Electric Stations in Canada recently issued by the Dominion Water Power Branch, Department of the Interior, as Water Resources Paper No. 33, provides the engineering profession and allied industries with another valuable report on the power resources of the Dominion. This volume, which represents a revised and enlarged edition of the directory issued in 1919, lists all stations in Canada engaged in the sale and distribution of electrical power, and includes details of each station which will prove distinctly valuable to all engineering, industrial and other organizations in any way interested in the development and the consumption end of the power industry. The report is prepared in collaboration with the Dominion Bureau of Statistics, and is available for distribution upon application to J. B. Challies, M.E.I.C., Director of Water Power, Dominion Water Power Branch, Ottawa.

PERSONALS

E. R. Gray, A.M.E.I.C., until recently city engincer of Hamilton, Ont., has been appointed director of eity parks of that city.

H. F. Finnemore, A.M.E.I.C., of the chief engineer's office of the Canadian National Railways at Moncton, has been transferred to the Montreal office.

Capt. D. C. Unwin Simson, A.M.E.I.C., of the Royal Canadian Engineers, is with the Canadian Battlefields Memorials Commission at Poperinghe, Belgium.

R. G. Gage, M.E.I.C., electrical engineer with the Canadian National Railways, has been moved from Moncton, New Brunswick, to the Montreal office.

William H. Barnes, S.E.I.C., is at the present time connected with the service department of the Abitibi Power and Paper Company, Limited, at Iroquois Falls, Ont.

R. A. Garvie, A.M.E.I.C., of Saskatoon, Sask., has accepted a position in Chicago, Ill., with the Acme Steel Goods Company, who are at present enlarging their plant.

H. F. Donkin, A.M.E.I.C., of Amherst, N.S., has been appointed to the staff of the valuation department of the Chicago, St. Paul, Minneapolis and Omaha, Railway Company.

J. D. Stott, A.M.E.I.C., has accepted a position on the engineering staff of the Shawinigan Engineering Company. Mr. Stott was formerly mechanical designer with the Dominion Bridge Company, Limited.

F. C. Mechin, A.M.E.I.C., who has recently been appointed superintendent of the Montreal East Refinery of the Imperial Oil Limited, was formerly assistant superintendent at the company's Halifax plant.

Jas. A. Joslin, Jr.E.I.C., of Toronto, Ont., has joined the staff of the American Bridge Company in Philadelphia. Mr. Joslin was formerly connected with the Toronto office of the Dominion Bridge Company, Ltd.

David G. McKean, A.M.E.I.C., has just returned from a trip to Scotland and is now located at Cleveland, Ohio. Mr. McKean was formerly assistant to the chief engineer of the Greater Winnipeg Water District at Winnipeg, Man.

R. S. Lea, M.E.I.C., whose professional activities are not confined to the boundaries of the Dominion, sailed from New York on Saturday, May nineteenth, accompanied by Mrs. Lea, on a visit to Europe of several months duration.

S. Eastman Root, S.E.I.C., formerly field engineer and assistant to the construction engineer of the St. Lawrence Paper Mills, Ltd., Three Rivers, Que., has accepted a position of assistant superintendent of construction with the Donnacona Paper Company at Donnacona, Quebec.

Col. R. W. Leonard, M.E.I.C., past-president of *The Institute* has presented to Queen's University, twelve acres of land to be used in connection with the university extension plans. Col. Leonard's gift was announced at a recent meeting of the council of the university.

J. B. Nelson, A.M.E.I.C., has accepted a position on the engineering staff of McGregor and McIntyre, Limited, Toronto. Mr. Nelson was formerly connected with the Toronto branch of the Trussed Concrete Steel Company of Canada, Limited.

H. Jardine, S.E.I.C., for the past year assistant to the city engineer of Galt, Ont., has accepted a position on the staff of the Department of Highways of Ontario, as district engineer for the counties of Ontario, York, Peel, Dufferin and Simcoe, with supervision of construction and maintenance of roads in the district.

A. S. Chapman, A.M.E.I.C., of the staff of the city engineer's department, Calgary, Alta., is now acting city engineer, following the resignation of George W. Craig, M.E.I.C. Mr. Chapman has been on the engineering staff of the city for a number of years having first entered the services of the municipality in 1913.

K. O. Elderkin, Jr.E.I.C., has accepted a position with the engineering staff of Price Brothers and Company, Limited, at Kenogami, Quebec. Mr. Elderkin graduated with the class of '20 of McGill University, after which he was draughtsman with the Nova Scotia Steel and Coal Company, Ltd., at New Glasgow, N.S.

J. J. Richardson, A.M.E.I.C., is division engineer with the Canadian National Railways at Cochrane, Ontario. Mr. Richardson has been connected with the Canadian National Railways at Moncton as assistant engineer in the chief engineer's office, and was later appointed assistant district engineer at Quebec, which position he held until his recent appointment.

Geo. H. N. Monkman, A.M.E.I.C., is located at Winnipeg, Man., with the engineering department of the Canadian Pacific Railway. With the exception of the period of his overseas service, from March 1915 until August 1919, Mr. Monkman has been with the engineering services of the Canadian Pacific Railway almost continuously since 1904.

O. H. Coté, A.M.E.I.C., has again entered private practice as consulting civil engineer. For the past three years he has been Industrial Commissioner to the Quebec Board of Trade. Mr. Coté is a graduate of the Ecole Polytechnique of Montreal of the class of 1899. His earliest work was with the Phoenix Bridge and Iron Works, Ltd., of which he later became chief engineer.

William W. Crouch, A.M.E.I.C., has for some months been located at Perry, Oklahoma, with Messrs. Black and Veatch, consulting engineers of Kansas City, Montana, on the construction of a sewerage system and disposal plant for that city, and since the completion of that work has been transferred by the firm to Neosho, Missouri, where the firm is building nineteen miles of sewer system.

Geo. W. Craig, M.E.I.C., has resigned from the position of city engineer of Calgary, Alta., which position he has held for the past ten years, to become district engineer for the Portland Cement Association with offices at Chicago, Ill. Mr. Craig was on the Council of *The Engineering Institute of Canada* for the years 1920 and 1921, and has always taken a very active part in the affairs of the Calgary Branch.

R. L. Seaborn, A.M.E.I.C., has received the appointment of assistant manager, woods department, the Donnacona Paper Company, Limited, Quebec. Mr. Seaborn graduated from the University of Toronto with the degree of B.A.Sc., in 1916, and was for a time with the Shawinigan Water and Power Company and later accepted a position as manager of the Laurentian Forest Protective Association, Quebec.

Horace L. Seymour, C.E. (Toronto), A.M.E.I.C., member of the Town Planning Institute of Canada has been appointed by the Town Planning Commission of the town of Waterloo to prepare a complete scheme for the development of Waterloo. This plan is being carried out in conjunction with the plan being prepared for the neighbouring city of Kitchener. The work of preparing the maps is under the direction of J. E. Hollaman, A.M.E.I.C Associate Member of the Town Planning Institute.

Recent appointments to the engineering staff of the Barrett Company Limited, Montreal, include the following members of *The Institute*:— L. F. Fyles, A.M.E.I.C E. Fortin, Jr.E.I.C., C. L. Brooks, S.E.I.C., G. B. Brown, S.E.I.C. In a letter addressed to headquarters, W. W. Schultz, district plant superintendent of the Barrett Company expresses his appreciation of the assistance rendered by the employment bureau of *The Institute* in this connection.

Alan H. Jones, A.M.E.I.C., assistant engineer with the Canadian National Railways, has been transferred from Toronto to the Montreal office. Previous to coming to Canada, Mr. Jones had spent some eight years in the United States on railway location and maintenance work. From 1911 to 1915, he was with the Canadian Pacific Railway Company, following which he was appointed resident engineer with the Canadian Government Railways on district No. 4 at New Glasgow, N.S., later being transferred to Moncton.

J. O'Neill, A.M.E.I.C., has resigned from the staff of the St. Lawrence Paper Mills at Three Rivers, Quebec, to accept a position with the Thompson-Starrett Company at New Haven, Connecticut. After graduation from the University of New Brunswick in 1912, he was appointed city engineer of Fredericton, N.B., and later accepted a position of assistant bridge engineer with the Hennepin Bridge Company of Minneapolis. After returning from overseas in 1919 he took a post graduate course at the University of New Brunswick.

Hugh a Lumsden, M.E.I.C., has been appointed county engineer and road superintendent of the county of Wentworth, Ont. After graduating from McGill University in 1912, Mr. Lumsden was for a time resident engineer for the Canadian Pacific Railway at Red Deer West, Alta., and Maple Creek, Sask., and in 1915 was appointed assistant engineer with the Department of Highways of Ontario, which position he later resigned to go overseas. On returning to Canada in 1919 he was appointed assistant director, vocational officer with the Department of Soldier's Civil Re-establishment, and later was appointed equipment engineer with the Abitibi Power and Paper Company. Early in 1921 he joined the engineering staff of the Department of Highways of Ontario.

President of Permanent Executive Class of 1923 University of Toronto

A. M. Reid, S.E.I.C., of Toronto is with the Bell Telephone Company, plant department, Toronto having been appointed to take the course of training provided by hat company for technical graduates. Mr. Reid graduated in civil engineering this year from the University of Toronto, and was recently elected by acclamation president of the permanent executive of the class of 1923. He has taken a most active interest in Institute affairs particularly as related to the students of the universities and is a member of *The Institute's* Committee on Students' Activities.

Elected Director, Ontario Steel Products, Ltd.

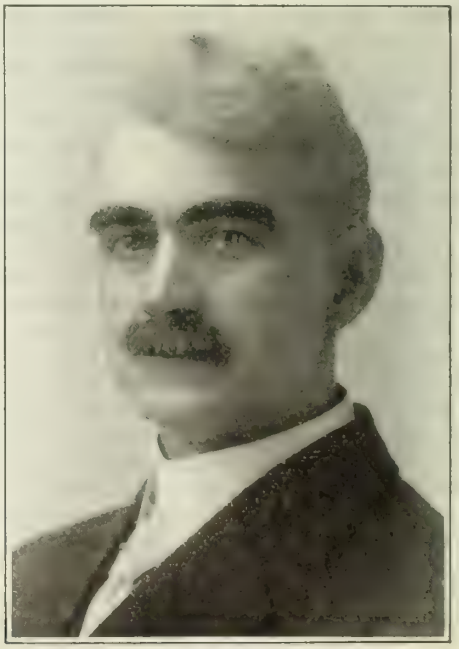
H. M. Jaquays, M.E.I.C., whose election to the board of directors of the Ontario Steel Products Company was announced recently has been connected since its formation with the Steel Company of Canada, of which company he is manager of works. He is also a director of the Gould Cold Storage Company.

After graduating from McGill University in 1896 with the degree M.Sc., Mr. Jaquays was engaged as draughtsman and designer in New York, Philadelphia and Manchester, England. In 1901 he returned to Montreal and was lecturer and assistant professor in mechanical engineering at McGill University until 1906 when he became chief engineer of the Montreal Rolling Mills, which was absorbed later by the Steel Company of Canada. Mr. Jaquays joined *The Institute* as a Student on March 24th, 1898 and in December of the same year was transferred to Associate Member, and in June 1909 to Member.

A. McGillivray, A.M.E.I.C., elected Chairman of the Winnipeg Branch

A. McGillivray, A.M.E.I.C., newly elected chairman of the Winnipeg Branch has been associated with the provincial public works of the government of Manitoba for the past eighteen years, at first on land drainage work and for the last nine years on good roads work, as highway commissioner and chairman of the Good Roads Board. Mr. McGillivray was previously engaged in railway work having been on location and construction with the Canadian Pacific Railway in British Columbia and with the Canadian Northern Railway in Manitoba.

A. M. REID, S.E.I.C.



A. McGILLIVRAY, A.M.E.I.C.

Honoured by Queen's University

JULIAN C. SMITH, LL.D., M.E.I.C.

Congratulations are in order to Julian C. Smith who has been honoured by Queen's University, on the occasion of the eighty-second convocation, by having conferred upon him the degree of Doctor of Laws.

Mr. Smith occupies a high place, not only in his chosen engineering profession, but in the manufacturing and financial fields as well. Within the past month he has been appointed president of the Quebec Railway Light Heat and Power Company, another tribute to the conspicuous position he occupies in hydro-electric power development in the Dominion. He is president of the new St. Maurice Power Company; vice-president and general manager of Shawinigan Water and Power Company; president Public Service Corporation, Quebec City; vice-president, Dominion Engineering Works, Limited; president, Canada Carbide Company; president, Canadian Electro Products Company, and North Shore Power Company and director of Manitoba Power Company.

Exchange or Library Privileges

Through the Society of American Military Engineers, Washington, D.C., exchange of privileges has been arranged between the library of *The Institute* and that of the United States Engineer School Library. The latter is situated in Washington, D.C., and contains some 60,000 volumes. Under this arrangement, members of *The Institute* may, at any time, avail themselves of the privileges of the library, while in Washington.

Recent Visitors at Headquarters

D. W. McLachlan, M.E.I.C., Ottawa, Ont.; C. N. Shanly, A.M.E.I.C., Chicoutimi, P.Q.; C. J. Mackenzie, M.E.I.C., Saskatoon, Sask.; Chas. A. Price, A.M.E.I.C., Ottawa, Ont.; K. H. Smith, M.E.I.C., Halifax, N.S.; Dr. M. Murphy, M.E.I.C., Ottawa, Ont.; Eben N. Harvie, M.E.I.C., London, Eng.; J. B. Wilkinson, A.M.E.I.C., Port Hope, Ont.

BRANCH NEWS

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

The branch meeting of March 22nd, was one of special interest to the local members and citizens generally. There were two addresses presented at this meeting. The first was by R. A. Brown, manager of the Canadian Nashua Paper Company, Limited, of this city, and was entitled "The Paper Converter".

The Paper Converter

In this address, which was informal in its character, Mr. Brown discussed the processes and problems of the paper converter. The speaker explained the meaning of the term "paper converter", showing how this business was divided into two main classes: there being the converter who buys paper from the mill and makes it into tags and envelopes — the man who builds things with paper; and the paper converter who changes the paper physically or chemically to fit it for a particular use. It was with this latter class that Mr. Brown dealt in his address. He described, in an interesting manner, the various processes envolved in producing such products as butter paper, waxed paper and various kinds of coated paper, including gummed paper.

The Ascent of Mount Everest

The second address of the evening was given by Major F. O. Wheeler, M.C., R.E., and his subject was "The Ascent of Mount Everest". Major Wheeler's account of the hardships and trials of the expedition of which he was a member, related in his own inimitable way, with his description of the country passed through and the people encountered en route provided entertainment of a very high order. The slides with which Major Wheeler's lecture was illustrated formed a complete pictorial story of the expedition. The hearty thanks of the Branch were extended to Major Wheeler for his excellent lecture.

Asbestos and Its Uses

Another of the industries of Peterborough was made the subject of an address at the meeting of the branch held on April 12th, when Robert Abbott, manager of the Canadian Raybestos Company Limited, of this city spoke on "Asbestos and Its Uses".

Mr. Abbott opened his address giving the derivation of the word "asbestos", and describing the chief chemical and physical characteristics of this material. He described the forms in which it was found, and the methods employed in mining it. He enumerated the uses to which this substance had been put and went on to describe some of the processes that it had to be put through in making such products as automobile brake linings, packings, etc. This subject, as treated by Mr. Abbott, was one which was extremely interesting and instructive to the members of the engineering profession, and elicited considerable discussion.

Annual Meeting

"If we look into the conditions as they existed, financially and industrially, a year ago, we have all reason to believe that we are now facing prosperity," is the opinion P. P. Westbye, M.E.I.C., expressed in his closing address as chairman of the Peterborough branch of *The Engineering Institute of Canada* at the annual meeting in the Chamber of Commerce last night. Mr. Westbye pointed out that the barometer of business is the iron and steel production, and, according to the Dominion Bureau of Statistics, the production of iron in Canada in February showed an increase over 1922 of 32 per cent.

The increase has not been in the form of a boom, but has been steady and healthy. The pulp and paper industry, one of the most important in Canada, shows a very large increase in production and export. Water power developments are being made, and the mining industry is opening up. These activities, Mr. Westbye said, make an opportunity for the professional engineer to take a part in the world which belongs to him.

Reviewing shortly the important engineering achievements which have been made in the city during the year of his office, the speaker mentioned the new home of the Western Clock Company, the layout of the new transformer station, the layout of the sewerage disposal plant, and others, in which members of the Peterborough branch of the E.I.C., took a prominent part.

Mr Westbye expressed his appreciation of the services of all the members of the branch, especially the work of the secretary and other officers, and the executive.

Fraser S. Keith, M.E.I.C., secretary of *The Engineering Institute of Canada*, was expected to address the meeting, but was unable to be present.

E. R. Shirley, M.E.I.C., in reporting for the meetings committee, remarked on the number of expressions of thanks from members of the general public who had taken advantage of the practice of the engineers to throw open the meeting to citizens when subjects of public interest were being discussed. There was an average attendance over the year of 80 to 90 per cent of the members.

Newly Elected Officers

The officers elected for the ensuing year are: Honourary chairman, P. P. Westbye, M.E.I.C.; chairman, R. L. Dobbin, M.E.I.C.; vice-chairman, E. R. Shirley, M.E.I.C. secretary, R.C. Flitton, A.M.E.I.C.; treasurer, A. B. Gates, A.M.E.I.C.; executive: A. L. Killaly, A.M.E.I.C., R. B. Rogers, M.E.I.C., B. L. Barns, A.M.E.I.C., D. L. McLaren, A.M.E.I.C., A. H. Munro, A.M.E.I.C. and H. O. Fisk, M.E.I.C.

During the evening several films depicting the beauties of Canada from coast to coast were shown, and at the close of the very successful meeting refreshments were served.

Highway Construction

A special meeting of the branch, held on May 8th, was addressed by Colonel H. C. Boyden, of Chicago, consulting engineer for the Portland Cement Association. While the lecture was intended for the enlightenment of the highway engineer in the recent developments in roadway construction, it was also of interest to all who travel on or help to pay for the highways.

Col. Boyden urged the necessity of wider highways, in order to reduce traffic at the sites, where breaking usually occurs first, and also to provide for future expansion in traffic. He spoke of tests made in Illinois with all kinds of road building material which showed that no surface that has not concrete incorporated in it in some form or other, would stand present-day traffic. This is being recognized by the government of the United States, eighty per cent of the federal roads building in that country being of concrete.

Expert construction is necessary, he said, to successful road engineering, and no set formula can be taken as a guide. Field investigations, although expensive, were essential, tests on laboratory models being of little use.

The speaker dwelt at some length on the importance of the sub-grade as a factor in these tests. The sub-grade naturally varies considerably in its supporting power, and if this feature is not given the attention it merits, a good road will not be obtained. Various methods of increasing its ability to carry loads have been investigated, and some suggestions have been made. One method is by the use of what is known as the "Arizona" type of road, in which the pavement is made thicker at the sides, commencing two feet from the edge, that it is at the centre. Some conclusions were drawn from investigations along this line: An intensive soil study should be made to determine the bearing power of the material for sub-grade. A uniform sub-grade should extend the entire width of the roadway. A standard for sub-grade cannot be fixed arbitrarily for a country or even for a state. The sub-grade must be taken into account for each part of the road, and the construction proceeded with to suit the conditions with regard to the maximum traffic on each road.

Col. Boyden then spoke of the necessity of keeping the concrete wet during the setting period and referred briefly to reinforcement, stating that cantilever strength is not increased by re-inforcement, but that it prevents cracking and will hold together cracks which occur, as well as distributing impact. Reinforcement should be used, he said, as an added precaution and not as a substitute for concrete. The importance of the prevention of impact was also stressed by the speaker. This was accomplished by doing away with surface inequalities.

Many lantern views were shown of test roads in the United States, showing examples of work, good and bad, in road construction.

Victoria Branch

Hugh Peters, A.M.E.I.C., Secretary.

Visit to Goverment Meteorological Observatory

On Saturday April 14th, members of the branch paid a very pleasant visit to the government meteorological observatory situated on Gonzales Hill. The panoramic view from this site on a clear day is very beautiful and the party spent some time on the roof of the observatory where the bright sunlight recording instrument is installed. The simplicity of this instrument is somewhat startling as it consists simply of a solid glass sphere and a graduated slip of paper. The duration of bright sunlight is registered on the paper as a scorched line. The operation for determining local wind currents at varying altitudes was explained and it was a matter of uncommon interest to learn that the 18-inch diameter balloon used for this purpose had on occasions been observed to a height of 45,000 feet although the telescope of the observing instrument was not more than 7 inches in length. A telescope, the personal property of the director of the observatory, Mr. Napier Denison, was of considerable interest, as the 5-inch lens was ground by an amateur astronomer of Victoria, the late Mr. O. C. Hastings, who constructed all the parts of the telescope with his own hands in 1894 and the lens is rated as a perfect piece of workmanship. The equipment of chief interest was the seismographs which are now recognized as among the most delicate in the world. Mr. Denison personally conducted the party and the visitors greatly appreciated the very entertaining manner in which he so kindly explained the many interesting features of the work of the observatory. The following members of the branch were present:—H. M. Bigwood, A.M.E.I.C., F. C. Green, M.E.I.C., F. G. Aldous, A.M.E.I.C., W. M. Everall, A.M.E.I.C., H. A. Icke, A.M.E.I.C., A. F. Mitchell, A.M.E.I.C., R. A. Bainbridge, M.E.I.C., F. L. MacPherson, M.E.I.C., R. F. Davy, A.M.E.I.C., H. Peters, A.M.E.I.C.

On Wednesday, April 18th, a party of engineers from this branch were guests aboard the Dominion government survey ship, "Lillooet" for most of the afternoon when H. D. Parizeau, A.M.E.I.C., in charge of the Pacific Coast hydrographic surveys, delivered a very instructive lecture on the nature of charting operations on the British Columbia coast, and permitted the visitors to observe his survey staff at work while taking soundings over Constance shoal located, some five and a half miles outside Victoria harbour.

The weather, at first wet and raw, cleared to bright sunlight by the time Constance shoal was reached, and the triangulation points at Race Rocks, Victoria and Discovery island were clearly discernable. Soundings were first taken with the Walker instrument, the operations of which were explained and the shallower depths were taken by direct observation. The location of each sounding was plotted directly on to the working drawing in the chart house as the sextant angles were called from the bridge. Owing to the great irregularity of the tides in this vicinity the correct reduced soundings are not available until the curve of the automatic tide gauge in Victoria can be studied at the end of the days work. This irregularity of tides is encountered in the Straits of San Juan de Fuca, the Gulf of Georgia and northward until Queen Charlotte Sound is reached.

For over two hours the visitors were keenly interested in observing the operations and examining the equipment and survey appliances of the "Lillooet" and greatly appreciated the courtesy of Mr. Parizeau and his assistants who went to much trouble to make the visit most instructive. The party included:—E. E. Brydone-Jack, M.E.I.C., and Mrs. Brydone-Jack, F. G. Aldous, M.E.I.C., and Mrs. Aldous, Mr. and Mrs. McCaw, G. H. Dawson, E. P. McKie, A.M.E.I.C., A. F. Mitchell, A.M.E.I.C., D. W. Hodgson, A.M.E.I.C., F. W. Knewstubb, A.M.E.I.C., H. M. Bigwood, A.M.E.I.C., A. Long, Jr.E.I.C., H. Peters, A.M.E.I.C., J. H. Browne, A. Halkett, F. C. Green, M.E.I.C., W. M. Everall, A.M.E.I.C., all of whom expressed their enjoyment of the trip and personally thanked Mr. Parizeau for the very interesting demonstration.

Marine Borers

On Friday evening, April 20th, in the committee room of the Chamber of Commerce building the members were addressed by Professor C. McLean Fraser of the University of British Columbia, on the subject of "Marine Borers". The subject is one of economic importance to this coast as the annual destruction to wharves and quays caused by marine borers costs well over $100,000 to B.C., cannery concerns alone, while many other industries are affected.

The lecturer gave a detail description of the xylotria and limnoria which are responsible for this damage and their anatomy and method of work was illustrated with lantern slides and exhibits. All timber native to B.C., is readily destroyed by them when placed in positions subject to immersion by salt water. The limnoria confines its attack from low water level to mean high water (neap tides) and the xylotria works from any depth up to a few feet above low water level. Untreated piles will in this way be rendered unsafe in less than a year. the salinity and acidity of the waters in which these borers are most active has been carefully studied in recent years on the coast of California particularly at San Francisco where the teredo has caused damage to the extent of many millions of dollars. This teredo, however, has not yet made its appearance on the B.C. coast, but as the xylotria is in the nature of an amplified teredo, the measures necessary for protection against their ravages are identical. The xylotria may attain a length of two feet while the teredo does not exceed seven inches. Various methods of protecting piling was touched on and it was stated that creosoted piles driven in place twenty-five years ago on this coast were still free from attack by xylotria or limnoria.

The engineers of the Dominion public works were the chiefly interested members of the audience and considerable discussion took place at the end of the lecture in which E. E. Brydone-Jack, M.E.I.C., C. C. Worsfold, M.E.I.C. and A. Halkett participated. Members of the Natural History Society of B.C., were also present by special invitation, and many questions were dealt with by the lecturer. Professor McLean is director of the Government biological station at Departure Bay, Nanaimo, and it was of great interest to have this subject dealt with by such an authority.

To those who studied the matter the following statements were possibly of chief interest:—

1. That the teredo has not so far been discovered on the B.C., coast.
2. That the worm so prevalent on this coast is the xylotria, which, however, is so similar to the teredo as regards incubation habits and destructiveness, that from the engineers' point of view the two are identical.
3. The timber is bored by a filing process of the head shells.
4. That they probably obtain very little nourishment from the timber destroyed but live on food taken from the water.
5. That therefore they must retain access to a free supply of water.
6. That the posterior end remains at the entrance to the original small hole by which access to the timber was obtained,
7. The extent of the destructive boring of each worm is therefore limited to its length.
8. Its duration of life is believed to be about two years.

Border Cities Branch

J. Clark Keith, A.M.E.I.C., Secretary-Treasurer.

The regular meeting of the Border Cities Branch was held in the Windsor Club on February 9th, at 7 p.m. when forty members and visitors enjoyed a social half hour around the dinner board preliminary to the address of the evening. An attempt was made to bring to light any musical talent incorporated in the branch membership and there appeared to be sufficient to justify another trial at subsequent meetings. The chairman announced the election of Geo. F. Porter, M.E.I.C., past-chairman of this branch, as a councillor from district No. 6 for the next three years.

Electric Development in Canada

S. E. McGorman, M.E.I.C., was the speaker of the evening,and he gave a most interesting address on "Canadian Electric Development, existing conditions, their future possibilities and the probable order in which development will take place." Practically every large industrial centre throughout the Dominion is now supplied with hydro-electric energy and has within easy transmission distance, ample reserves of power. Over ninety per cent of the prime motive power of the central electrical stations of Canada is hydro power. The amount of power which Canada really possesses is unknown. The last available Dominion Government statistics give a minimum 365-day flow of 18¼ million horse power roughly divided as follows: Quebec, 7 million, Ontario 5 million, Manitoba 3¼ million, British Columbia 2 million, the other million distributed throughout the remainder of the Dominion.

The water wheels installed throughout the Dominion total two and three-quarter million horse power. Making allowance for storage possibilities, load factors, etc., the present turbine installation represents only six-tenths per cent utilization of the present recorded water power resources. Canada is exceeded in installed horse power development per capita by Norway alone and in current consumption per capita by Switzerland. The capital invested in central electric stations exceeds that of any other injury with the exception of steam railroads.

After discussing at length the Chippawa and Nipigon developments which are the two largest systems operated by the Hydro-Electric Power Commission of Ontario, Mr. McGorman utilized curves representing the increased consumption in various Ontario cities to show that the demand for electric power in Ontario will double every five years for some time to come. The possibilities of the development of the St. Lawrence for power was covered in detail and embraced much constructive criticism of various reports which have been made available to the public on this important project.

Oliver M. Perry, M.E.I.C., in moving a vote of thanks to the speaker, referred briefly to the increased power consumption in Windsor. Electric stoves alone now installed, if operating simultaneously, would create a demand for 20,000 h.p. The motion was seconded by D. A. Molitor, M.E.I.C., who gave some very interesting information regarding his preliminary investigations of the St. Lawrence development.

Meeting of March 9th

The regular dinner meeting of the branch was held in the Windsor Club on Friday March 9th at 7 p.m. The chairman extended a welcome to the mayors of the Border Municipalities and to officials of the Windsor Water Commission and the Walkerville Water Company who were the guests of the branch for the evening.

The chairman stated that the members of *The Institute* in Quebec did not appear to favour the proposed amendments to the by-laws inasmuch as their representation on council did not compare favourably on the basis of membership with that of other branches. On behalf of the executive he wished to bring the following resolution to the attention of the branch for their consideration.

"Whereas this branch approves the principle of representation of council for all branches of *The Institute* and whereas we believe that this representation should be on the basis of membership where the membership exceeds one hundred, it is hereby resolved that this branch favours a change in the by-laws as proposed whereby this principle will be recognized".

This motion was discussed by H. Thorne, M.E.I.C., and D. A. Molitor, M.E.I.C. On motion of J. E. Porter, A.M.E.I.C., vice-chairman, and E. J. McIntyre, A.M.E.I.C., the resolution was adopted with the request that it be forwarded to council.

A very pleasing incident during the evening was the presentation by the chairman of a cheque from council to P. E. Biggar, S.E.I.C., for his paper on "The Aeroplane Engine".

Detroit Filtration Plant

The chairman expressed his pleasure and that of the branch, in having as our guest and speaker Colonel Theodore A. Leisen, engineer in charge of design and construction of the Detroit filtration plant. Mr. Leisen briefly referred to the cordial relations existing between the two countries separated by the Detroit river and hoped that he would again be privileged to attend later meetings with Canadian engineers. Before dealing with the construction of the filtration plant he briefly traced the growth of the Detroit waterworks system.

Prior to 1874 the Detroit waterworks pumping station was located at the foot of Orleans street, approximately three miles below the present station. In 1873 the property on East Jefferson was acquired owing to contamination of the lower source of supply. This intake and two subsequent ones were extended but a short distance into the river and this location in time became unsafe. To combat this condition, a new intake, crib, and connecting tunnel were decided upon, further upstream and sufficiently distant from shore to avoid normal pollution-laden currents. This was completed in 1904. A brick tunnel ten feet in diameter was constructed 3,200 feet under the river from the crib to a shore shaft and thence to the suction wells of the pumping stations.

In 1913 calcium hypochloride was first used as a sterilizing medium, followed in 1914 by liquid chlorine, which has since been uninterruptedly in use. In the eight year period preceding and following chlorination the typhoid death rate was reduced from 22 to 11 per 100,000 people and in the past two years has been reduced to 5. Authority was granted in 1917 to construct a small experimental plant to prove the truth or falsity of the hypothesis that Detroit river water could be treated at a rate in excess of that hitherto deemed feasible in or general use. This plant demonstrated that the water could be filtered with efficient results up to 200 million gallons per acre per day or slightly over three gallons per minute per square feet of effective sand area.

The Detroit filter plant is the largest single rapid sand filtration plant in the world. It has a daily filtering capacity of from 320 to 360 million gallons with provision for meeting peak loads of short duration up to a 400 million gallon rate. No provision has been planned for any future extension as the plant as constructed equals the capacity of the intake tunnel. The ground area occupied by the works is seventeen acres.

The raw water flows through a six and a ten foot tunnel to the suction wells of the low lift pumps, 18 feet below ground surface from whence it is discharged to the mixing chamber. This is unusually small and insures rapid mixing, the water passing into the coagulation basin in two minutes. Storage is provided for aluminium sulphate over the mixing chambers. The period of subsidence is two hours and forty minutes at a 288 m.g.d., rate. There are eighty filters each controlled by a 24-inch hydraulically operated gate valve. Each bed has an effective sand area of 1,088 square feet or 1/40th of an acre with a capacity of from 4 to 4½ million gallons at a 180 m.g.d., rate. Chlorine is added just prior to the entry of the effluent into the clear well, which occupies the site of a previous settling basin.

The low lift pumping station, filtration plant and filtered water reservoir were built on piles. Sixteen thousand concrete piles were used under the first two structures and 15,000 wooden piles under the last named. These piles foundations cost one and one half million dollars. Most of the piles were calculated to support fifteen to twenty tons while under test they carried twenty-five to thirty per cent in excess of this amount.

The total cost of the works with a generous allowance for small portions not yet completed will be $4,100,000. This may be divided into two general items, pile foundations $1,385,000, and general structures $3,115,000. The pile foundation for the filters and coagulation basin cost $1,120,000, the general structure $260,000. In the filtered water reservoir the piling was $265,000, the general structure $465,000. The cost complete based on 350 m.g.d., capacity if $13,000 per million or $9,000 per million without piling, which is a lower unit cost than filters built ten years ago. The filtered water reservoir with a capacity of 38 m.g., cost $19,000 per million gallons. The depth of this reservoir was limited by existing conditions. It is expected that the plant will be completed and placed in operation early in the coming summer.

The address was illustrated throughout with slides and was of particular interest to this district in view of the construction of a plant similar in design and now under way for the Border Cities. At the conclusion of the address a hearty vote of thanks was tendered to Mr. Leisen on motion of A. J. M. Bowman, A.M.E.I.C., and H. Thorne, M.E.I.C.

The Future of the Engineering Profession

The April meeting of the branch was held in the Windsor Club on Wednesday, April 4th, Fraser S. Keith, M.E.I.C., general secretary of *The Institute*, was the guest of the branch on that evening and a change was made in the regular meeting night to coincide with his visit here.

Mr. Keith addressed the branch on "The Future of the Engineering Profession" and in his introductory remarks he congratulated the branch on its excellent showing during the past year and then proceeded to trace the growth of *The Institute*. In 1917 there were nine branches with a mailing list of 2,000 whereas to-day there were twenty-three active branches with a membership of 5,300. The various branches now hold from forty to fifty meetings a month for the consideration of problems which have meant or which will mean much in the way of advancement to the entire Dominion.

Engineering is so broad in its application that a suitable definition of the profession is difficult to give. Seemingly, and unlike the other professions, that though a man change from a strictly engineering occupation to that of an executive in other lines of endeavour, he always remains an engineer. Any advance which the profession may hope to make and by so doing secure proper recognition for itself is dependent upon the recognition which the individual engineer is able to obtain. The welfare of the individual must be recognized. Every branch should have its members take a primary part where possible in civic affairs and be represented on civic governing bodies. Under the new by-laws of *The Institute* which were recently voted on every member becomes attached to some branch.

In order to secure the utmost in recognition, certain things are necessary:— Registration of Engineers; Adoption of proper classification and remuneration schedules; Adoption of a high ethical code; A definite programme where all engineers may become trained as public speakers; Closer co-operation with the universities; Increased publicity for the profession.

Uniformity of registration in all provinces is extremely desirable The very nature of the work on which we are engaged forces us more or less to change our place of residence and unnecessary embarassment may be caused if non-uniform registration standards are in effect. To stand high in the estimation of our fellow men we must maintain and enforce our ethics. If we can discipline non-ethical engineers, we will rise in the estimation of the public generally. Public speaking is an asset to the individual as well as to the profession. It should be the duty of a specially appointed committee to bring forward to the more retiring and reticent branch members. If public speaking can be developed, even in the next decade, leadership for engineers would be assured. Students should be taught that contact with fellow engineers will be one of their finest assets in later life. Engineers as a class seem adverse to publicity, they are naturally shy and reserved, and when it comes to a matter of publicity, they are content to allow the credit for constructive ideas to be taken by those who do not originate them. Branches are realizing and accepting their responsibility with respect to publicity and by so doing, obtaining individual recognition from the public.The future of the engineering profession will be largely governed by our acts of to-day. The other professions have established themselves in the eyes of the public and do not overlook any opportunity of strengthening the position which they now hold. The legislation respecting professional engineers in Ontario is not effective in its present state, but engineers would be well advised to support the newly organized body.

At the close of Mr. Keith's address, there was considerable discussion led by G. F. Porter M.E.I.C., and D. A. Molitor, M.E.I.C. Mr. Molitor in speaking of legislation, stated that the act must at the beginning be sufficiently broad to include all those who call themselves engineers as a man cannot be legislated out of his profession. Some years must pass before the benefits of legislation are apparent and we must seek later amendments to perfect the act. A vote of thanks to Mr. Keith was moved by Geo. F. Porter, M.E.I.C., and seconded by D. A. Molitor, M.E.I.C.

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

The record attendance at the regular meeting of the St. John branch, on Thursday, April 19th, attested to the popularity of the subject, "Radio Telephony", and the high standing of the speaker, Frank P. Vaughan, M.E.I.C.

With the aid of lantern slides, Mr. Vaughan showed the development of the radio apparatus: and by graphs, the improvements in the thermonic valve, so vital to the development of radio telephony. The intensive development made necessary by the late war did much to advance science and scientific research, and it would have taken many years, under peace conditions, to reach the present state of development along these lines. One of the important achievements was the development of the "Wireless Telephone", made possible by the wartime development of vacuum tube detectors and amplifiers for the production and modulation of radio frequency power, and applied to communication between different points on land and sea and in the air. While it is true that the thermonic valve was in fair state of development in 1914, the greater part of it development has taken place since that time. The development of this valve has shown that its many applications are destined to considerably increase its importance in engineering practice, as well as in the laboratory. When we speak of wireless telephony, we refer to the transmission of articulate speech to great distances without the use of connecting wires between the transmitting and receiving stations. The subject is by no means new and for years attempts have been made, with more or less success, to transmit speech over moderate distances without wires. After giving in detail the history of this development, Mr. Vaughan stated that the question is sometimes asked as to what effect the introduction of the wireless telephone will have on the present telephone systems throughout the world. It is perfectly safe to predict that its application will in no way curtail the present wire systems, but will occupy an entirely new field, supplementary to the present systems. The same question was asked at the time of the introduction of the wireless telegraph, yet to-day each is occupying its own sphere. Mr. Vaughan then described the construction and use of the thermonic valves and by the lantern slides showed the numerous equipments issued by the various companies with the peculiarities of each.

A general discussion took place after the paper. A vote of thanks to Mr. Vaughan was moved by W. R. Pearce, M.E.I.C., and seconded by G. C. Murdoch, M.E.I.C.

Annual Meeting

The Union Club, St. John, was the scene of a merry gathering of engineers on Tuesday, May 8th, when the St. John Branch held its annual meeting and banquet. A. G. Tapley, A.M.E.I.C., was in the chair, and after all had been satisfied from a culinary viewpoint, the usual toasts were drunk.

C. C. Kirby, M.E.I.C., spoke of the activities and progress of *The Institute* in replying to the toast to the E.I.C. Alex. Gray M.E.I.C., replied to the toast to the Maritime Professional Meeting of 1923 and impressed the members with the necessity for enthusiasm to put this thing over "big". He outlined the tentative programme of papers, dinners and excursions, and with the encouragement they had already received he had no doubt that the professional meeting of 1923 would be an epoch in the history of Institute affairs in the Maritime Provinces.

The reports of the various committees were presented and adopted, A hearty vote of thanks to the retiring secretary was moved by G. G. Murdoch, M.E.I.C., and seconded by G. H. Waring, A.M.E.I.C.

The scrutineers reported the following officers elected for the year 1923-24:—

Chairman, Harry F. Bennett, A.M.E.I.C.
Vice-Chairman, G. N. Hatfield, A.M.E.I.C.
Secretary-Treasurer, W. J. Johnston, A.M.E.I.C.
Executive Committee, F. G. Goodspeed, M.E.I.C.
W. R. Pearce, M.E.I.C.
E. G. Cameron, A.M.E.I.C.
A. G. Tapley, A.M.E.I.C.
C. C. Kirby, M.E.I.C.

Retiring Chairman's Address

The retiring chairman, A. G. Tapley, A.M.E.I.C., then addressed the meeting introducing his remark by commending to the very earnest consideration of those present, the address of the retiring chairman of the Halifax Branch as published in the February 1923, *Journal*. He then emphasized the necessity for efficient team work in order that the greatest benefit may be derived from our profession and from our *Institute*, the first requisite being discipline which he defined as the cultivation of a spirit of co-operation, obedience, responsibility and personal loyalty. Referring to the first of these he said in part:—

"Co-operation is joint labour. To effectively co-operate, each and everyone of us must do everything we can to advance Institute affairs. We must attend the meetings, interest ourselves in Institute affairs, and in every way do everything possible to advance the best interests of *The Institute*."

"Do not make the mistake of thinking that our addresses or papers are addressed to a little coterie of intellectuals, that they are over your heads, that it requires some kind of superior intelligence to understand them. Usually they are descriptive of some certain work, of designs and methods used in that work. Not having been published, they are, as a rule, unobtainable elsewhere than at our meetings. By staying away, by procrastination, you cheat yourselves."

While pointing out that we must expect to criticize each other and to be criticized, Mr. Tapley urged that such criticisms should be constructive and not destructive and that the making and repeating of thoughtless criticisms is most harmful to the profession.

Referring to the matter of remuneration, the speaker showed how by being too absorbed with the job on hand engineers were practically oblivious to what other engineers may be doing and as a result they were dealt with as individuals or small groups of engineers and

their services secured at the lowest possible figure. The adoption of the salary schedule recently drawn up by a committee of *The Institute*, could only be secured, he said, "by unity amongst the individual members of the profession. Unity is the profoundest law. By unity, I do not mean union, in the sense of trade unionism. If our employing engineers will adopt the schedule and urge others to adopt it, if our executive engineers will urge on our employers its acceptance, if each and every one of us do our level best in all ways for its adoption, then it stands a chance of being adopted, otherwise not.

Competition amongst our membership is a good thing. Competition for power and for place. But let it be fair competition. Let the best man win. When competition in unfair, then it becomes a menace. The beaver is emblematic of *The Institute* and of our Country. Probably it was chosen as such for its well-known industry. We cannot do better than emulate the beaver. Those of you who are familiar with the beaver, those who have seen him at work, are well aware that he does not work alone, but in colonies, in compact organizations. You are aware that with the beaver, teamwork is exemplified in its best form. With them, it is "all for one and one for all". So should it be with us. Greatness is measured, not by what men do for themselves, but by what they do for others."

The present enormous emigration from this country, while probably only a temporary condition, was cited in discussing the necessity for more intensive development of our natural resources. Taking one particular instance, Mr. Tapley said:—

"You are all familiar with the coal deposits of the Maritime provinces. Some years ago, one of our members, who is also a local engineer, Major E. T. P. Shewen, M.E.I.C., advocated the establishment of by-product coke-ovens, on a large scale, in the Grand Lake-Minto coal fields. Major Shewen's scheme included the piping of the gas to St. John and other industrial centres for light, heat and power purposes. The average yield of coke from coal is from 68 to 70 per cent. The other by-products are numerous and very valuable.

"According to a report issued by the U.S. Geological Survey for 1921, on "By-product Coke Industry", by-product coke-ovens were in operation in nineteen different states in that year. During that year, 28,813,111 net tons (2000 lbs.) were charged into these ovens, and by-product coke produced was 19,749,580 net tons. The average value of coal, per ton, was $4.82, and the average value of the coke and by-products produced was $14.58 per ton.

"Major Shewen, with his usual thoroughness, went fully into his scheme for the Grand Lake fields, taking into consideration the available raw supplies, the best type of ovens to be used, and total cost of installation. No doubt his estimates and other information are still available.

"Coke is a good, clean and smokeless fuel and can be made with much less ash than American anthracite contains, and we can produce and sell it more cheaply, in Canada, than anthracite has been selling of late years. By installing these ovens, in Montreal, we could replace the anthracite and provide an even better and more economical fuel for that portion of Canada east of the head of the Great Lakes.

"Canada's national autonomy is a myth, so long as a great part of our country depends for its coal supply on the United States. In 1921-22, the imports of bituminous coal from the United States to Canada, amounted to 9,734,041 tons, the cash value being $34,305,964. Imports of anthracite coal from the United States to Canada, in the same year, amounted to 12,515,014 tons, valued at $72,042,584, or a total valuation of $106,348,548. Every dollar of that money should be spent in Canada for the payment of wages of Canadian workmen, and every pound of coal required in Canada should be mined and coked in Canada."

The development of our natural resources said Mr. Tapley, is very pertinently the business of the engineers. This being the case, we must broaden out. We must get the capital, necessary for their development, interested. If we are unable to interest private capital then we must get after government aid. Should the necessity arise, we must be prepared to urge upon our legislators the importance of this development. In the event of lack of interest, or opposition on their part, we should be prepared to place our own men as legislators.

The development of these resources will give employment to hundreds of thousands of men, and for every other line of business in keeping with the country's advancing population. The sooner the country becomes aroused to the fact that Canada has a wonderful future, and the sooner a start is made to develop the resources, the sooner will Canada rise to the position of importance in the world that her vast natural resources entitle her to occupy. Remember, this is not a matter for fifty years in the future, the need is immediate.

After referring briefly to the important part the engineers have taken in the development of Canada and how the country's destiny depends to a large measure upon her engineers, the speaker said, —

"Very great responsibility is ours. Responsibility is unescapable. Wherever relationship is established, there is established responsibility. You are a member of *The Institute*, therefore you are responsible for *The Institute*. As a citizen of Canada, you are responsible for Canada. The closer the relationship, the closer the responsibility that goes with it. Whether you like it or not, you are your brother's keeper. The neglect of your responsibilities will tend to weaken your organization Can any organization be successful without obedience to its elected officers, its rules, regulations and by-laws? Without personal loyalty, no organization, no profession, no business, be it what it may, can survive.

"We have had the Ice Age, the Stone Age, the Bronze Age, and the Iron Age. The present is known as the Engineering Age, and the twentieth century as Canada's. This being so, it becomes our duty to our country, and our people to give them the very best that is in us, and this we may only do if harmony, unity and teamwork prevail amongst us. As Kipling so aptly puts it —

> It ain't the individual, nor the army as a whole
> But the overlasting teamwork of every blooming soul.

"We have our provincial associations of engineers. These are purely business organizations, and should be kept so. Our *Institute* is our place for getting together, our place of accounting for that which we are doing, our place for the exchange of ideas, etc., our forum or our campfire, if you like.

"In concluding, I wish to thank those of you who have so ably co-operated with me during the past year. I know that you will all join me in a very hearty vote of thanks to our retiring secretary, H. F. Bennett, A.M.E.I.C. Mr. Bennett has most capably performed the duties of that office for the last three years. It is with very real regret that we see him retire. I am afraid that few of you realize the amount of time and effort the secretary is called upon for."

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

The Executive Committee held a meeting on April 19th, at which a number of important matters were taken up particularly that in regard to the convention of the A.S.M.E., in May. It was decided in this connection to approach the membership in the Montreal Branch for a voluntary subscription to cover the cost of entertaining the visiting members of the A.S.M.E. This question was put before the branch membership at a regular meeting on the same evening, and it was unanimously approved.

The Fuel Investigation committee has been very active recently, chairman F. A. Combe, M.E.I.C., having appeared before the senate and given some very practical information concerning the various fuels available, their use, advantages and disadvantages, together with a talk on the important subject of central heating plants and their commercial possibilities. Mr. Comb's evidence is being published by the Government Printing Bureau and a limited number of copies are available. On May 12th, a very complete table of relative costs and values of the better known fuels was handed to the daily press and published in the "Star" and "La Presse". This table has been highly commented upon by quite a number, and we consider it to be a most important article, of a real practical nature, for the benefit of the householder. This committee further proposes articles of a similar nature that will be given to the newspapers from time to time, throughout the summer.

Transportation Routes in Canada and Their Relation to Enduring Production

A paper that has been commented upon as "one of the two most important and far reaching in its effects given before this branch" was that of F. W. Cowie, B.A.Sc., M.E.I.C., consulting engineer, Harbour Commissioners of Montreal, on April 19th. This paper was printed beforehand, and copies distributed at the meeting to the members and to a number of visitors who are well-known in the transportation field and who were invited to be present. Quite a few of them took part in the discussion. Numerous requests for copies of the paper have been sent in and a number of written discussions have been received.

The paper will be published in *The Journal* at a later date together with some of the discussion that took place.

Briefly, the paper covered the existing transportation routes in Canada, the cost of shipping grain over them to United Kingdom ports, and also a comparison of the cost from other countries and a projected route through the Hudson's bay. Mr. Cowie also outlined what he considered to be necessary modifications and improvements to the existing routes.

Among those who took part in the discussion were:—T. Harling, W. G. Ross, R. S. White, F. P. Jones, Judge Duclos, Professor Smith, Henry Holgate, M.E.I.C., A. D. Swan, M.E.I.C., R. C. Jamieson, Professor Barnes. On account of the importance of the subject two evenings were devoted to it — one for the reading of the paper and general comments, and the other for discussion.

A point that is worthy of attention is the fact that while the author did not advocate the Hudson's Bay route, as would be the opinion formed by one who was dependent for his information on the press

only, he emphasized the fact that, by reason of the seeming low transportation rate through this route, it was highly advisable that it be thoroughly investigated.

Several of the written discussions sent in request that *The Institute* should take the matter in hand and study this question together with the other routes referred to in the paper.

Notes on Metals in Engineering Service

On April 26th, Gordon Sproule, M.Sc., A.M.E.I.C., lecturer in metallurgy at McGill University, delivered a well prepared address on the above subject. Mr. Sproule dealt in detail with the service of metal structures and parts, as affected by design and kind and quality of materials. He showed how, in many cases, failures in machinery parts and structures were due to improper uses of excellent materials and a total disregard of the elementary principles of design. He further emphasized the fact that there is in use to-day a great deal of standard design apparatus on railways, machinery parts, etc., in which wasteful and incorrect principles are maintained and which are worthy of consideration. The lecturer had on hand a series of lantern slides showing the internal construction of well-known metals of various kinds. Included in this series were a number of metal parts in which failures had occurred and which, upon close examination, showed, in an emphatic manner, the reason of the failure.

Following the lecture, a lengthy discussion took place, and the lecturer very kindly and in an apt manner responded to various questions that were put to him by those present.

Papers and Meetings

The program for the Spring session has now come to a close after a very successful year. The Papers and Meetings Committee, which comes into office now and which will be responsible for next year's work, is as follows:— Chairman, H. W. Fairlie, A.M.E.I.C.; vice-chairman, P. S. Gregory, A.M.E.I.C.; civil section, A. Cousineau, A.M.E.I.C.; electrical section, C. V. Christie, A.M.E.I.C.; mechanical section, J. S. Cameron, A.M.E.I.C.; industrial section, G. P. Cole, A.M.E.I.C.; marine section, I. J. Tait, A.M.E.I.C.; railway section, J. E. Armstrong, A.M.E.I.C.

This committee is busily engaged in securing papers for the coming year, and they would heartily appreciate it if the members, who may have interesting information on engineering works or subjects, would get in touch with them and let them know if they would be prepared to read a paper before the branch.

At one time it was necessary, in order that a man might become or remain a member of *The Institute*, that he should deliver an address before *The Institute*. This practice has been discontinued of late years on account of the very large membership. However, it is felt that a great number are doing, or have done, work that is worthy of being made known publicly, and it is hoped that the committee in charge of the papers and meetings will be given most hearty support. The fact should further be remembered that, even though prospective author is not allotted a date at the time a programme is set, his willingness to contribute is not lost sight of for it is necessary, in order to provide for such contingencies as sickness, necessity of absence from the City, etc., to have available nearly twice as many papers each year as there are dates allotted. Again, the executive wishes it to be remembered that if there are sufficient demands for additional evenings to be set aside for the giving of worthy papers on certain subjects, they will be only too happy to make arrangements therefor. It should also be borne in mind that *The Institute* is the headquarters for the giving of information on technical and engineering subjects, and the members should make it their duty to use it as the channel through which the results of their efforts be first publicly made known.

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

A meeting of the branch was held at 8 p.m., Friday April 27th, at the Royal Connaught hotel, when F. W. Paulin, M.E.I.C., occupied the chair, and at which there were about thirty-five in attendance. Previous to the meeting, the out-of-town members were entertained at dinner. While the attendance was small, the meeting was pronounced a great success in bringing the members together informally, and it seemed to be the desire of all that more meetings of this kind should be held. The papers were presented by out-of-town members on the subjects of roads and pavements.

Non-rigid Pavement

F. P. Adams, A.M.E.I.C., city engineer, Brantford, was the first speaker. He spoke on the "non-rigid" type of pavement, which was more common in Europe than here. He mentioned, as an example, a road in Chatham where the sub-soil was a very dense sticky clay and where a mat of hay was first laid, then covered with broken stone, and a top dressing of asphalt added. This was laid in 1899 and is still in use; only the top dressing having been renewed. The town put in their own asphalt plant and old macadam streets were levelled up with broken stone and a top dressing of asphalt laid on. Other streets were paved with 4-inch asphalt macadam laid hot, one and one-half inch of sheet asphalt being laid on top. This, he said, is much cheaper than concrete and has stood up well and no cracks have developed. It is suitable for light or moderately heavy traffic. The great advantages of this type are that one set of equipment does the whole work, there is no delay as in waiting for concrete to harden, so that traffic is not seriously delayed. Another great advantage is that the surface knits with the base and a good wearing surface is formed. There must be a good sub-soil and pavement must be well rolled with a 15 ton roller.

Norfolk County Roads

The next speaker was Guy R. Marston, A.M.E.I.C., county engineer for Norfolk. He referred to the old roman roads in England and said we could not build roads to last 2,000 years. The Paddington borough council built a road with five-inch creosoted blocks and a twelve-inch concrete base. The Liverpool to Manchester road had eight-inch reinforced concrete base and 8-inch stone blocks. It was 30 feet wide on each side of a double street car line.

Norfolk county has two hundred and forty miles of road to maintain, and has $125,000 to spend this year on construction. The traffic is not heavy because of restrictions; a ten-ton limit means a load of five-tons on a five-ton truck. Their work is done by day labour. They lay a seven-inch base of four-inch stone, although in some places eighteen inches of stone was required because it crushed down into the "blow" sand. A filler of sand and gravel is well swept into the base and a layer of two-inch stone is placed on top with a layer of Tarvia and good coarse sand which is better than a half-inch stone. The cost was from $22,000 to $23,000 per mile in 1919. Last year it was about $19,000 per mile. Teams cost $5.00 per day and labour 22 cents per hour.

The speaker suggested that a cash allowance should be available for experimental work on short sections of road. This would save money over laying some miles of road without a previous test.

Considerations in Municipal Paving

D. T. Black, A.M.E.I.C., city engineer of Galt, was then called upon and in the course of his remarks, said that municipalities require good streets, but it is the way they are maintained that indicates the character of the people. There is a great need of sidewalks along the highways in rural districts. Asphaltic concrete pavements, although ideal, should not be forced on the people, because of their great expense. To-day, macadam for city streets is not receiving the consideration it is rightly entitled to. An application of sixty per cent of asphaltic compound increases the power of resistance of macadam thirty per cent. He had proved by test that a macadam base stands up better than a concrete base. Street corners should be made on a large radius, not less than twenty-five feet while thirty feet is better. The city of Galt was referred to as an example of what can be accomplished when the people desire beautiful parks and ornamental streets.

Among those who took part in the discussion were: A. M. Jackson. Principal Gill, E. B. Allen, A.M.E.I.C., C. A. Waterous, M.E.I.C., and E. H. Darling, M.E.I.C. who moved a vote of thanks which was heartily applauded; the meeting being pronounced one of the best we have held.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.

W. St. J. Miller, A.M.E.I.C., Branch Editor.

"History repeats itself" is an ancient adage, but is as true to-day as ever. The significance of its application as presented in the following remarks will be apparent, at any rate to members of the Calgary branch. We read that the cloak of Elijah lighted on the shoulders of Elisha, or in modern parlance the burden of branch editorship has been handed over to one who should aspire to "fill the bill" in as capable a manner as our late local editor, F. K. Beach, A.M.E.I.C. The fulfilment of such an aspiration is however of a somewhat doubtful probability.

There is one thing that we are not certain about concerning the account of old referred to and that is at what particular season of the year this change of responsibility took place. If Elisha had had his say he should have demanded it during the busy season, whichever that may have been! To commence ones duties at this time of year when local affairs in the engineering line are at an extremely low ebb is, to say at least, somewhat exasperating. Regular meetings are at an end, spring fever is raging. One is pawing the ground in a feverish anxiety to turn the first sod; another feels capable of sinking a caisson in an endeavour to get the first seed into the ground. A pile-driver has an insignificant appearance in comparison with ones estimated spade-pushing capacity. The pull of the proverbial wild horses would prove utterly futile against that electro-magnetic effect of the golf course. As a result of such happenings the futility of attempting to report on matters pertaining to our profession is obvious, and there must of necessity be a lack of "news" or references to items of local engineering import during the coming summer months.

We have concluded a most successful winter season. The subjects treated have been varied in the extreme, ranging drom the airplane, with the sky as the limit, down to the lowest cretaceous coal-bearing

strata and as far afield as the Punjab. The subject of concrete was dealt with by Col. H. C. Boyden, Portland Cement Association representative. Irrigation was handled by V. Meek, A.M.E.I.C., R. S. Stockton, M.E.I.C., and A. N. McI. Robertson, M.E.I.C., Street railways were reviewed by W. J. Gale, A.M.E.I.C.; the airplane by Major S. M. Croil, D.F.C., and coal by Major C. C. Richards, M.E.I.C., J. H. Ross, A.M.E.I.C., and his assistants showed us over the Institute of Technology and Art, and Major C. J. Child, A.M.E.I.C., elightened members and their lady friends on the subject of our great national parks. There were other interesting papers read and reported on, but these few have been referred to in order to emphasize the varied activities of the branch during our season now closed.

Farewell Dinner to George W. Craig, M.E.I.C.

The Calgary branch, has sustained a loss in the person of George W. Craig, M.E.I.C., who we all regret to say has severed his connection with the city of Calgary as city engineer. He has departed, with the best of good wishes of his fellow engineers for his future success, to take up special work in Chicago. At a farewell dinner tendered to him by the branch on April 27th, Mr. Craig stated he would be unjust to himself at least if he did not accept this position, also he considered he could prove more useful to his profession in his new work.

Mr. Craig has proved himself of valuable assistance at all times to the executive and to the branch. He is one of those who realizes that the tendency of this age is to specialize and it is for this reason in particular that he has made the change.

A fitting presentation was made during the evening, when he received, at the hands of A. S. Dawson, M.E.I.C., three framed enlarged photographs of the concrete bridges which were erected during his ten years tenure of office with the city, the subjects being the Centre street bridge, the Mission bridge, and the new Louise bridge. His work was spoken very highly of by the mayor of Calgary, by William Pearce, M.E.I.C., A. S. Dawson, M.E.I.C., and others.

Following his suitably expressed response to the good wishes of the branch he incidently mentioned that he had guaranteed the expenses of his two sons through college with the proviso that they never take up municipal engineering! It has not been Mr. Craig's advice alone that has been generally sought, for he was distinctly blessed with an exceptional fund of general friendliness towards all with whom he came in contact.

Local News

Work on the Imperial Oil Company's Refinery in East Calgary was recommenced recently after a cessation of a few months. The company was unabled to proceed owing to the arrival of material in sufficiently large quantities. Close on one thousand men are now being re-employed, which has helped considerably in relieving the unemployment situation in Calgary and vicinity.

It is noted that H. R. Rindal, M.E.I.C., is resigning his position from the Canadian Pacific Railway in Calgary and is returning to Vancouver to take up private work. He only recently arrived in the city to succeed District Engineer F. W. Alexander, M.E.I.C., who was promoted to Vancouver, B.C. Thomas Lees, A.M.E.I.C., is coming here from Winnipeg to assume the position of district engineer, Canadian Pacific Railway, Mr. Lees was recently in charge of Water services, Canadian Pacific Railway, at Winnipeg.

London Branch

F. J. Bridges, A.M.E.I.C., Secretary-Treasurer.

R. I. Olmsted, A.M.E.I.C., Branch News Editor.

Regular Meeting May 7th.

The regular meeting of the London branch, was held on May 7th, in the offices of the Department of Public Works, Royal Bank building. In the absence of the chairman and vice-chairman, H. B. R. Craig, M.E.I.C., presided and introduced the speaker of the evening, Lt.-Col. H. C. Boyden, of the Portland Cement Association, Chicago. Col. Boyden chose for his subject "Recent Developments in Concrete" and illustrated the lecture with lantern slides.

The speaker said that the amount of Portland Cement marketed in 1922 amounted to 116,000,000 barrels which if laid in an 18-foot highway, nine inches thick, would cross the continent from New York to San Francisco eight times. Provision is made this year to manufacture 142,000,000 barrels to take care of the natural increase in demand.

The speaker outlined the slump test and its relation to the amount of cement required to give maximum economical results and explained the term "fineness modulus", in detail with the practical application of the information thus obtained in determining the amount of cement and water necessary to give any desired consistency for a pre-determined strength.

He then dealth with the three ingredients necessary to make concrete, namely, cement, aggregate and water. Explaining in the case of the aggregate that sand must be clean, that there is no objection to fine sand and that sharp sand has no advantage over rounded sand.

By observing the fundamentals laid down so far fifty per cent is the maximum to be expected. In order to obtain results approximating the hundred per cent of the strength of concrete at least twenty-one days of proper curing should be resorted to. Ponding, wet earth' straw, burlap may be advantageously used, giving results far superior to the twice a day sprinkling commonly observed. Where water is scarce an additional cement allowance must be made to make up for the loss due to improper curing. Col. Boyden also explained that test results showed there was no advantages to be gained by prolonged mixing and that a minute and a half was sufficient if the time was taken after all ingredients were in the mixer.

At the conclusion of the lecture lantern slides were shown which illustrated the various important points brought out in the lecture. Many interesting questions relative to the lecture were asked and were replied to by the speaker. Copies of the latest developments in concrete were made available to those interested, through the kindness of Col. Boyden.

The meeting was well attended and included members of the local chapter of the architects, as well as interested contractors. The meeting was brought to a close by a vote of thanks moved by J. M. Moore, M.E.I.C., and seconded by W. C. Miller, A.M.E.I.C.

Edmonton Branch

R. H. Douglas, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the granch was held in the Edmonton Board of Trade Rooms on Wednesday March 14th, with Professor R. S. L. Wilson, A.M.E.I.C., in the chair, and about thirty-five in attendance.

Professor C. A. Robb, M.E.I.C., of the University of Alberta read a paper on "Combustion Problems and Furnace Design" dealing particularly with Canada's great fuel demand and the sources from which it must be drawn, showing also how through the efforts of the provincial government in carrying out tests in Winnipeg on our Alberta coal a firm hold had been established on the Manitoba market. The paper also dealt with the characteristics of bituminous and sub-bituminous coals and showed how the export of the bituminous coal insures a more equitable basis for freight and tends to stabilize the whole industry leaving the domestic market to be served by the higher moisture coals.

The second paper of the evening was delivered by John Armstrong, special engineer of the C.N.R., and for a number of years chief engineer of the Hudson's Bay Railway, the subject of the paper being "Why our Wheat goes via American Ports". Mr. Armstrong stated that one of the main reasons for this was on account of the fact that our wheat was largely carried by the liners at a cost considerably less than the freight steamers could carry it. The American ports have a much greater number of liners calling than the Canadian ports and the wheat is used by these great vessels as ballast, which enables them to carry it at a very favourable rate. Mr. Armstrong also dealt exhaustively with the Hudson's Bay route giving it as his opinion that this would be entirely feasible and would greatly cheapen the transportation cost on our western grain.

Both papers were followed by a very interesting discussion in which many of those present took part.

Ottawa Branch

F. C. C. Lynch, Associate E.I.C., Secretary-Treasurer.

A. J. Nesbitt, president of Nesbitt, Thomson and Company Limited, Investment Brokers, Montreal, was the speaker at a largely attended luncheon given by the Ottawa Branch at the Chateau Laurier on April 19th. Mr. Nesbitt was introduced by O. S. Finnie, M.E.I.C., chairman of the Ottawa Branch, who presided. Mr. Finnie referred to Mr. Nesbitt's manifold activities in connection with the financing of water-power development throughout Canada.

"As engineers," declared Mr. Nesbitt, "you should be intensely interested in the financing of Canada's water power enterprises." He went on to show how important it was for these huge enterprises to be economically financed. Canada was blessed with great natural resources and the financing of water power enterprises to develop these resources was of foremost importance. Mr. Nesbitt said it was estimated there were between 18 millions and 41 millions of horse-power capable of being developed in Canada and only about seven per cent or three millions of horse-power had been developed yet. Most of this developed power was in Quebec and Ontario, and it was used largely by the pulp and paper industry. It was estimated that

20 per cent, or 640,000 horse-power, was used by the pulp and paper interests. It required about 100 horse-power for every ton of newsprint produced. He predicted that within the next 10 years the developed horse-power of Canada would be increased from three millions to six millions.

Dealing with the gold, silver, and coal output of Canada, Mr. Nesbitt stated that the output of gold in 1922 amounted to $25,000,000 and the output of silver was $12,000,000 chiefly from northern Ontario, where electrical power was most essential. This output would increase as additional power was developed. The cost of horse-power in northern Ontario was from $250 to $350. Mr. Nesbitt said it was estimated that the development of 100,000 horse-power would be the equivalent to bringing into the country about $100,000,000 in industries. In Quebec there were under construction, or about to be commenced, electrical power development enterprises to the extent of 600,000 horse-power. The largest single electrical development plant consisted of one with eight units representing 320,000 horse-power.

The cost of water-power development, he said, was from $60 to $150 per h.p. Such enterprises were usually financed by the issue of first mortgage bonds and junior securities, in the proportion of 60 per cent of bonds and 40 per cent junior securities. The reason that water-power securities were regarded as very safe was the fact that there had never been one case of default in first mortgage bonds by any water-power company in Canada. That was more than could be said with regard to municipal or school bonds. There were about 80,000 shareholders in water-power security companies whose holdings represented a value of about $650,000,000. It was of the utmost importance, he declared, that these securities be retained in Canada.

In Canada there was one horse-power for every three of population, Canada being second only to Norway in horse-power per capita. "I firmly believe that we will have in Canada six millions of horse-power developed within the next 10 years," declared Mr. Nesbitt.

In conclusion Mr. Nesbitt conveyed his thanks to J. B. Challies, M.E.I.C., and other officials of the Water-Power Branch of the government for much of the information that he had given.

Those at the head table were: — C. P. Edwards, A.M.E.I.C., William Cochrane, T. Shanks, M.E.I.C., H. H. Stevens, M.P., Hon. J. G. Foster, H. B. McGiverin, M.P., Hon. E. D. Smith, C. H. Keefer, M.E.I.C., Hon. Jacques Bureau, Hon. Senator Bostock, Rt. Hon. R. L. Borden, O. S. Finnie, M.E.I.C., A. J. Nesbitt, Rt. Hon. Arthur Meighen, Hon. R. J. Manion, Hon. E. N. Rhodes, Hon. Gerald White, Dr. Deville, Hon. M.E.I.C., Sir Henry Egan, D. M. Finnie, Russell Blackbrun, Dr. Camsell, M.E.I.C., Hon. A. K. McLean, G. A. Mountain, M.E.I.C., J. B. Hunter, Dr. Bell Dawson, M.E.I.C., J. J. McArthur, M.E.I.C., Hon. Senator Casgrain, K. M. Cameron, M.E.I.C., C. A. Bowman, N. A. Cauchon, A.M.E.I.C., D. W. McLachlan, M.E.I.C.

Cement Highway Construction.

When planning modern highways engineers should remember that the future must be served by them and should construct their roads to take care of increased volume and weight in traffic, Lieut.-Col. H. C. Boyden, of the Portland Cement Association, told members of the Ottawa Branch at a meeting held at the Victoria Memorial Museum on the evening of May 14th. Col. Boyden spoke in particular of cement highway construction giving the result of several important investigations recently made in the United States and specifications which were the result of careful research.

Lethbridge Branch

George S. Brown, A.M.E.I.C., Secretary-Treasurer.

The last meeting for the season of the Lethbridge Branch was held in the Y.M.C.A. on Saturday evening, April 24th.

C. D. MacKintosh, M.E.I.C., occupied the chair and a splendid paper on water purification was read by J. T. J. Vallance, city sanitary inspector.

Mr. Vallance first referred to the purpose of water purification and the results to be expected from proper treatment of water after which he described the various purification methods, such as filtration, distillation, and sterilization. He stated that the average reduction in deaths from typhoid following purification of the water supply is 75 per cent. The average figures in the case of our own city were, during the six years 1911 to 1916 inclusive, 63; the highest being 97 in 1916 and the lowest 32 in 1915. The 97 cases in 1916 all occurred in the first three months of the year, and in March of that year by temporary means of disinfecting the water by the application of hypochlorite of lime were installed. Chlorination was continued either by the use of bleaching powder or liquid chlorine from that time until the filtration plant went into operation in March 1918.

EMPLOYMENT BUREAU

Situations Vacant

Mechanical Engineer.

Pulp and paper company requires the services of a mechanical engineer to take charge of repair work and efficiency work in the improvement of the wood end of their mill. Apply Box 22-V.

Mechanical Engineer.

Mechanical engineer, preferably a graduate, age between 26 and 32, required by a large pulp and paper company in the province of Quebec Applicant must be thoroughly experienced in mechanical draughting and shop work. One with paper mill experience preferred, though not essential. Apply Box 25-V.

Electrical or Mechanical Engineer.

An electrical or mechanical engineer is desired by the Northern Aluminum Company, Limited, Shawinigan Falls, P.Q. The applicant should have had some experience. Please write the Company for further details and state qualifications for the position.

Drau htsman.

A senior draughtsman with experience in construction and steel work for temporary position. Salary $140.00. Apply Box 36-V.

ELECTIONS AND TRANSFERS

During the first four months of this year the following Students were admitted:—

At the meeting of Council held on January 9th, 1923.

COWAN, L. . . . . 143 Stanley St., Montreal, Que.
HUNTER, H. M. . . . . University of Alberta, Edmonton, Alta.
RENOUF, E. T. . . . . 718 Pine Avenue, W., Montreal, Que..
SCHURMAN, H. H. . . . . 51 Hollis St., Halifax, N.S.

At the meeting of Council held on February 16th, 1923.

AKERLEY, E. C. . . . . Barker's Point, York Co., N.B.
BURPEE, C. M. . . . . 207 Smythe St., Fredericton, N.B.
BUTTERWORTH, J. V. . . N.S. Technical College, Halifax, N.S.
GRAHAM, H. J. . . . . 362 Beresford Avenue, Toronto, Ont.
IRWIN, K. W. . . . . 23 St. Alexander St., Toronto, Ont.
PIERCY, J. S. . . . . P.O. Box 318, Cornwall, Ont.

At the meeting of Council held on March 27th, 1923.

BUZZELL, H. W. . . . . Abbotsford, Que.
DAVIES, E. J. . . . . N.S. Technical College, Halifax, N.S.
FOSTER, A. R. . . . . Queen's University, Kingston, Ont.
FURNESS, G. W. C. . . . . 67 McTavish St., Montreal, Que.
GWYTHER, V. M. W. . . . Suite 5, 1645-11th Ave., W. Vancouver, B.C.
JAMES, A. L. . . . . 1620 De La Roche St., Montreal, Que.
LOWE, M. C. . . . . 51 Hollis St., Halifax, N.S.
MAXWELL, E. G. . . . . 348 Sherbrooke St., West, Montreal, Que.
MILLETT, R. S. . . . . N.S. Technical College, Halifax, N.S.
MITCHELL, W. M. . . . . 4630 St. Catherine St. W., Montreal, Que.
STERNS, L. . . . . 17 Tulip St., Dartmouth, N.S.
WALDEN, J. G. L. . . . . Bagot, Manitoba.
WELTON, C. R. . . . . N.S. Technical College, Halifax, N.S.

At the meeting of Council held on April 23rd, 1923.

ABBOTT-SMITH, H. B. . . 10 Bellevue Avenue, Westmount, Que.
CLEVELAND, H. R. . . . . Strathcona Hall, Sherbrooke St. W., Montreal, Que.
GAUVIN, L. G. . . . . 263 Tower Road, Halifax, N.S.
HALPENNY, M. B. . . . . 2248 Mance St., Montreal, Que.
HANSULD, S. B. . . . . Queen's University, Kingston, Ont.
HUMPHREY, H. W. . . . . N.S. Technical College, Halifax, N.S.
LONGWORTHY, W. O. . . 2035 Hamilton St., Regina, Sask.
McCALL, A. D. . . . . 41 Lincoln Ave., Montreal, Que.
RIVA, R. H. . . . . 237 Sherbrooke St., W., Montreal, Que.
ROLLESTON, P. R. . . . . 87 Milton St., Montreal, Que.
SMALLHORN, E. R. . . . . 7 Vendome Avenue, Montreal, Que.

OTHER SOCIETIES NEWS

Amendment to Nova Scotia Professional Engineering Act

At the last session of the Legislature of the province of Nova Scotia the following amendments to the Nova Scotia Engineering Profession Act was passed.

No. 92 Bill 1923

An Act to amend Chapter 186, entitled "An Act respecting the Engineering Profession".

Be it enacted by the Governor, Council and Assembly as follows:—

Clause (i) of section 7 is repealed and the following substituted:—

(i) Any person working as an assistant under the direct control and supervision of a professional engineer and not having any responsibility for the design of the work or any responsibility other than that of carrying out the design and instructions of his chief shall not be deemed to be practising as a professional engineer, but any person who although employed as such assistant is responsible to any extent for the design of the work or for the technical details of the carrying out of the work shall be deemed to be so practising.

Clauses (d) of section 9 is repealed and the following substituted:—

(d) Hereafter only four Councillors shall be elected each year. The four Councillors elected at each annual election hereafter shall act for two years.

Any vacancy occurring among the Councillors appointed by the Governor-in-Council shall be filled by the Governor-in-Council, and any other vacancy in the Council occurring between annual elections shall be filled by the Council.

(34) On and after January 1st, 1930, no one shall be registered as a professional engineer who has not been practising or preparing to practise engineering prior to January 1st, 1924, unless such person can fulfil the following conditions, viz:—

(a) Is a graduate from a technical college or university recognized jointly by the Governor-in-Council and the Council of the Association of Professional Engineers and has had two years practical experience in engineering work.

(b) Has a B.A. or B.Sc. degree from some college or university recognized jointly by the Governor-in-Council and the Council of the Association of Professional Engineers and has had three years practical experience in engineering work.

Canadian Geodetic Society.

The fifth season of the Canadian Geodetic Society, which has recently been brought to a close, may be pronounced a successful one in all respects. Every meeting has been well attended, both by members of the geodetic survey staff and by visitors from other branches of the government service. The thanks of the society are specially due to Dr. William Bowie, of Washington, to R. A. Field, of the surveys laboratory, topographical survey branch and to F. H. Peters, M.E.I.C., of the surveys bureau, each of whom contributed an interesting lecture.

At the recent annual meeting the secretary's financial statement showed a substantial balance. J. L. Rannie, M.E.I.C., the president, spoke briefly about the successful season. At the same time he expressed disappointment that, owing to delay in the arrival of certain reports Dr. E. Deville had not yet been able to address the society on the subject of last year's geodetic conference in Rome. After describing his tenure of office as a liberal education for himself, Mr. Rannie spoke of the very harmonious relations which had existed throughout the season between all the members of the executive. He referred specially to the work of the secretary, to whom, on behalf of the society, he then presented a beautiful silver mounted walking stick.

At the conclusion of the meeting the following officers were elected for the ensuing season: President, A. M. Grant, A.M.E.I.C., (by acclamation); vice-president, H. F. J. Lambart, A.M.E.I.C.; secretary-treasurer, H. G. Rhoades, (by acclamation); council, H. B. Kihl, Major G. H. McCallum, A.M.E.I.C., Dr. D. McMillan, A.M.E.I.C.

Canadian Good Roads Association Convention.

The tenth annual convention of the Canadian Good Roads Association will be held in Hamilton, Ontario, from June 11th to 14th inclusive, with headquarters at the Royal Connaught hotel. The attentive official programme which has just been issued gives promise of one of the most interesting meetings yet held by this Asso-

promise of one of the most interesting meetings yet held by this association. Registration commencing at 9 a.m., Monday, June 11th, and following the luncheon of the first day, an automobile drive is arranged for the delegates over about sixty miles of the provincial highways in that neighbourhood.

The following technical papers will be presented at the various sessions:—

TUESDAY, JUNE 12TH.

"Provincial Systems of Highways and Permanent Construction", Geo. Hogarth, M.E.I.C.
Discussion: H. M. Necker.
"Test Road Experiments," Thos. H. McDonald.
Discussion: Clifford Older.
"Who should pay for the Road," A. W. Campbell, M.E.I.C.
Discussion: H. S. Carpenter, M.E.I.C.
"Maintenance," (a) Methods and Cost data. (b) Gravel and Earth Roads (Scrapers and graders), E. A. James, M.E.I.C.
Discussion: B. M. Hill, M.E.I.C.
"Patrol Systems, how best conducted."
Discussion: A. McGillivray, A.M.E.I.C.

WEDNESDAY, JUNE 13TH.

"Methods for reconstructing Old Macadam Roads," James Pearson.
Discussion: A. P. Sandles.
"Culverts and small Bridges," J. L. G. Stuart, A.M.E.I.C.
Discussion: R. Jackson.
"Refined Tar in Construction and Maintenance," J. S. Crandell.
Discussion: A. F. Macallum, M.E.I.C.
"Cement Concrete (Single track)," A. M. Jackson, A.M.E.I.C.
Discussion: J. G. Wilson.
"Bituminous Surfaces."
"Road Machinery," J. Lefebvre Boulanger.
Discussion: Patrick Philip, M.E.I.C.

THURSDAY, JUNE 14TH.

"The proper use of the highways," (a) Methods for regulation of traffic and enforcing speed laws. (b) The Autobus. (c) Motor Truck. (d) Uniform hand and danger signals. (e) Headlight regulations. (f) Lights on all vehicles.
"Tourist Traffic," John Pierce.
Discussion: J. B. Harkin.
"The Contractor," Col. W. G. MacKendrick.
Discussion: A. E. Foreman, M.E.I.C.

In addition to these papers, provision is made for a luncheon on each day of the convention and for the annual general meeting on the afternoon of Wednesday, June 13th, while the annual dinner and entertainment will take place on the evening of the same day. The convention will close with a second automobile drive of approximately one hundred miles, taking in Niagara Falls and Queenston.

American Society For Testing Materials Annual Meeting.

The provisional programme of the twenty-sixth annual meeting of the American Society for Testing Materials which is to be held at Atlantic City, N.J., from June 25th to 29th inclusive, provides thirteen sessions as follows:—

MONDAY, JUNE 25:

First Session: On Non-Ferrous Metals and Alloys.

TUESDAY, JUNE 26:

Second Session: On Corrosion, Fatigue of Metals and Magnetic Analysis.
Third Session: On Wrought and Cast Iron, Coal and Coke, and Heat Treatment.
Fourth Session: Presidential Address.

WEDNESDAY, JUNE 27:

Fifth Session: On Steel and Methods of Testing. Reports of Administrative Committees.
Sixth Session: Symposium on Consistency. Testing of Glue.

THURSDAY, JUNE 28:

Seventh Session: On Road Materials, Waterproofing and Thermometers.
Eighth Session: On Timber, Rubber and Textiles.
Ninth Session: On Preservative Coatings.
Tenth Session: On Cement, Lime, Gypsum, Ceramics and Nomenclature.

FRIDAY, JUNE 29:

Eleventh Session: On Petroleum Products, Electrical Insulating Materials, and Slate.
Twelfth Session: On Concrete.
Thirteenth Session: Symposium: "What Properties of and Methods of Making Concrete Require Further Investigation?"

CORRESPONDENCE

International Bridge at Edmundston, N.B.

Edmundston, N.B., May 11, 1923

Editor, *Journal*,
Dear Sir:

The new International bridge, which spans the river St. John between Edmundston, N.B., and Madawaska, Me., was opened for traffic during the last week in August 1922, following a ceremonial which was conducted by the local authorities, of both sides of the boundary line.

The structure consists of four through truss spans of 235½ feet each, on reinforced concrete piers and abutments. The length from end to end of concrete being 1,033 feet 7 inches. The bridge is designed for highway traffic only having 20 feet 8 inches width of roadway and 6 feet width of sidewalk and 14 feet clearance. The material of the superstructure is open hearth steel (structural grade) and designed for dead-load of 1,500 lbs., and live-load 1,260 lbs., per lineal foot of truss. The floor system is for 15-ton truck with axles 12-foot centres and 6-foot gauge.

The foundation piers and abutments are of heavily reinforced concrete, massive in form and the piers designed to withstand spring flood, which carries heavy ice and very large quantities of timber for the mills below. The material under the foundation of the piers was tested by wash borings and found to be of coarse, sharp sand, with irregular round and smooth gravel from ¼ to 3½-inch, very hard packed with occasional small traces of clay. The whole being remarkably clean. This material was almost impervious to the borings,

International Bridge at Edmundston, N.B.

the greatest penetration being 35 feet below river bottom. Double lap 3-inch piling enclosed the foundation pits, which were surrounded by timber crib-work with filling between, the pits being sunk below the river bed to 6 feet in the middle pier and to less than 5 feet in the others and was so tenacious that the excavation by pick was very difficult.

The foundation load under the piers is 2.13 tons per square foot. The foundation pit of the middle pier was heavily reinforced with R.R. steel, the timber framing being moved in process, allowed to fill and the concrete deposited under water by trip buckets. All other foundations were built in the dry. One inch twisted steel bars one foot within the forms laid all around supplied the reinforcement required.

The piers are 58 feet high over the foundation and the variation from low to high water will range to 30 feet. The cutwaters on the piers were designed to meet this condition. During the surveys a high water mark was pointed out that had been chiselled in a rock on the Canadian side, by some observing and thoughtful inhabitant, with the inscription "Water came to here April 1885", which proved to be a year of extraordinary high water.

The main body of the concrete was in the proportions of 1–3–5 with bridge seats and coping of 1–2–4. A very excellent gravel was found nearby and proved to be remarkably clean, so no washing was required, and was graded for the aggregate before being used. The proportions being adjusted by the quantity of cement. Tests of material were made continuously by the laboratories of the department of Public Works and the State of Maine.

The river banks at the site are high and permitted the structure to be so designed as to cross over the National and Temiscouata Railway tracks with a clearance of 23 feet. The floor was built of two by four "Kyanized" spruce laid on end with tight joints and expansion cared for at each pier by separating eight sticks of the floor timber by springs similar to the leaves of an automobile spring. The joints being covered with canvas heavily tarred. The usual broken stone MacAdam was laid over this in two courses treated with Tarvia X and K.P., then rolled to a finished surface in the usual manner. The approach to the bridge on the Canadian side is of pitch asphalt widening to about 40 feet with 8 feet cement sidewalk. On the American side the approach is the usual state road of oil treated McAdam. The lighting is by nine closed lamps of 60 c.p., at each portal and centre and ends of trusses over the roadway. Provision is made for power, telephone and telegraph circuits underneath the structure.

The cost of the work from end to end of concrete is borne equally by the state of Maine and the Dominion government, operating through the Highway Commission of the state and the department of Public Works of Canada. The total appropriation available being $324,000.

The substructure was started early in May and finished end November 1921, and comprises about 5,272 yards of concrete and 163,600 lbs., of steel reinforcement which together with the other items of that contract totalled approximately $143,000. Erection of the superstructure was started in November 1921 and was completed by the end of February 1922, approximates 1,802,000 lbs. of steel and costs erected $147,000.

The flooring was built by day labour and the cost borne jointly between the two offices. Its cost not being determined at the present time. The approaches and other incidentals are paid for by the office on that side of the line.

The contractors for the substructure were D. C. Burpee and Son, of Devon, N.B., with C. McN. Steeves as engineer. The contractors for the superstructure were the Canadian Bridge Company of Walkerville, Ont.

Yours very truly,
S. J. CHAPLEAU, M.E.I.C.

Editor's note:—The work was under the direction of S. J. Chapleau, M.E.I.C., engineer of the department of Public Works of Canada, and Paul D. Sargent, chief engineer with L. N. Edwards, bridge engineer of the State of Maine Highway Commission. L. de B. Roy, Jr. E.I.C., assistant engineer of the department of Public Works and H. E. Towne, assistant engineer of the Main Highway Commission were the residents on the work and A. W. Gregory, A.M.E.I.C., assistant engineer of the department of Public Works, represented both governments as inspector of materials.

Winnipeg Branch Activities

Winnipeg, Man., April 5th, 1923.

Editor, *Journal:*—
Dear Sir,

Replying to your letter of February 24th, requesting a report on the activities of the Winnipeg Branch along the recommendations of the Publicity Committee of *The Institute*, this letter was presented to the executive yesterday, and I am instructed to report as follows:—

The Winnipeg Branch has for the past four years had a publicity committee which has been more or less active. Notices of all meetings are inserted in the Winnipeg papers and reports of each meeting are also published, usually on the day following, the meeting.

It has been the practice of the branch to invite the general public to meetings at which papers of a general or even of a special local interest are to be discussed. This year it was contemplated that three popular engineering lectures would be given under the auspices of the branch, but it was found difficult to obtain speakers to provide papers, and besides a number of popular lectures were given under the auspices of the university. It was later decided not to hold these this year.

The branch elects each year a committee on legislation and public affairs, and through the individual membership of the branch have taken active parts in many public questions, the branch offered their services in the preparation of revised building by-laws for the city, which are at present under consideration. This committee has been active in advising the provincial government on such matters as the continuation of the Public Utilities Commission which is at present under advisement.

Quite a number of our engineers hold important public offices, such as commissioner of the Greater Winnipeg Water District, chairman of the Good Roads Board, commissioner of the Manitoba Power Commission, deputy provincial secretary, deputy minister of public works, etc. Our membership is represented on the city council and in the prominent social organizations. Just recently one of our members was elected mayor of the city of St. Boniface.

We believe that the engineering profession have been fairly successful in this district in promoting, as far as is practicable, its welfare. As you are well aware, recognition by the public is a slow process. It means a general education of the public to the part that the professional engineers are playing in the development of the community. Council can rest assured that consistent effort is being put forth to effect that recognition and prestige in the community that the engineers rightly deserve.

Yours truly,
GEO. L. GUY, M.E.I.C., Secretary-Treasurer.

Canada's Fuel Problem

Ottawa, May 7, 1923

The Editor: *Journal.*

Dear Sir:—

The Engineering Journal of May 1923 contains a long and thoughtful letter on this subject from Mr. C. V. Corless. In the third paragraph Mr. Corless states that:—

"The coal consumption of Canada is now about 3⅓ times our consumption twenty-five years ago and about 60 per cent of our concumption is imported. It is therefore at least possible, if not probable, that by the middle of the present century Canadians may consume 100,000,000 tons of coal annually, of which 60,000,000 tons may be imported."

As I am uncertain whether the second part of this statement takes due account of the influence of water power development in decreasing the amount of coal required, the following remarks may prove of interest.

Effect of Water Power Development on Coal Consumption

The effect of water power development on coal consumption can be definitely shown by official statistics, and it is desired to briefly set forth how great this effect has been, and will continue to be, in reducing the coal that would otherwise be required by Canada.

No records exist, of the extent of water power development twenty-five years ago, but in 1910 the amount was approximately 975,000 h.p., and to-day it is practically 3,000,000 h.p., an increase of over 200 per cent in about twelve years. It may be reasonably expected that if there had been no water power development the total coal used would increase approximately pro-rata to the increase of population, but this has not been the case.

The total coal consumption and the consumption per capita increased annually in a fairly uniform manner from 1886 to 1913 and in the latter year it first exceeded 30,000,000 tons. In 1921 however it was less than in 1913 although the population had increased 17 per cent. (In 1922 it was still lower, nearly 12 per cent lower than in 1921, but 1922 was a year of abnormal shortage and will not be considered for the present purpose). The situation may be shown thus:—

	1913	1921	
Population.....	7,527,208	8,788,483	increase 16.8%
Coal consumption.			
Total tonnage.....	31,583,000	31,174,000	decrease 0.95%
Per capita.....	4.2	3.55	decrease 15%

Analysis of official statistics shows clearly that this result is due to the increasing use of water power in industries. Industrial statistics are not available for exactly the same years as in the above table but they are available for 1911 and 1920. which covers practically the same period. These show that while the population increased 20 per cent and the horsepower in use increased 120 per cent the coal used in manufacturing only increased 28 per cent this being due to the increase in the use of water power in manufacturing by 254 per cent in the nine years.

Continuing the analysis and assuming that no *further* development of water power had taken place after 1911 and that the rate of coal consumption per horsepower installed had remained the same as in 1911, shows that the coal actually saved in industries in 1920 was over 13,000,000 tons. It may be fairly assumed that the saving is approximately in the same ratio for all water power developed and this gives a total saving at the present time of 25,000,000 tons per annum. This is equivalent to practically 9 tons of coal per installed horsepower per annum.

Effect in Ontario and Quebec

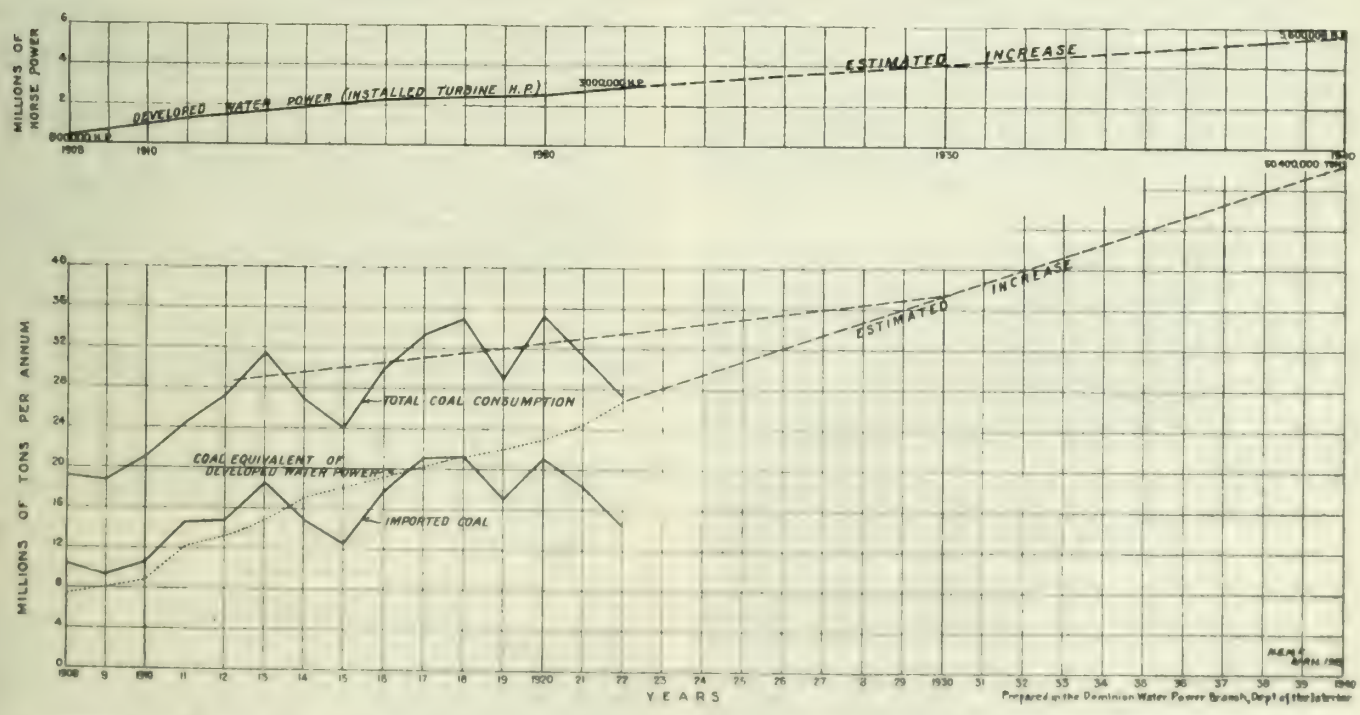
These figures may be applied to the provinces of Ontario and Quebec, the supply of coal to which it is now agreed constitutes the "fuel problem of Canada." Ontario and Quebec contain over 60 per cent of the total population of Canada, nearly 80 per cent of the total manufacturing development and use 55 per cent of the total coal consumption of the Dominion. Over 90 per cent of their combined coal consumption is imported from abroad.

In water power these provinces have between 12 and 18 million horsepower available and of this over 2,373,000 horsepower is already developed, this developed water power representing an increase of 218 per cent since 1910.

The combined coal consumption of Ontario and Quebec for 1921 was 18,690,000 tons — the coal equivalent of developed water power in the same area is 21,358,000 tons. It will therefore be seen that *but for this developed water power, Ontario and Quebec would require more than twice their present supply of coal.*

To further illustrate this matter a diagram is attached which shows the relation of the coal equivalent of developed water power to coal imports and to total coal consumption, from 1908 to 1940. From this it will be seen that the coal equivalent of developed water power in tons per annum already considerably exceeds the total imports of coal and that by about 1930 it will equal the total coal consumption of the Dominion.

Reviewing the above, the immense relief that has already been afforded to the fuel situation by the development of water power is



NOTE: — It will be seen that the total coal consumption was less in 1921 than in 1913; 1922 is shown but was a year of abnormal shortage. It will also be seen that, on any reasonable assumption, by the year 1930 the coal equivalent of developed water power will be about equal to the total coal consumption of Canada.

very apparent and the question becomes, to what extent can this be continued in the future.

It is indisputable that the more water power is developed the less coal will be required but it must be anticipated that as population and industry increase the total coal required will also tend to increase. The rate at which it does so will be mainly dependent on water power development being so pushed forward that it is always a little ahead of demand and that the surplus will therefore be available for the less essential uses.

The uses of coal in per cent of total consumption stood approximately thus in 1921:

Steam railways	29 per cent
Bunker coal	4 "
Industries and coke	34 "
Electric light and power	2 "
Domestic use and gas	31 "
	100 "

The degree of saturation in the use of water power is still capable of considerable extension in many directions — in the supply of power and of process steam from electric steam generators in industry; in supplementary, seasonal and off-peak heating in certain localities and, gradually and ultimately, in the electrification of steam railroads.

In short, a study of the tendencies shown by actual statistics during the past decade does not show the probability of so serious an increase in our coal difficulties as is suggested by Mr. Corless, but on the contrary does show that an active policy of water power development may be confidently expected to greatly diminish those difficulties.

H. E. M. KENSIT, M.E.I.C.

Tests of Compressive Strength Cement

The Editor, *Journal*,

Dear Sir:—

With reference to Mr. E. C. Goldie's letter, appearing in the May issue of *The Journal*, on the subject of variations in the quality of cements as measured by compression tests.

We have had occasion to make comparative tests of many different brands of Portland cement from widely separated sources. These cements have usually been received directly from the mills, and have therefore been fresh and in good condition. Our experience has been that the variation in compressive strength of different brands of Portland cement, while by no means negligable, is not more than half as great as the difference found by *The Institute* committee between Super Cement and Canada Portland cement.

If cements are procured haphazard from dealers stock, much wider variations can be expected, for the period and nature of storage conditions may materially affect the quality of the cement. In the case of the tests reported by *The Institute* committee in the February issue of *The Journal*, we have reason to believe that both Super and Canada cements were fresh and in good condition. The strength differences found we would characterize from our experience as being normal differences ordinarily found in comparing Super cement with Portland cement when both are in good condition.

We would like to take this opportunity moreover of pointing out that such strength differences are of very material importance, particularly when the cements are to be used for exposed concrete. Aside from the direct saving it may be possible to effect by the use of a lesser quantity of the better cement, there is the point, too frequently overlooked, that the use of a greater quantity of inferior cement per unit volume of concrete, while producing the desired compressive strength, does not affect any improvement in the *quality* of the cement matrix, and the greater volume which the latter occupies in the mass usually displaces aggregate which is itself of a stronger, less absorptive, and more durable nature.

We do not wish it to be inferred that we look upon compression tests as an infaillible index to all the cardinal qualities of a cement. We are, however, of the opinion that they are less likely to prove misleading, when used as a guide to quality, than are many other forms of experiment practised in testing laboratories. Unless evidences of superior quality are sought for, apart from the minimum requirements of the present specifications, and unless they are effectively appreciated when found, incentive to improvement in the quality of cement is lacking.

The engineer, therefore, who takes pains to invariably discriminate in favour of the best available cement, is not only ensuring quality and permanence in his concrete, but is also using his influence to encourage the cement manufacturer to improve his product, and, by so doing, is enhancing the usefulness of his profession to the public.

Yours very truly,

E. W. REED-LEWIS, M.E.I.C.

Publications recently received

Reports

Presented by University of Minnesota.

"The Use of Marl in Road Construction", by Charles H. Dow. Bulletin No. 1, volume 26, No. 2, February 7th, 1923.

Presented by Department of the Interior, United States Geological Survey.

"Surface Water Supply of the United States 1918". Water supply paper No. 483, part 12, North Pacific drainage basins B. Snake River Basin.
"Surface Water Supply of the United States 1919-1920". Water supply paper No. 508, part 8, Western Gulf of Mexico basins.
"Gold, Silver, Copper, Lead, and Zinc in Nevada in 1921", I: 24, Mines Report, by V. C. Heikes.
"Gold, Silver, Copper, Lead and Zinc in Idaho and Washington in 1921", I:25, Mines Report by C. N. Gerry.
"Mineral Waters in 1921", II: 29, by W. D. Collins.
"Structure and Oil and Gas Resources of the Osage Reservation, Oklahoma", by David White and others. Bulletin No. 686.
"Structure Maps Osage Reservation, Oklahoma", Bulletin No. 686.
"Stratigraphy of the El Dorado Oil Field, Arkansas, as determined by drill cuttings", by James Gilluly and K. C. Heald. Bulletin 736-H.

Presented by Department of Commerce, Bureau of Standards, Washington, D.C.

"Further tests of stellar radiometers and some measurements of planetary radiation", No. 460, part of volume 18.
"Spherical aberration of thin lenses", No. 461, part of volume 18.
"Various photo-electrical investigations", No. 462, part of volume 18.
"Preparation and properties of pure iron alloys; III: effect of manganese on the structure of alloys of the iron-carbon system", No. 464, part of volume 18.
"A study of commercial dial micrometers for measuring the thickness of paper", No. 226, part of volume 17.
"American and English ball clays", No. 227, part volume 17.
"Index to Volume 16, 1921 and 1922".
"Testing of barometers and altimeters", No. 46 (Third edition).
Electrical Characteristics and testing of dry cells", No. 79. (second edition).
"United States Government specifications for large tungsten filament incandescent electric lamps", Circular No. 13, standard specification No. 23.
"United States Government specification for asphalt varnish". circular No. 104, standard specification No. 19.

Presented by Committee on Marine Piling Investigations, National Research Council, New York.

"Variations in the pallets of teredo navalis in San Francisco Bay", Appendix II from Third Annual Progress Report San Francisco Bay Marine Piling Committee.
"The Digestion of wood by teredo navalis", Appendix IV from Third Annual Progress report San Francisco Bay Marine Piling Committee.
"Extract from Report of Committee on Wood Preservation A.R.E.A." Bulletin 255, March 1923.

Transactions, Proceedings, etc.

Presented by American Society for Testing Materials.

"Index to Proceedings" Volumes 13-20 (1913-1920).

General Publications

Presented by Estate of the late W. McNab, M.E.I.C.

"Construction of Trussed Roofs", by N. Clifford Ricker, M. Arch.
"The Forth Bridge". Reprinted from "Engineering" February 28th, 1890.

Mathematics for Engineers

"Mathematics for Engineers", part 2, by W. N. Rose, B.Sc., England, (Lond.), published by Chapman and Hall, Limited. The second edition of this text book as recently been published being the second part of the two volumes prepared by the author with a view to embracing all the mathematical work required by engineers in their practice and by students in all branches of the engineering science. This volume is devoted, with the exception of the chapters on spherical trigonometry and mathematical probability, to the study of the calculus, both differential and integral.

Preliminary Notice

of Application for Admission and for Transfer

19th May, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in June, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

Every candidate for election as MEMBER must be at least thirty years of age, and must have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in some school of engineering recognized by the Council. The term of twelve years may, at the discretion of the Council, be reduced to ten years in the case of a candidate who has graduated in an engineering course. In every case the candidate must have had responsible charge of work for at least five years, and this not merely as a skilled workman, but as an engineer qualified to design and direct engineering works.

Every candidate for election as an ASSOCIATE MEMBER must be at least twenty-five years of age, and must have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in some school of engineering recognized by the Council. In every case the candidate must have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, shall be required to pass an examination before a Board of Examiners appointed by the Council, on the theory and practice of engineering, and especially in one of the following branches at his option, Railway, Municipal, Hydraulic, Mechanical, Mining or Electrical Engineering.

This examination may be waived at the discretion of the Council if the candidate has held a position of professional responsibility for five years or more years.

Every candidate for election as JUNIOR shall be at least twenty-one years of age, and must have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the Council, if the candidate is a graduate of some school of engineering recognized by the Council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who is not a graduate of some school of engineering recognized by the Council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, Geography, History (that of Canada in particular), Arithmetic, Geometry, Euclid (Books I.-IV and VI.), Trigonometry, Algebra up to and including quadratic equations.

Every candidate for election as ASSOCIATE shall be one who by his pursuits scientific acquirements, or practical experience is qualified to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BOWMAN—CHARLES ARTHUR, of Cloverdale Road, Rockcliffe, Ottawa, Ont. Born at Amble, Northumberland, Eng., Jan. 23rd, 1883. Educ., 1899-1904 Rutherford College, Newcastle-on-Tyne, during ap'ticeship. 1899-1901 workshops and drawing office Robt. Stephenson & Co., 1901-04 indentured ap'tice, R. & W. Hawthorn, Leslie & Company, Ltd., St. Peters Works, Marine Engrg., Newcastle-on-Tyne. 1905 Jan-June, 3rd engr., S.S. Cairnglen of Cairns, Noble & Co., Newcastle-on-Tyne. 1905-07 dftsman., gun mtg. dept., Vickers Limited, Barrow-in-Furness. 1907-08 dftsman., ordnance dwg. office, Elswick Works, Armstrong Whitworth & Co., 1908-1911 marine dept., Canad'n Govt., dftsman, Dominion Lighthouse depot, Prescott. After first few mths in charge of dwg. office. 1911-12 mech. dftsman, Dept. Rlys. and Canals, Ottawa. Entered newspaper editorial work, Feb. 1913 after winning first prize offered through Can. Soc. C. E. for draft scheme on reorganization of govt. tech. services. At present Editor The Citizen, Ottawa, Ont.

References: W. P. Anderson, J. G. Macphail, W. A. Bowden, [illegible] Sherwood, D. W. McLachlan, C. A. Magrath, O. S. Finnie.

CAMPBELL—ROBERT ANDERSON, of Sault Ste. Marie, Ontario. Born at Alliston, Ont., May 2nd, 1883. Educ., E.E. Univ. of Toronto, '09; 1909 (six mos.), elec. power stn., Barrie, Ont.; 1910-11, in charge meter dept., supplying Sault Ste. Marie, Ont.; 1912-15 supt. hydro-elec. power stn., Algoma Steel Corpn., Sault Ste. Marie; 1914, engr., in charge constrn., and installn, hydro-elec. power stn., at Steep Hill Falls, Ont.; 1916-18 overseas; 1918-19 supt. Great Lakes Power Co., Sault Ste. Marie and 1920-21, engr., in charge constrn., and install'n., 7200 h.p. hydro-elec. extension of same company and from 1921 to date supt. of the hydro-elec., power stn., for same company.

References: A. E. Pickering, J. W. LeB. Ross, B. E. Barnhill, G. H. Kohl, C. H. Speer.

CHISHOLM—CHRISTOPHER RONALD, of New Glasgow, N.S. Born at Ipswick, Mass., U.S.A., on Nov. 16, 1886; Educ., 4 yrs. Arts course and junior matric. St. François Xavier College; I.C.S.; 1910-12 rodman, Intercolonial Rly., Dept. of the Interior, and Town of New Glasgow; 1914 (May-Dec.), instr'man, B. & M. Rly.,; 1914-19, overseas, Capt. 13th, Bn. R.H.C.; 1920 (Apr.-Dec.), instr'man, G.T.R.; 1921 (Apr.-Dec.), asst. to engr. in charge, Acton Urban Village Council; May 1922-Jan. 1923, asst. and later res. engr., N.S. Prov. Highways board.

References: W. Walker, J. P. Menard, W. A. Hendry, R. J. Bethune, A. P. H. Tully, J. A. Boyle.

GERIN—MAURICE, of 84 St. Antoine St. Montreal, Que. Born at Coaticook, Que., on Jan. 17, 1899; Educ., B.S. Univ. of Montreal, '20; M.S., Mass. Inst. Tech. '21; May 1922 to date salesman, pump and elec. dept. Canadian Fairbanks-Morse Co., Ltd., Montreal.

References: De Gaspé Beaubien, J. A. Duchastel, T. J. Lafrenière, O. O. Lefebvre, C. C. Leluau, A. Surveyer, P. A. Beique, A. Frigon.

HERMANS—SAMUEL, of 1829 Esplanade Ave., Montreal, Que. Born at Le Havre, France, Dec. 3rd, 1887. Educ., First class B.O.T. marine engrs. certificate, 1912, Armstrong College of Science (even'g.), Newcastle-on-Tyne, Eng.; 1901-08, 3 yrs. ap'ticeship with Sir W. G. Armstrong Whitworth and 4 yrs. ap'ticeship with Sir Chas. A. Parsons & Co., Newcastle-on-Tyne, Eng.; 1908-15 engr., in Harrison Line, Eng.; 1915-16, Guarantee engr. for Armstrongs, Eng.; 1916-18, erect'g. engr., Armstrong's Longueuil Works, Quebec, Can.; 1918-19, chief artificer engr., in Canadian Navy; 1919-20 (8 mos.) chief engr., on 2 French Gov't. steamers; 1920-22, mechanic, foreman and mechanical dftsman, Halifax Shipyards, N.S.; 1922 to date Sales engr., with Griswold & Co., Montreal, Que.

References: M. J. Butler, F. A. Combe, I. J. Tait, C. G. Porter, H. W. B. Swabey, Albert Laurie.

HIGGINS—THOMAS JAMES, of 696 St. Hubert St., Montreal, Que. Born at Fitchburg, Mass., U.S.A., Jan. 22nd, 1899. Educ., I.C.S., mech. engrg.; 1915-17, detail dftsman on machine tools, Manning Maxwell & Moore Co., Fitchburg, Mass.; 1917-23 with B. F. Sturtevant Co., at Hyde Park, Boston, design and layout of heating and ventilating, pneumatic conveying, drying apparatus, new design on steam engine, turbines and motors, under M. S. Leonard, chief engr., later transferred to another dept. checking all work of sales engrs., in branch offices, on all equipment mfd., by the company and supervision of shop constrn.; June 1921, promoted to office mgr., engaged in sale as well as design of all applications of air; From Jan. 1923, engaged as a specialist in the design and application of air to the paper and pulp industry by J. O. Ross Corp'n., New York, and subsequently appointed mgr., of Ross Engrg., of Canada, Montreal, to carry on this work in Canada.

References: E. A. Briner, John T. Farmer, George F. Hardy, H. S. Ferguson.

HUSSEY—EDWIN HOWARD, of International Falls, Minn., U.S.A. Born at Sangerville, Me., U.S.A., Aug. 11th, 1884; Educ., C.E. Univ. of Maine, 1907, 1906, (Apr.-Sept.), Instrument man, paper mill and power development, Great Northern Paper Co., Millinocket, Me.; 1907, (July-Oct.), draughting for American Bridge Co., Edge Moor, Del.; 1907-1908, insp'r. East River Tunnels, Penn. R.R. Long Island City, New York, 1908-09, rodman, leveler, New York State Barge canal, Fort Miller, New York; 1909-11 pusher, foreman, erecting steel for Penn. Bridge Co., Beaver Falls, Pa. 1911 (June-Oct), carpenter, foreman, reinforced concrete bridge for Bearce & Clifford, Lewiston, Me.; 1911-12, foreman, erecting steel for Virginia Steel & Iron Co., Roanoke, Va., 1912 (Mar-May), foreman, Ocoll Con. Co., Parksville, Tenn., 1912-13, contractor, Island of Haiti, for Caribbean Constrn. Co., New York; 1913-14, detailing for Phoenix Iron Co., Phoenixville, Pa., 1914-16, asst. engr. Palisades Interstate Park, New York, 1916-19, draughting and asst. engr. for H. S. Ferguson, New York, 1919-20, engr. International Paper Co., New York, 1920 to date chief engr., of the Minnesota and Ontario Paper Company and all allied interests at International Falls, Minn., U.S.A.

References: H. S. Ferguson, A. H. White, S. H. Woodard, S. S. Scovil, R. Laurence Weldon, W. A. B. Hicks, L. C. Jacobs, C. H. Attwood.

LAKE—HENRY MORTON, of 152 Upton Road, Sault Ste. Marie, Ont. Born at Toronto, Ont., July 18th, 1890. Educ., I.C.S., mech. engrg. 1910. 1904-08 ap'tice machinist, G.T.R. shops, Lindsay, Ont., 1908-09 testing autos, McLaughlin Auto Co., Oshawa, Ont., 1909-11, surface tableman, Algoma Iron Works, Sault Ste. Marie, Ont. 1911-14 dftsman, Algoma Steel Corp'n. 1914-17 partner, T. H. Lake & Son, Sault Ste. Marie, 1917-19 checker, dftng. office, Algoma Constrn., and Engrg. Co., 1919-21 designing on new mill constr'n., Algoma Steel Corp'n. 1921-22 estimator, McNamara Bros. & Thornton, contractors; 1922-23, designing, bldg., and installg. patented appliance for drying timber, also [illegible] tests of same with Canadian Water Dryer and Woodworking Co., at Island Lake, Ont. At present senior dftsman on blast furnace repts., Algoma Steel Corp'n., Ltd., Sault Ste. Marie, Ont.

References: J. B. Ryckman, [illegible] Smallwood, A. W. [illegible], C. H. [illegible], C. H. Speer.

LEACH—THOMAS, of 1940 Hamilton St., Regina, Sask. Born at Brownsville, Ont., Dec. 3rd, 1891. Educ., Diploma commercial accounting from Woodstock Bus. Coll., Woodstock, Ont., 1909-10. Teller and accountant, the Traders Bank of Canada, (now with the Royal Bank of Canada), Brownsville, Ont.; 1910-12, worked with elect'l. supt. at Moose Jaw, later in charge service dept., 1912-13, partner in brokerage business, 1913-17, ap'ticeship on automatic telephone, Sask. Gov't. Telephone Dept., Regina, installer and troubleman, outside plant. Later transferred to inside plant on install'n. and m'tce of all central office equipment in Regina, Prince Albert and Saskatoon, 1917-21, transferred to Swift Current in charge of all plant work in district of twenty or more towns, 1921-23 transferred to Regina in charge of m'tce of all central office automatic equipment. At present wire chief for Saskatchewan Gov't. telephones at Regina.

References: G. D. Mackie, W. H. Greene, J. D. Peters, F. H. Smaill, H. B. Sherman, S. Parker, W. R. Warren, J. R. C. Macredie.

McCARTHY—CLARENCE WILBERT, of 20 Yale St., Halifax, N.S. Born at Spry Bay, N.S., Feb. 3rd., 1891; Educ., Engr'g., corres. course. Course in surveying and higher maths., N.S. Tech. Coll.; 1911-13, rodman, rly., location C.N.R.; 1913-14, rodman, inspr., of concrete and pile inspr., concrete bridge, G.T.R.; 1914-15, running precise level, transit work and inspection, Greater Wpg. Water District; 1916 (June-Sept.), asst. to W. T. Thompson on highway location in charge of party, Highway Comm'n., of Sask.; 1916-17 Ill and unable to work; 1917-20 with C.N.R., Halifax Ocean Terminals, transitman in charge field party, install'n. sewer and water system; 1920-1923 (Feb.), Res. engr., in charge constr'n. of roads, bridges and culverts with Highway Board of Nova Scotia. At present on leave of absence from Highway Board of N.S.

References: J. G. Dryden, K. H. Smith, W. A. Duff, A. S. Gunn, F. G. Haven, W. A. Hendry.

MILLS—GEOFFREY GORDON, of 136 Ranboro St., West, Toronto, Ont. Born at Winnipeg, Man., July 9th, 1887. Educ., B.A.Sc., Toronto Univ., 1907; 1909-13, Montreal Engr'g. Co., Ltd., (Porto Rico Rys., Camagney Elec. Co., Demerara Elec. Co., Calgary Power Co., Trinidad Elec. Co., Mexican Northern Power Co.,) 1913-14, partner, firm of Mills Bros., machinery and equipment; 1915-19, overseas, C.F.A.; 1919-20 Dist. Vocational officer, Prov. of Quebec, D.S.C.R.; 1920 to date, Manager, The Under-Feed Stoker Co., of Canada, Ltd., and Vice-Pres. and gen. mgr., A. W. Cash Co., of Can. Ltd., (valve and power plant specialties).

References: A. E. K. Bunnell, J. B. Carswell, G. T. Clark, W. E. Douglas, E. G. Hewson.

MOORE—CHARLES ARTHUR, of Assiniboia, Sask. Born at Arden, Man., Dec. 17th, 1890; Educ., home study in engrg. maths. and elec. and mech. engrg.; 1909-10, operating engr. in combined milling and elec. power plant, Qu'Appelle, Sask.; 1911-15, in charge design, installn. and subsequent operation, power plant and distribution system, Qu'Appelle, Sask.; 1916-19, overseas, Can. Engrs. etc.; 1919 (July-Dec.), line constrn. work, prov. telephones dept., Sask.; Dec. 1920 to date, in charge elec. and water utilities, town of Assiniboia.

References: J. D. Peters, K. N. Crowther, A. C. Garner, H. A. McLean, M. D. Cadwell.

VERDON—JOSEPH BENJAMIN, of 8 Collins St., Quebec City, Que. Born at St. Edouard, Que. June 16th, 1872; 1893-98 Ap'ticeship on constrn. and m'tce of power plants; 1898-1903 Thompson & Houston Elec. Co., Lynn, Mass., U.S.A.; 1906 (six mos.), Mead-Morrison on Can. Northern Coal & Ore Docks, Port Arthur, Ont., and (six mos.), C.P.R. shops, Fort William, Ont.; 2 yrs. engr., in charge shift, City of Calgary, Alta., 1909-10, West Can. Collieries, Bellevue, Alta., power plant constrn., later master mechanic in charge of all equipment; 1911 master mechanic Chinook Coal Co., power plant and coal handling equipment constr'n.; 1911-13 chief engr., Can. Coal Consol., Frank, Alta.; 1913 (Jan.-May) master mech. West Can. Collieries, Bellevue, Alta.; 1913-14 engr., in charge of constr'n., Hudson's Bay Co., Edmonton; 1914-16 master mechanic Brazeau Collieries, Nordegg, Alta.; 1916-18 master mech. Canadian West. Steel Co., Redcliffe and Medicine Hat Mills; 1919 (Mar. Sept.), and 1920 (Apr.-Dec.) chief engr., Chateau Lake Louise, Alta., (C.P.Rly. Co.,) 1919-20 (Oct.-Apr.) master mechanic, Jasper Park Collieries, Pocahontas, Alta.; 1921 to date chief engr., power plant and equipment, Chateau Frontenac, Quebec, Quebec. (C.P.R. Co.).

References: James Ruddick, E. A. Evans, J. A. E. Tremblay, E. Drolet, S. L. de Carteret.

WRIGHT—WEIR STANLEY, of Iroquois Falls, Ont. Born at Montreal, Que. on June 17, 1901; Educ., B.Sc., McGill Univ., '22; at present in charge water filtration plant for town of Iroquois Falls, operated by Abitibi Power & Paper Company.

References: E. Brown, J. B. Porter, C. M. McKergow, L. E. Kendall, F. B. Brown, A. Stansfield.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

DOANE—HARVEY WILLIAM LAWRENCE, of Halifax, N.S. Born at Halifax, N.S. Jan. 20th, 1892; Educ., B.Sc. (C.E.), N.S. Tech. Coll., 1913; 1912, survey and design, sewer system, Springhill, N.S., water supply and distribution system, Chester, N.S., surveys for Northwest Arm intercepting sewer, Halifax, and in charge of engrg. and inspection during constrn., sewer system, Lunenburg, N.S.; 1913, surveys, plans and assisted in design and constrn., elec. light system, Truro, N.S., surveys for design and engrg., constrn. of steel water supply main, Kentville, N.S., investigation of and report on proposed hydro-elec. power development, Parrsboro, N.S., engrg. work, sidewalks and streets, Halifax, N.S.; 1914, instructor, short course, Prov. Land Surveyors, N.S. Tech. Coll., also 1915), design and constrn. of a deep well pumping plant, Trenton, N.S., also constructed a 1,000,000 gallon reservoir and water pipe line. Surveys, design and report on water supply, sewer system, sewage disposal and community heating system for Commercial Cable Co., Hazel Hill, N.S., and other municipal works, 1915, general municipal engrg. work in Nova Scotia; 1915-19, overseas; Lieut. to Major, Service in Palestina and France; 1919 to date, city engr's. dept., Halifax, N.S. in charge of permanent pavement and street dept., city of Halifax, also inspected and reported on various municipal works in the province.

References: F. W. W. Doane, I. P. MacNab, J. W. Roland, F. A. Bowman, F. R. Faulkner, O. S. Cox, K. L. Dawson, R. P. Freeman, C. E. W. Dodwell.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

COKE—REGINALD NORMAN, of Y.M.C.A., Vaughan St., Winnipeg, Man. Born at Lyndhurst, Mile Gully, Jamaica, B.W.I., on Aug. 24, 1892. Educ., B.Sc., McGill Univ., '14; 1912-13 (summers) engr'g. dept., Winnipeg Light and Power Co.; six mos. operating dept., Nor. Ontario Light and Power Co.; 1915-19, overseas, Royal Engrs., 1915, officer in charge of erection, anti-aircraft and anti-submarine searchlights (electric). 1916, officer in charge, mechanical transport; 1917, O.C. 7th Corps Siege Artillery and in 1918, 2nd in command of the corps mechanical workshops; 1918, officer in charge, elec. workshop, No. 4, heavy repair shop; 1919, Asst. constrn. engr., telephone dept. Sask. Prov. Govt.; 1920, asst. traffic engr., Bell Telephone Co., Toronto; 1921-22, erection engr., Canadian Westinghouse Co., Hamilton, Ont.; 1922 (Oct.) to date, asst. elec. engr., Winnipeg Electric Railway, Winnipeg, Man.

References: E. V. Caton, J. W. Sanger, H. B. Dwight, G. A. Clendenning, W. F. McLaren, C. V. Christie.

HUGLI—EDWIN EZRA HERMAN, of Toronto, Ont. Born at Golden Lake, Ont., April 10th, 1890. Educ., B.A.Sc., Univ. of Toronto, '14; six mos. dfting. in office of Wm. Fingland, architect, Winnipeg; 6 mos. dfting. Roman Stone Co., Weston, Ont.; 2 summers in charge of a survey party on mtce. of way, Ontario divn. C.P.R.; 2 mos. Canadian Kodak Plant, Mt. Dennis, Ont.; 2½ years, detailing and checking, structl. steel drawings, Lewis Hall Iron Works, Detroit, Mich; 8 mos. structl. dfting., Mond Nickel Company, Coniston, Ont.; Enlisted Dec. 1917, discharged Mar. 1919; 1920-21, structl. engr., Thos. W. Lamb, Toronto; Feb. 1921, to date, structural engr., H.E.P.C., of Ontario, Toronto, Ont.

References: H. G. Acres, W. P. Dobson, J. L. Brower, A. H. Harkness, T. R. Loudon, O. M. Perry, C. R. Young, H. W. Armstrong.

O'CONNOR—GARRETT DAUNT, of Bridgeburg, Ont. Born at Niagara Falls, Ont., on June 4, 1895. Educ., B.Sc., Queen's Univ. '21; 1912 (summer) marker, Horton's, Ltd.; 1912-13 (winter) Queen's Univ.; 1913 (summer) rodman, G. Ross, D.L.S.; 1913-14 (winter) Queen's Univ.; 1914-19 overseas, Lieut., C.E., 1919-20 (winter) Queen's Univ.; 1920 (summer) marker, Horton's, Ltd.; 1920-21 (winter) Queen's Univ.; 1921-22 instr'man. and asst. Const. Queen's Univ. Stadium and Arena, articled with F. F. Miller, O.L.S.; 1922 (May-Oct.), foreman for W. L. Malcolm on paving and culverts; 1922 (Oct.), to date, asst. to city mgr., and engr., Niagara Falls, Ont.

References: T. S. Scott, W. L. Malcolm, D. S. Ellis, W. P. Wilgar, A. Macphail, L. M. Arkley, H. F. H. Hertzberg.

TITUS—OLCOTT W., of Hamilton, Ont. Born at Weston, Ont., on Apr. 24, 1896. Educ., B.A.Sc., Univ. of Toronto, '17; 1914-15-16 (summers) elect'n. helper and switchboard wireman, Toronto Power Co., Niagara Falls; 1917 (Feb.-Aug.) asst. radio engr., Marconi Wireless Telegraph Co., of Canada, Montreal and Glace Bay; 1917-19, Can. Engrs. from Aug. 1918, Lieut. Reserve of Officers; 1919-20, demonstrator in Thermodynamics, Univ. of Toronto; April 1920 to date, elec. Cable sales engr., Standard Underground Cable Co., of Canada, Ltd., Hamilton, Ont.

References: W. F. McLaren, R. W. Angus, L. M. Arkley, C. H. Mitchell, J. J. Traill, J. A. Tilston, A. S. Runciman.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

DONALDSON—ARTHUR, of 9847-110th St., Edmonton, Alta. Born at Belfast, Ireland, on Apr. 22, 1899. Educ., B.Sc., (C.E.), Univ. of Alta, '12; 1916-17-18 (summers) on govt. road surveys; 1919 (summer) timekpr. and material clerk, H. G. Macdonald, contractor, Keith Sanatorium, Calgary; 1920 (summer) in charge reinforcing work, R. J. McDiarmid Co., Revillon Warehouse, Edmonton; 1921 (summer) in charge concreting and labour, McDougall & McNeill, Prince Rupert Court House; 1922 (May-July), instr'man. streets and sewers, city engr's dept. Edmonton; 1922 to date timekpr. and material clerk, Carter Halls Aldinger Co., Ltd., Winnipeg, attached to the Alberta Provincial Office, Edmonton, Alta.

References: R. S. L. Wilson, C. A. Robb, A. W. Haddow, R. J. Gibb, R. H. Douglas.

PERRY—ROLF SELBY, of Vancouver, B.C. Born at Grand Forks, N.D. Apr. 22nd, 1890. Educ., B.Sc., McGill Univ., '15; 1909; Rodman Geological Survey; 1910, Yukon Boundary Survey; 1910-11, asst. to E. H. Verner, municipal engr., Coquitlam, B.C.; 1912-13 (summers) B.C. Forest Service, fire ranging, Timber cruising, surveying, etc.; 18 mos. during 1917-18-19, Imperial Munitions Board Aeroplane spruce dept. gen. technical duties connected with the securing of aeroplane spruce supplies; July 1920 to date Forest Products Laboratories of Canada, Vancouver Br. timber testing and for past nine months acting supt. in charge of Laboratory.

References: E. G. Matheson, E. A. Cleveland, C. J. Chaplin, W. G. Swan, F. S. Keith, J. McHugh, L. L. Brown, R. G. Swan.

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A

ABRASIVE WHEELS

DRESSING AND TRUING. Dressing and Truing of Abrasive Wheels for Surface Grinding Machines, F. O. Wyse. Am. Mach., vol. 58, no. 14, Apr. 5, 1923, pp. 501-502, 4 figs. Distinction between dressing and truing; self-truing of wheels on heavy vertical surface-grinding machines.

Practical Abrasive Wheel Truing, Howard P. Drake. Abrasive Industry, vol. 4, no. 2, Feb. 1923, pp. 31-33, 12 figs. Diamonds and mechanical devices are used for dressing and truing wheels; describes several forms of diamond settings.

MANUFACTURE. Grinding Wheels — How They Are Made. Raw Material, vol. 6, no. 3, Mar. 1923, pp. 113-118, 17 figs. Methods of manufacture and different kinds of wheels available. Chapter from book on grinding published by Norton Co.

AIRPLANES

CARRYING CAPACITY. "Quality" in Aviation (La "qualité" en aviation), L. Hirschaufer. Technique Moderne, vol. 15, no. 6, Mar. 15, 1923, pp. 161-165, 8 figs. Discusses quality understood to mean total efficiency of airplanes considered as weight carriers.

COLUMN FORMULAS. Comparison of Column Formulas, J. S. Newell and A. S. Niles, Jr. Air Service Information Circular, vol. 4, no. 395, Feb. 15, 1923, 4 pp., 2 figs. General classification, and comparison of types of formulas; problem of restrained ends. Combination of Johnson parabolic with Euler formula is recommended for design of all airplane struts and columns.

SEAPLANES. *See Seaplanes.*

AIRSHIPS

TYPES. Airships, F. Arnold Best. Instn. Mech. Engrs. — Proc., no. 1, Jan. 1923, pp. 47-53. Brief reference to gases used in airship work and their behavior when submitted to difference of atmospheric pressure and temperature, followed by discussion of mechanical and constructional details of various types of airships.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

COPPER. *See Copper Alloys.*

EUTECTIC, STRUCTURE OF. The Structure of Eutectics, Albert M. Portevin. Inst. of Metals, advance paper, no. 18, for meeting Mar. 7-8, 1923, 30 pp., 40 figs. Examination of microscopical structure of considerable number of binary eutectic alloys, based on which attempt is made to give methodical classification from data obtained. Photomicrographs.

MAGNESIUM. *See Magnesium Alloys.*

MONEL METAL. *See Monel Metal.*

ALUMINUM

SHEET, WORK-HARDENED. Tests on Work-Hardened Aluminium Sheet, H. C. H. Carpenter and C. Coldron Smith. Am. Inst. of Metals advance paper, no. 6, for meeting Mar. 7-8, 1923, 37 pp., 8 figs. Results of long-period heating tests on rate of softening of work hardened aluminium sheet in temperature range 200 to 100 deg. cent., total period of test was 41,000 hr. = 4.68 yr., mechanical tests were carried out on sheet from time to time. See also Metal Industry, vol. 22, no. 11, Mar. 16, 1923, pp. 247-252 (including discussion), 1 fig.

ALUMINUM ALLOYS

ALUMINUM-COPPER. The Heat-Treatment and Mechanical Properties of Alloys of Aluminium with Small Percentages of Copper, D. Hanson and Marie L. V. Gayler. Inst. of Metals advance paper, no. 12, for meeting Mar. 7-8, 1923, 13 pp., 5 figs. Alloys containing 0 to 2 per cent of copper are not appreciably affected by quenching from 500 deg. cent. and subsequent aging, alloys containing 2.5 to 5 per cent of copper are profoundly affected by this form of heat treatment. See also (abstract) in Engineering, vol. 115, no. 2985, Mar. 16, 1923, pp. 343-344, 5 figs.

Some Properties of the Copper-Rich Aluminium-Copper Alloys, R. C. Reader. Inst. of Metals advance paper, no. 19, for meeting Mar. 7-8, 1923, 18 pp., 12 figs. Investigation of alloys containing not more than 11 per cent of aluminum; deals with density, volume changes during and after solidification, self-annealing properties; effect of heat treatment on 10 per cent alloy. See also (abstract) in Engineering, vol. 115, no. 2985, Mar. 16, 1923, pp. 344-347, 22 figs.

ALUMINUM-COPPER-NICKEL. The Constitution of Some Alloys of Aluminium with Copper and Nickel, Kathleen E. Bingham and John L. Haughton. Inst. of Metals advance paper, no. 5, for meeting Mar. 7-8, 1923, 42 pp., 40 figs. Investigation of ternary system copper, nickel, aluminum up to 12 per cent copper and 10 per cent nickel; methods used were (1) thermal analysis (2), electrical-resistance measurements at high temperatures, and (3) microscopic examination of quenched specimens previously annealed or slowly cooled from liquid state.

ALUMINUM-COPPER-SILICON. Investigation of Copper-Silicon-Aluminum Alloys With and Without Manganese, E. H. Dix and A. J. Lyon. Air Service Information Circular, vol. 4, no. 385, Dec. 1, 1923, 27 pp., 23 figs. Investigation of mechanical and physical properties and casting qualities of alloys containing from 0 to 9 per cent silicon and from 0 to 6 per cent copper, and of effect of addition of 1 per cent manganese to certain of these alloys.

COMPOSITION. Industrial Method of Proportioning Light Aluminum Alloys (Sur une méthode industrielle de dosage des alliages légers d'aluminium), Ph. Pascal. Chimie et Industrie, vol. 9, no. 2, Feb. 1923, pp. 264-269. Content of aluminum alloys; extra-light alloys, light alloys of medium resistance, and light alloys of high resistance.

"Y" ALLOY. The Production and Heat-Treatment of Chill-Castings in an Aluminium Alloy ("Y"), W. Rosenhain and S. L. Archbutt. Inst. of Metals advance paper, no. 20, for meeting Mar. 7-8, 1923, 19 pp., 15 figs. Study of properties of alloy in form of chill castings and contribution to detailed study of factors governing properties of chill and die castings generally. See also (abstract) in Metal industry, vol. 22, no. 11, pp. 253-258, 12 figs. and Engineering, vol. 115, no. 2985, Mar. 16, 1923, pp. 347-351, 14 figs.

AMMONIA

SYNTHESIS. Characteristics of the Ammonia Synthesis. Chem. Age (N.Y.), vol. 31, no. 3, Mar. 1923, pp. 117-119. Conditions of reaction; behavior of catalyst; heat evolved by reaction; addition of ammonia; cyclic removal of ammonia; life of catalyst.

ANEMOMETERS

TESTING. The Testing of Anemometers, O. J. Hodge. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 2, Mar. 1923, pp. 75-78, 1 fig. Method of calibration used by bur. of Standards.

ANNEALING

STUDY OF PROCESS. Contribution to the Study of the Annealing Process (Beitrag zur Kenntnis des Temperprozesses), P. Oberhoffer and J. Welter. Stahl u. Eisen, vol. 43, nos. 4 and 9, Jan. 25 and Mar. 1, 1923, pp. 105-110, and 301-306, 28 figs. Influence of composition, annealing temperature and medium on properties; behavior of sulphur; the soft skin.

APPRENTICES, TRAINING OF

PATTERNMAKERS AND MOLDERS. The Training of Patternmaking and Molding Apprentices According to the Plan of Courses Worked out by the German Committee for Technical Education (Die Ausbildung der Modelltischler- und Formerlehrlinge nach den Lehrgängen des Deutschen Ausschusses für technisches Schulwesen), Chr. Gilles. Giesserei-Zeitung, vol. 20, no. 5, Feb. 1, 1923, pp. 51-57, 12 figs. Fundamental rules for training of apprentices; curriculum for school and workshop for each of year of training.

AUTOMOBILE ENGINES

ASSEMBLING. Individual Engine Assembly Method Gets Greater Accuracy, J. Edward Schipper. Automotive Industries, vol. 48, no. 14, Apr. 5, 1923, pp. 773-774, 3 figs. One man builds up entire Cadillac power plant from carefully inspected sub-assemblies; considered worth while, in spite of slightly higher cost, because of better parts interrelation.

CYLINDERS. Machining a Cylinder Block Casting. Machy. (Lond.), vol. 21, no. 545, Mar. 8, 1923, pp. 705-709, 10 figs. Methods of Riley, Ltd., Coventry, including bore-rolling processes and machine for cutting connecting-rod clearance.

VALE-ACTION ANALYSIS. Increase in Cam Tip Radius Effects Reduction in Inertia Forces, Glenn D. Angle. Automotive Industries, vol. 48, no. 15, Apr. 12, 1923, pp. 824-827, 13 figs. Investigation shows possible errors in use of straight-line motion analyses for valves operated by rocker arms; effect of any change in modification in cam contour upon valve-action curves impossible to predict; important conclusions drawn.

AUTOMOBILE FUELS

BENZOL AND ALCOOL. Benzol and Alcohol as Automobile Fuel [illegible] Benzol y del alcohol como combustible en los automóviles, Oscar N. [illegible] de Ingenieros de Chile — Anales, vol. 22, nos. 8 and 9, Aug. and Sept. 1922, pp. 480-501 and 550-564, 6 figs. Automobile fuels used in Germany; their analysis and calorific value, mixtures of benzol and alcohol; results of automobile tests; tables of test data showing best results obtained with each alcohol mixtures.

AUTOMOBILES

ACCELERATORS, MANUFACTURE OF. Manufacturing Methods and Machines of an Accelerator Factory, C. A. Handschin. West Machy. World, vol. 14, no. 3, Mar. 1923, pp. 99-101, 14 figs. Mechanical equipment and methods giving advantage in plant of Williams Bros. Aircraft Corp.

CREEPER TRACK. Creeper Tracks for High Speed. W. F. Bradley. Autocar, vol. 50, no. 1432, Mar. 30, 1923, p. 531, 4 figs. Data on the Mors car having 30-hp. Knight engine, capable of developing speed of 55 m.p.h., fitted with Citroën Kegresse-type rubber and cane or flexible creeper band; and a 4-passenger Ford which has been converted to flexible creeper track system. See also Motor Transport, vol. 36, no. 941, Apr. 2, 1923, pp. 413-414, 3 figs.

PAINTING PRACTICE. Painting Practice from the Chemist's Viewpoint, L. Valentine Pulsifer. Soc. Automotive Engrs. — Jl., vol. 12, no. 4, Apr. 1923, pp. 335-341, 1 fig. Discussion of résumé of two papers published in full in same journal, Jan. 1922 and Jan. 1923, respectively.

STEAM. The Future of Steam, Kyle W. Williams. Motor Transport, vol. 36, no. 944, Apr. 2, 1923, pp. 415-416. Consideration of this form of power as applied to road motor vehicles and tractors. Summary of paper read before Instn. Eng. Inspection.

AVIATION

AIR-POWER POLICY. The Development of Air Power Policy, Arthur R. Blessing. Aerial Age, vol. 16, no. 4, Apr. 1923, pp. 165-168 and 181, 4 figs. Factors to be considered in formation and development of air-power policy.

COMMERCIAL. Commercial Aviation: Some Truths on the Subject, P. D. Johnson. Aerial Age, vol. 16, no. 4, Apr. 1923, pp. 169-170, 2 figs. Arguments in favour of Civil Aeronautics Act of 1923.

Successful Commercial Aviation Analyzed, Temple N. Joyce. Aviation, vol. 14, no. 16, Apr. 16, 1923, pp. 420-422. Notes on pre-war aviation; war influences; question of personnel; post-war flying.

What is the Matter with Commercial Aviation? William Knight, Aerial Age, vol. 16, no. 4, Apr. 1923, pp. 177-180 and 185. Discusses conditions in the United States.

AXLES

ALLOY-STEEL. New Views on Selection of Material for Street-Car Axles (Neuere Gesichtspunkte für die Auswahl des Werkstoffes für Strassenbahnwagenachsen). Kurt Schmidt. Verkehrstechnik, vol. 40, no. 11, Mar. 16, 1923, pp. 81-84, 5 figs. Results of experiments carried out by Krupp on carbon nickel, manganese, silicon and chromium-nickel steels, showing difference in physical properties; recommends low nickel-chromium alloy steel for high elongation.

B

BALANCING

TURBINES. Balancing Machine Utilized in the Field for Quickly Correcting Turbine Operation, H. D. Fisher. Power, vol. 57, no. 13, Mar. 27, 1923, pp. 480-481, 4 figs. Balancing at 140 r.p.m. on flexible mounting produces good operation at 3600 r.p.m.; balance corrections are calculated for convenience in attaching weights.

BEARINGS, BALL

CAGES. Cages for Ball Bearings (Die Räfige für Kugellager), H. Behr. Elektrotechnische Zeit., vol. 44, no. 9, Mar. 1, 1923, pp. 196-197, 12 figs. Calculation of load distribution over separate balls to determine stress of cages; description and investigation of best-known cage types.

LOAD-CARRYING CAPACITY. Load-Carrying Capacity of Deep Groove Bearing. Can. Machy., vol. 29, no. 5, Feb. 1, 1923, pp. 40-43, 9 figs. Experiments conducted to determine relation of radial and thrust stresses on single-row non-filling slot type of bearing; calculations based on actual working tests.

MANUFACTURE. Manufacture and Regrinding of Ball Bearings, C. A. Handschin. West. Machy. World, vol. 14, no. 3, Mar. 1923, pp. 81-82 and 88, 12 figs. Methods and special equipment used in plant of Kelly Ball Bearing Co., San Francisco.

BEARINGS, ROLLER

ADVANTAGES. Roller Bearings for Track Vehicles (Rollenlager für Gleisfahrzeuge), Albert. Verkehrstechnik, vol. 40, nos. 9 and 10, Mar. 2 and 9, 1923, pp. 65-67 and 75-77, 30 figs. Advantages of roller over ball bearings; disk bearings; enumerates conditions for effective roller-bearing operations; conical and other types of roller-bearings; cages; lubrication; etc.

RAILWAY-CAR. Stafford Roller Bearings for Pedestal Trucks. Ry. Age, vol. 74, no. 17, Mar. 31, 1923, pp. 872-873, 2 figs. Improvements incorporated in recent design of bearings for trucks of Mich. Central baggage car; original design was described in Ry. Age, daily edition, June 16, 1922.

The Stafford Roller Bearing for Railway Cars. Ry. and Locomotive Eng., vol. 36, no. 4, Apr. 1923, pp. 102-104, 4 figs. Description of its design and performance on cars of Mich. Central R.R.

SPHERICAL. Advantages of the Spherical Type Roller Bearing, H. E. Brunner. Ry. Mech. Engr., vol. 97, no. 4, Apr. 1923, pp. 225-227, 4 figs. New design which combines self-alignment, low frictional resistance and high capacity.

BELTING

EFFICIENCY. Practical Facts About Belting. Paper, vol. 31, no. 19, Feb. 28, 1923, pp. 10-11. Comparative operating cost of leather and rubber belting; result of tests to determine relative power transmitted under given tension; advisability of investigating more than first cost.

POWER TRANSMISSION BY. Fundamentals of Transmission of Power by Belting. Louis W. Arny. Iron Age, vol. 111, no. 15, Apr. 12, 1923, pp. 1025-1026, 2 figs. Pulley grip and elasticity essential to efficiency in belt; large influence of arc of contacts. See also Belting, vol. 22, no. 2, Feb. 1923, pp. 19-20, 2 figs.

Power Transmitting Capacity of a Belt, R. C. Moore. Paper, vol. 31, no. 22, Mar. 21, 1923, pp. 12-13, 2 figs. Tables of horsepower rating for leather belting; ideal condition and correction factors for differences; determination of arc of contact.

RUBBER. Rubber Belting for Mill Use, C. M. Howard. Wood-Worker, vol. 42, no. 1, Mar. 1923, pp. 65-66, 2 figs. Recommendations for operation and care of rubber belts.

STEEL. Performance Tests of Steel Belts with Compressed Spruce Pulleys, Garth L. Young and Guido V. D. Marx. Mech. Engrs., vol. 45, no. 4, Apr. 1923, pp. 246-247, 2 figs. Particulars regarding an investigation of performance of welded and continuous steel belts running on compressed-spruce pulleys not specifically faced.

BEAMS

CALCULATING METHOD. The Deformation Method for Calculation of Statically Indeterminate Systems. (Die Deformationsmethode), A. Ostenfeld. Bauingenieur, vol. 4, nos. 2 and 3, Jan. 31 and Feb. 15, 1923, pp. 34-39 and 69-72, 13 figs. Calculating method according to which deformation coefficients are chosen as unknown quantity.

STEEL, GUNITE ENCASEMENT OF. Reinforcing Value of Gunite Encasing for Steel Beams. Can. Engr., vol. 44, no. 13, Mar. 27, 1923, pp. 361-362. Results of tests carried out; flange stress reduced 57 per cent; deflection reduced 88 per cent; comparison of concrete and gunite.

BLAST-FURNACE GAS

BURNERS. Burning Blast Furnace Gas, Grant D. Bradshaw. Blast Furnace and Steel Plant, vol. 11, no. 4, Apr. 1923, pp. 250-252, 5 figs. Classification of burners; details of numbers of tests.

BLAST FURNACES

COWPER. Accelerated Heating of Cowpers by the P.S.S. Process (Pfoser-Stracke-Stumm) [Le chauffage accéléré des Cowpers par le Procédé P.S.S. (Pfoser-Stracke-Stumm)], P. Lemoine. Revue de Métallurgie, vol. 20, no. 2, Feb. 1923, pp. 87-94, 8 figs. Advantages and savings due to this system.

SCRAP, USE OF. Obtaining Large Blast Furnace Production, D. T. Croxton. Iron Age, vol. 111, no. 13, Mar. 29, 1923, pp. 897-900, 2 figs. Operating records of Trumbull-Cliff's furnace with reference to use of scrap and hard ore combined with fast driving. See also Iron Trade Rev., vol. 72, no. 14, Apr. 5, 1923, pp. 1009-1013, 3 figs.

STACK REMODELING. Martins Ferry Stack Is Enlarged, J. D. Knox. Iron Trade Rev., vol. 72, no. 15, Apr. 12, 1923, pp. 1081-1084, 6 figs. Describes remodeling of stack of wheeling Steel and Iron Co., Wheeling, W.Va.; production is augmented 75 tons daily.

BOILER FEEDWATER

INTERIOR TREATMENT. Interior Treatment of Boiler Feed Water, A. J. Loppin. Power, vol. 57, no. 14, Apr. 3, 1923, pp. 520-522. Where interior treatment is allowable; principles of exterior and interior treatment.

BOILER FIRING

WOOD REFUSE. Power from Wood Refuse at an Aeroplane Factory. Practical Engr., vol. 67, no. 1881. Mar. 15, 1923, pp. 146-147, 5 figs. Data on power plant and equipment of Bristol & Colonial Aeroplanes Co.'s works at Filton, near Bristol, Eng., where nothing but wood refuse of factory is used as fuel for driving machinery.

BOILER FURNACES

DRAFT REGULATION. Automatic Regulation of Furnace Draught. Times Trade and Eng. Supp., vol. 12, no. 245, Mar. 17, 1923, p. 19, 1 fig. Apparatus designed by H. Liese, Hamburg, to effect automatic regulation of draft with hand stoking.

LOSSES. Combustion of Coal in Boiler Furnaces, M'Kean Maffitt. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 230-235. Deals with furnace losses that are preventable.

MAINTENANCE. Boiler Furnace Maintenance, W. H. Gaylord, Jr. Combustion, vol. 8, no. 3, Mar. 1923, pp. 166-168, 7 figs. Economies effected through use of old firebrick for repairing and reconstructing furnace walls and arches.

BOILER OPERATION

ECONOMICAL. Determining Boiler Operating Factors, D. C. Hess. Steam, vol. 31, no. 3, Mar. 1923, pp. 65-69, 8 figs. Factors in economical operation of boiler plants equipped with underfeed stokers: determining combined efficiency. See also Black Diamond, vol. 70, no. 11, Mar. 17, 1923, pp. 296-297, 8 figs.

EFFICIENCY. Determination of Boiler Operating Factors, D. C. Hess. Ry. Mech. Engr., vol. 97, nos. 3 and 4, Mar. and Apr. 1923, pp. 177-179 and 239-241, 8 figs. Methods of checking boiler-room efficiency. Calculating combined efficiency of boiler, furnace and grate.

FACTORS. Determining Boiler Operating Factors, D. C. Hess. Power House, vol. 16, no. 3, Feb. 5, 1923, pp. 21-24, 8 figs. Methods used to determine essential factors for economical operation of boiler rooms; results of tests; method of calculating combined efficiency of boiler.

BOILER PLANTS

AIR HEATERS FOR. Air Heating for Boiler and Industrial Plants. Power Engr., vol. 18, no. 203, Feb. 1923, pp. 45-48, 5 figs. Use of air heaters in place of or in addition to feedwater heaters; arguments in their favour as developed by S. Utting.

BOILER TUBES

REPLACING. Fixing Boiler Tubes (Die Befestigung der Siederohre). Praktische Maschinen-Konstrukteur, vol. 56, no. 1, Jan. 5, 1923, pp. 1-2, 3 figs. Describes new machine for replacing boiler tubes, made by Hanover Machine Co.

BOILERS

A.S.M.E. CODE. Work of A.S.M.E. Boiler Code Committee. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 261-263 and 273, 1 fig. Modifications of revisions; new revision, 1923.

ELECTRICALLY HEATED. Electric Boilers (Les Chaudières électriques), M. Bergeon. Houille Blanche, vol. 22, no. 73-74, Jan.-Feb., 1923, pp. 20-23. Resistance, induction, and electrode boilers for high tension, and advantages of third type; comparison with coal-fired boilers; uses.

SETTINGS. Boiler Settings for Economical Steaming, Zuce Kogan. Power Plant Eng., vol. 27, no. 7, Apr. 1. 1923, pp. 361-365, 16 figs. Theories of design.

WASTE-HEAT. Waste-Heat Boiler. Practical Engr., vol. 67, no. 1882, Mar. 22, 1923, p. 159, 1 fig. on supp. plate. Describes Krike fire-tube boiler, made by Spencer-Bonecourt, Ltd., Hitchin, Eng.; outstanding characteristics are great length of tubes as compared with their diameter, and high velocity of gases through them.

BOILERS, WATER-TUBE

CARE AND OPERATION. Care and Operation of Water Tube Boilers. Can. Shipg. & Mar. Eng. News, vol. 13, no. 3, Mar. 1923, pp. 8-9. Precaution and care necessary from safety and economical standpoint both while operating and overhauling, also means of increasing boiler efficiency.

The General Management and Working of Water-Tube Boilers in Merchant Ships. Mar. Engr. and Naval Architect, vol. 46, nos. 545 and 546, Feb. and Mar. 1923, pp. 73-74 and 112-113. Need for careful firing; advantages of water-tube boilers; tubes; feedwater and feeding; addition of lime; care of boilers after use; examination.

FAULTS IN CONSTRUCTION. Faults in Construction of Water-Tube Boilers (Konstruktionsmängel bei Wasserrohrkesseln?), R. Schirmer. Wärme, vol. 46, no. 2, Jan. 12, 1923, pp. 15-18, 14 figs. Discusses unequal heat transmission as a cause of damage to boilers; examples of vertical tube boilers; complete water circulation.

OIL-BURNING. Yarrow Water-Tube Boiler with Kermode System of Oil-Firing. Engineering, vol. 115, no. 2988, Apr. 6, 1923, pp. 430-431, 1 fig. Boiler has 2000 sq. ft. of heating surface and working pressure of 200 lb. per sq. in.; fitted to fire and salvage boat; burners are of pressure-atomizing type.

VERTICAL. The Humboldt Vertical Tube Boiler (Der Humboldt-Steilrohrkessel), W. Alberts. Wärme, vol. 46, no. 7, Feb. 16, 1923, pp. 69-71, 3 figs. Advantages of vertical tube boilers; evaporation test of Humboldt plant.

BRAKES

POWER. The Development and Importance of Power Brakes in Transportation, W. E. Symons. Ry. & Locomotive Eng., vol. 36, no. 4, Apr. 1923, pp. 129-131. Review of experience in United States and present situation in India; value of brakes in controlling factors of transportation.

BRIDGES, CONCRETE

ARCH. New Bridge at Muskham on the Great North Road. Engineer, vol. 135, no. 3508, Mar. 23, 1923, pp. 313-314, 8 figs. partly on p. 316. Bridge over Trent River consists of two arch spans and two short girder flood openings, one at either end.

ERECTION OVER OLD BRIDGE. Building a New Concrete Bridge Over an Old One. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 654-656, 5 figs. Piers for Adams St. structure over Miami River at Troy strengthened for heavier loads; three new arches added.

BRIDGES, HIGHWAY

CONCRETE. Combination Pre-Cast and In Situ Reinforced Concrete Bridge. Concrete and Constrn. Eng., vol. 18, no. 3, Mar. 1923, pp. 169-175, 6 figs. Describes reconstruction of Wellesley Road bridge over, Gunnersbury.

LENGTHENING. Lengthening Bridge After Caving of Bank in Flood, B. H. Faber. Eng. News-Rec., vol. 90, no. 16, Apr. 19, 1923, p. 703, 4 figs. Washout caused 200-ft. gap where 100-ft. span had been; replaced by one 200-ft. and one 60-ft. span.

BRIDGES, LIFT

ROLLING. The Inchinnan Bridge at Renfrew. Engineer, vol. 135, no. 3509, Mar. 30, 1923, pp. 338-340, 14 figs. partly on p. 342. New rolling lift bridge spanning Cart River comprises one opening span and one abutment at each end, along with machinery houses; operating machinery.

BUILDING CONSTRUCTION

HOLLOW-CONCRETE-BRICK. Building With Pax Bricks (Die Bedeutung der Paxstein-Bauweise), P. Peters. Deutsche Bauzeitung, vol. 57, no. 10, Feb. 3, 1923, pp. 49-50. Describes method of construction with hollow concrete brick and leukolith, a new mortar.

UNDERPINNING. Using Divers and Compressed Air in Underpinning. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 629-630, 3 figs. Unusual means employed to underpin brick party wall, 10 stories high, during Boston bank-building construction.

BUILDINGS

LIVE LOADS. Allowable Live Loads in Buildings. Am. Mach., vol. 58, no. 12, Mar. 22, 1923, pp. 447-448. Abstract from report of study made at Equitable building, New York City.

STEEL-FRAME. The Design of Steel-Frame Buildings, Ewart S. Andrews. Concrete and Constr. Eng., vol. 18, no. 3, Mar. 1923, pp. 140-145, 3 figs. Discussion with particular reference to Joint Conference Report.

C

CABLES, ELECTRIC

CURRENT CAPACITY. Current Capacity of Wires and Cables, George E. Luke. Elec. Jl., vol. 20, no. 4, Apr. 1923, pp. 127-130, 8 figs. Factors by which size of wire or cable used in transmission of electric power may be determined; continuous and short-time rating of bare and insulated wire and cables.

HIGH-TENSION. American Investigations of High-Tension Cables (Amerikanische Untersuchungen über Hockspannungskabel), Richard Hiecke. Elektrotechnik u. Maschinenbau, vol. 41, no. 8, Feb. 25, 1923, pp. 131-135, 3 figs. Cable construction, insulation, loads, temperatures and testing.

CALORIMETERS

ELECTRIC HEATING. Note on the Electric Heating of Calorimeters, Walter P. White. Wash. Acad. of Sci. — Jl., vol. 43, no. 2, Jan. 19, 1923, pp. 17-28, 1 fig. Deals with features of electric standardization which need attention in working to 30 per million; conduct of determination, and error from heat produced in leads.

CAMSHAFTS

GENERATING MACHINE. A Novel Camshaft Generating Machine. Eng. Production, vol. 6, no. 127, Apr. 1923, pp. 235-236, 2 figs. Hotchkiss-Taylor camshaft shaping machine developed for cutting cams on shafts made from bar or drop forgings.

CAR DUMPERS

CAR-DUMPING MACHINE. Philadelphia and Reading Car Dumping Machine. Ry. Jl., vol. 20, no. 3, Mar. 1923, pp. 23-24, 1 fig. 120-ton machine to be erected at Port Richmond terminal; plant will consist of 900-ft. pier, with car-dumping machine, power plant, thawing plant, car haulage, mechanical trimming and boat haulage, and machines designed to deliver direct from cars to vessels.

ROTARY. The Field for the Rotary Car Dumper, Shelden Smillie. Coal Industry, vol. 6, no. 4, Apr. 1923, pp. 200-212, 7 figs. Rotary car dumper permits use of solid-end car, with its greater strength, increased capacity and less leakage on haulage ways; especially adapted for dumping trip of cars in bin.

CAR WHEELS

CHILLED-IRON. An Investigation of the Properties of Chilled Iron Car Wheels, J. M. Snodgrass and F. H. Guldner. University of Ill. Bul., vol. 20, no. 3, Apr. 16, 1923, Eng. Experiment Station, bul. no. 135, 97 pp., 62 figs. Strains due to brake application, coefficient of friction and brake-shoe wear.

REMOVAL. Methods and Equipment for Removing Wheels, C. W. Squier. Elec. Ry. Jl., vol. 61, no. 11, Mar. 17, 1923, pp. 447-452, 15 figs. Study covering 50 shops of various methods employed in pressing off wheels to bring out function of holes in gear blank, looking toward standardization of number, size and location of these holes.

CARS

ARTICULATED. Articulated Carriages, Bengal-Nagpur Railway. Ry. Gaz., vol. 38, no. 12, Mar. 23, 1923, pp. 488-489, 4 figs. Cars on articulated system designed and constructed by Leeds Forge Co. for service in India.

CARS, FREIGHT

CONCRETE. Reinforced-Concrete Freight Cars (Die Eisenbahngüterwagen aus Eisenbeton), Max. Gensslar. Beton u. Eisen, vol. 22, no. 5, Mar. 5, 1923, pp. 67-69, 5 figs. Details of 24 freight cars which have travelled 85,814 km., it is proposed to run experimental train for further tests.

CASE HARDENING

CARBURIZING MATERIALS. Selection, Test and Use of Carburizing Materials. Can. Machy., vol. 29, no. 10, Mar. 8, 1923, pp. 16-17. Recommended practice of Am. Gear Manufacturers' Assn. different steels have varying intensity of carbon absorption; high carbon content for camshaft work.

METHODS. Methods of Case-Hardening. West. Machy. World, Vol. 14, no. 3, Mar. 1923, pp. 96-97, 1 fig. Method of producing case-hardening material of commercial form consists of mixing coking coal or other strong coking materials with appropriate amounts of chemical energizers, heating this mixture and crushing and screening resulting mass of compound coke.

ROLLER BEARINGS. Casehardening Plant, Timken Roller Bearing Co., E. W. Ehn. Chem. and Met. Eng., vol. 28, no. 13, Mar. 28, 1923, pp. 578-587, 11 figs. Over 2,000,000 roller-bearing parts are hardened daily; special furnaces and quenching machines; slow, mild carburizer used exclusively.

CAST IRON

CHEMICAL CONSTITUENTS. Notes on Grey Cast Iron, A. E. MacRae Smith. Foundry Trade Jl., vol. 27, no. 346, Apr. 5, 1923, pp. 270-272. Indication of influence of chemical constituents of cast iron with view to clearer understanding of grading of pig iron and mixing of irons by analysis.

DISSOLVED CASES, INFLUENCE OF. The Influence of Dissolved or Occluded Gases in Cast-Iron. Foundry Trade Jl., vol. 27, no. 343, Mar. 15, 1923, pp. 209-211. Summary of existing knowledge on influence of dissolved gases. Gases present in cast iron; influence of dissolved gases on properties and soundness; oxygen in cast iron; influence of hydrogen and nitrogen.

PHYSICS OF. Physics of Cast Iron, E. Adamson. Foundry Trade Jl., vol. 27, no. 340, Mar. 29, 1923, pp. 257-260, 4 figs. Author seeks to elucidate dominating influence of condition of carbon on molecular physics of cast iron. See also criticism of above article by J. E. Hurst, pp. 261-262, 1 fig.

PROPERTIES. Wear and Anti-Friction Qualities of Cast Iron, J. E. Hurst. Can. Foundryman, vol. 14, no. 2, Feb. 1923, pp. 20-21 and 29. Acknowledged to be best material from point of view of wearing and general running properties.

CASTING

CENTRIFUGAL. Centrifugal Casting — The Harbinger of a New Era in the Steel Industry, Leon Cammen. Raw Material, vol. 6, no. 4, Apr. 1923, pp. 138-143. Its effect upon present production methods in steel industry; wastefulness of ingot as intermediate steel product; patent situation of centrifugal casting; applications outside of steel industry.

CEMENT

ALUMINA. Also Cement, Henry S. Spackman. Concrete (Cement Mill Section), vol. 22, no. 3, Mar. 1923, pp. 113-114. Chemical composition and physical qualities of alumina cement which has been used in Europe since 10 years under name of ciment fondu, ciment électrique, etc.; methods and cost of manufacture. Bibliography.

CEMENT MANUFACTURE

QUALITY CONTROL. Quality Control in the Manufacture of Cement, G. E. Warren. Management Eng., vol. 4, no. 4, Apr. 1923, pp. 265-266, 3 figs. High standards maintained by constant testing.

CENTRAL STATIONS

COMINES, FRANCE. The Central Electric Generating Station at Comines. Engineer, vol. 135, nos. 3506 and 3507, Mar. 9 and 10, 1923, pp. 249-251 and 277-279, 18 figs. partly on p. 262. Details of new station with three generating units each of 25,000-kw., capacity; boiler house and coal-handling arrangements; auxiliary plant; water supply and steam pipes; transformer house; transmission lines; pumping plant; distribution and substations.

ECONOMY. Power Production in Relation to Ultimate Values, A. Hugh Seabrook. Elec. Ry. & Tramway Jl., vol. 48, no. 1174, Mar. 9, 1923, pp. 102-104. Factors in power-station economy; states that cost of power production is only one factor and that all circumstances should be taken into account. From address before Bradford Eng. Soc.

OUTPUT, 1922. Eight Systems with Output of 1,000,000,000 Kw. in 1922. Elec. World, vol. 81, no. 14, Apr. 7, 1923, pp. 802-805. Survey indicates that in 1922, 92 companies of United States and Canada reported individual outputs exceeding 100,000,000 kw-hr. Data on output and peak load of largest generating and distributing systems in United States and Canada.

WASTE-STEAM UTILIZATION. Experience in Steam Power Works (Erfahrungen mit Heizkraftwerken mit Fernversorgung), K. Heilmann. Warme, vol. 46, no. 8, Feb. 23, 1923, pp. 85-86. Discusses cases of connecting central stations to hospitals, baths, factories, etc., to utilize surplus and waste heat and power.

WIND-DRIVEN. Proposals for D.C. Central Station Driven by Wind Power (Vorschläge zu einer durch Windkraft betriebenen, selbständigen Gleichstromzentrale), R. Besselmann. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 23, Dec. 10, 1922, pp. 261-263, 2 figs. Describes new regulating arrangement for which successful operation is claimed.

CITY PLANNING

PARKS AND ZONE. City Planning. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 4, Apr. 1923, pp. 702-728, 1 fig. Contains following articles: Parks and Parkways, Linn White; Zoning — Its progress and Application, Morris Knowles. See also (discussion) pp. 753-770.

CLUTCHES

FRICTION. Friction Clutch for Oil-Engine Power Transmission. Motorship, vol. 8, no. 6, Mar. 1923, pp. 198-200, 7 figs. Details of Frauenfelder flexible clutch as used on U.S. submarines.

COAL

BITUMINOUS. The Four Ingredients of Banded Bituminous Coal. Fuel in Sci. and Practice, vol. 2, no. 2, Mar. 1923, pp. 37-41, 1 fig. Conditions of occurrence and manner of separation of four ingredients, with particular reference to Hamstead coal: fusain, durain, clarain and vitrain, their differing response to action of nitric acid, and difference in microscopic appearance of residues after treatment.

CAKING-POWER CURVES. The Caking-Power of Coals, A. Fuel in Sci. and Practice, vol. 2, nos. 2 and 3, Mar. and Apr. 1923, pp. 42-45 and 61-65, 2 figs. Mar.: The Determination of the Caking Power of Coal, by Thomas Gray, describing modification of Campredon sand test by author. Apr. The Caking Power Curves of Coals, by A. Badarau and F. V. Tideswell, giving preliminary account of researches which, it is claimed, have given results of exceptional interest.

COMBUSTIBILITY. The Combustibility of Coal (Über die Verbrennlichkeit der Kohle), A. Koreväar. Stahl u. Eisen, vol. 43, no. 13, Mar. 29, 1923, pp. 431-435, 2 figs. New ideas on the reactions in gas producers, influence of quality of coal on volume of combustion zone, volume and temperature of combustion zone, method for determination of combustibility of coal.

RECOVERY FROM SLAG. Magnetic Separation of Coal from Slag. F. A. Brackmann. Iron Age, vol. 111, no. 12, Mar. 22, 1923, pp. 828-829, 6 figs. New German patent process recovers 80 per cent of fuel from slag and ashes and yields fuel with 75 per cent of original heating value.

SPONTANEOUS COMBUSTION, PREVENTION OF. How to Prevent Spontaneous Combustion in Coal Piles, O. P. Hood. Fire and Water Eng., vol. 73, no. 12, Mar. 21, 1923, pp. 495-496, 499 and 516, 8 figs. Practical suggestions for fuel and water works departments on problem; conditions which are favorable for spontaneous ignition of coal in storage; bituminous more subject to trouble than anthracite.

COAL GAS

PURIFICATION. Iron Purification Plant, Alexander M. Becker. Gas Industry (Manufactured Gas Edition), vol. 13, no. 3, Mar. 1923, pp. 89-91, 4 figs. New plant of Rochester Gas and Electric Co. Reprinted from Gas and Oil. News.

COAL HANDLING

Pneumatic Plant. Coal Handling by Suction at the Brimsdown Power Station of the North Metropolitan Electric Power Supply Company. Iron and Coal Trades Rev., vol. 106, no. 2873, Mar. 23, 1923, pp. 426-427, 5 figs. New pneumatic plant performs three distinct handling operations by means of one receiver and vacuum pump.

COAL MINES

Electrical Equipment. Electrical Developments at St. John's Collieries, Normanton, Joseph Gill. Iron and Coal Trades Rev., vol. 106, no. 2870, Mar. 2, 1923, pp. 314-315, 1 fig. History of development and details of present equipment. Paper read before Nat. Assn. Colliery Guardians.

COAL STORAGE

Methods. Storage of Bituminous Coal, Andress Allen. Black Diamond, vol. 70, no. 11, Mar. 17, 1923, pp. 288-289 and 310, 3 figs. Advantages and disadvantages of coal storage; various kinds of storage plants and operating characteristics of each.

COLD STORAGE

Plants. The Swift Slaughter House and Cold Storage Plant at La Plata (Une visita al Frigorinco Swift de La Plata), C. Dedlow. Ingenieria, vol. 27, no. 2, Feb. 1923, pp. 74-82, 10 figs. Describes layout, buildings, and equipment for dealing with up to 10,000 animals per day.

Warehouse. A New and Modern Cold Storage Warehouse. Ice and Refrigeration, vol. 64, no. 3, Mar. 1923, pp. 191-196, 8 figs. New plant of Kansas City Cold Storage and Warehouse Co.; ice-making equipment; room piping; elevator equipment; refrigerating machinery; insulating doors and ice chutes.

CONCRETE

Variables Affecting Strength. Variables in Concrete from the Construction Standpoint, Walter P. Bloecher. Eng. World, vol. 22, no. 3, Mar. 1923, pp. 170-174, 4 figs. Includes tables showing principal variable conditions affecting strength of concrete and normal maximum range of their influence, secondary and intangible variables affecting strength, and comparison of uniformity of tests results obtained in practice.

CONCRETE CONSTRUCTION

Railway Street Crossings. Concrete Structures for D., L. & W. R. R. New Grade Crossings, M. Hirschthal. Eng. News-Rec., vol. 90, no. 12, Mar. 22, 1923, pp. 536-538, 5 figs. Different standard street crossings and elevated-station structures used in East Orange grade elevation; old masonry arch elevated by concrete superstructure.

CONCRETE MIXERS

Types and Use. Concrete Mixers and Mixing, F. S. Besson. Pub. Works, vol. 54, nos. 2 and 3, Feb. and Mar. 1923, pp. 46-48 and 90-91, 5 figs. Treatise on mixers, their classification, power, traction, distribution system, and method of use; capacity and rating and actual output; selecting size suitable for given mix and job.

CONCRETE CONSTRUCTION, REINFORCED

Exterior Surface Treating. How Should Exterior Surfaces Be Treated? Contract Rec. and Eng. Rev., vol. 37, no. 13, Mar. 28, 1923, pp. 1923, pp. 308-311. Specification of Am. Concrete Inst. for treating exterior surfaces of industrial reinforced-concrete buildings; gives practical ideas for finishing walls.

CONCRETE, REINFORCED

Shrinkage and Temperature Changes. Shrinkage and Temperature Changes In Reinforced Concrete, E. H. Harder. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 661-664, 8 figs. Preliminary study based on strain-gage observations made on reinforced-concrete bridge at Fairmont, W.Va.

CONDENSERS, STEAM

Tubes. Condenser Tubes — Their Manufacture and Specification. Raw Material, vol. 6, no. 3, Mar. 1923, pp. 97-103, 13 figs. Practice of Chase Metal Works, Waterbury, Conn. Manufacturing processes; causes of failures; corrosion; control of final grain size; use and care of tubes.

CONNECTING RODS

Duralumin. Machining Duralumin Connecting-Rods, Fred H. Colvin. Am. Mach. vol. 58, no. 9, Mar. 1, 1923, pp. 321-323, 7 figs. Coining to size for grinding; drilling, reaming and broaching operations; inserting and swaging babbitt bearings; boring large ends for selective assembly.

CONVERTERS

Rotary. Starting Rotary Converters. Practical Engr., vol. 67, no. 1881, Mar. 15, 1923, pp. 143-144, 2 figs. Describes several methods.

CONVEYORS

Belt. Half-Mile Conveyor System for Transporting "Hog" Fuel, W. A. Scott. Belting, vol. 22, no. 2, Feb. 1923, pp. 21-24, 3 figs. Methods and equipment employed in delivering hog fuel to boilers at Camas, Wash., plant of Crown Willamette Paper Co., involving operation of barges, a clam-shell 2-yd. bucket and 2135 ft. of conveyors.

Cable. New Auxiliary for Conveying in Mountainous Mining Districts (Neuzeitliche Hilfsmittel zum Materialtransport bei Tiefbauten im Hochgebirge), Friedrich Riedig. Fördertechnik u. Frachtverkehr, vol. 17, no. 3, Feb. 2, 1923, pp. 30-32, 6 figs. Deals with cableways, cable cranes, conveying by cars on tracks controlled by cables, inclined elevators, etc.

COOLING LIQUIDS

Spray Coolers. Heat Exchange in Spray Coolers (Der Wärmeaustausch am Berieselungskühler); Wilhelm Nusselt. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 9, Mar. 3, 1923, pp. 203-210, 6 figs. Heat-transmission coefficient of spray cooler for heat exchange between cooling surface and spraying liquid.

COOLING TOWERS

Design. Cooling Towers, Edwin Burhorn. Refrig. Eng., vol. 9, no. 9, Mar. 1923, pp. 275-276 and 280. Suggests important factors in successful design.

COPPER

Hardness. The Hardness of Annealed Copper, A. L. Norbury. Am. Inst. of Metals advance paper, no. 15, for meeting Mar. 7-8, 1923, 16 pp., 8 figs. Research to obtain more definite expression of Brinnell hardness of copper.

COPPER ALLOYS

Copper-Aluminum-Nickel. The Ternary System Copper-Aluminum-Nickel, Charles R. Austin and A. J. Murphy. Inst. of Metals advance paper, no. 2, for meeting Mar. 7-8, 1923, 41 pp., 40 figs. Cooling curves were taken on 250 alloys covering whole ternary diagram, determination being most numerous in area 0 to 20 per cent aluminum and 0 to 20 per cent nickel; from data obtained liquidus surface for complete system has been established.

Copper-Tin. The Density and the Hardness of the Cast Alloys of Copper with Tin, Harold Heape. Inst. of Metals advance paper, no. 13, for meeting Mar. 7-8, 1923, 19 pp., 5 figs. Author concludes that algebraic sum of changes in volume, occurring on alloying and during subsequent solidification, is in every case negative, that is, results in contraction, it is not possible to determine exact relationship of density and hardness by means of determinations made on cast alloys, it is difficult to obtain sound castings with copper-rich alloys. See also (abstract) in Metal Industry, vol. 22, no. 10, Mar. 9, 1923, pp. 227-230, 5 figs.

COST ACCOUNTING

Cold-Storage Plant. Operating and Financial Reports for Cold Stores, B. T. Aitken. Brit. Cold Storage and Ice Assn.—Proc., vol. 19, no. 1, 1922-23, pp. 45-58 and (discussion) 59-69. Describes system adopted by author, dealing with subject under following heads: (1) stores department; (2) engineer's department; (3) office department; (4) reports; (5) analysis of reports.

Estimating. How to Get Reliable Cost Estimates, Thomas W. Howard. Factory, vol. 30, no. 4, Apr. 1923, pp. 410-412, 440, 442 and 444, 1 fig. Describes method employed in author's plant.

Factory. Quantity Production and Its Effect on Cost, H. E. King. Management Eng., vol. 4, no. 4, Apr. 1923, pp. 269-271, 3 figs. Points out that standard methods should be based on labour-cost analysis.

Seven Propositions for the Organization of a Practical Factory-Accounting System (Sieben Thesen zur Einführung einer natürlichen Abrechnungspraxis in Fabrikbetreiben), Ernest Just. Werkstattstechnik, vol. 17, no. 5, Mar. 1, 1923, pp. 130-134. Theses presented before Research Soc. for Sci. Management, and explanation and discussion of these theses by J. F. Schar, Georg Schlesinger and A. Wallichs.

COST ACCOUNTING

Road Construction. Road Accounting and Cost Keeping, E. L. Miles. Contract Rec., vol. 37, no. 10, Mar. 7, 1923, pp. 222-226, 7 figs. System developed by County of Victoria, Ont., records essential information and provides analysis of all operations with very little clerical assistance.

Standard Costs. Standard Costs, Arthur Lazarus. Jl. of Accountancy, vol. 35, no. 4, Apr. 1923, pp. 247-252. Author claims that standard costs, when based upon necessary elemental data, provide excellent cost short-cuts, but are not designed to do work of planning, engineering or production departments.

Standardization. Standardization in Cost Accountancy, H. G. Jenkins. Indus. Management (Lond.), vol. 9, no. 6, Mar. 22, 1923, pp. 177-178. Advantages and difficulties; cost figures and trade depression; fundamental principle; principles formulated. Paper read before Instn. Cost and Works Accountants. See also (discussion) in no. 7, Apr. 5, 1923, pp. 205-208.

Steam-Derrick. 70-Ton Portable Steam Derrick Crane. Engineering, vol. 115, no. 2988, Apr. 6, 1923, pp. 426-427, 10 figs. partly on p. 425. Features of crane constructed for handling of heavy concrete castings.

Trailer. 15-Cwt. Trailer Crane. Engineering, vol. 115, no. 2895, Mar. 16, 1923, pp. 331-332, 5 figs. Portable crane arranged to be used as trailer in connection with type of battery truck now commonly used in workshops, warehouses, etc.

Travelling, Electric. Operating and Maintenance Practice for Electric Traveling Cranes, B. Hantman. Indus. Engr., vol. 81, no. 4, Apr. 1923, pp. 176-180 and 225, 8 figs. Describes crane inspection and repair procedure, with method of reducing number of spare parts carried in stock, followed by Westinghouse Elec. and Mfg. Co.; some ways to prevent trouble and prolong life of parts subject to hard service.

Wind-Pressure Hazard. Wind Pressure is Bridge Hazard, C. O. Burton. Iron-Trade Rev., vol. 72, no. 15, Apr. 12, 1923, pp. 1090-1093, 6 figs. Ore, coal and dock cranes often threatened with destruction during severe storms; new-type anenometer with recorder shows whether operation is safe or unsafe; automatic control.

CRANKSHAFTS

Balancing. Method of Balancing High-Speed Crankshafts, C. Norman Fletcher. Can. Machy., vol. 20, no. 11, Mar. 15, 1923, pp. 23 and 40, 3 figs. Graphical explanation of balancing methods; static balance and dynamic unbalance; effect of speed variation.

Manufacture. The Manufacture of Crankshafts, Chas. S. Pettit. Automobile Engr., vol. 13, no. 174, Mar. 1923, pp. 75-77, 7 figs. Description of proposed procedure and equipment.

CULVERTS

Headwalls. Headwalls for Pipe Culverts, Howard See. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 624-625, 1 fig. Night walls satisfactory in warm and cold climates; headwalls not always necessary.

CUPOLAS

Blowing Methods. Methods of Cupola Blowing Compared, E. A. Roper. Foundry Trade Jl., vol. 27, no. 342, Mar. 8, 1923, pp. 196-197, 1 fig. Difference between fan and Roots blower; comparison with regard to volume and pressure application, cupola design and resistance, control, efficiency and cost.

Cathode. A Cathode Cupola Furnace Plant (Eine neuzeitliche Kupolofenanlage), Alfred Mesker. Zeit. für die gesmate Giessereipraxis, vol. 44, no. 7-8, Feb. 24, 1923, pp. 46-47, 3 figs. Describes Lebert Bröse type with special air distribution.

Steel-Scrap Melting in. Throws Light on Steel Melting, G. Munts. Iron Trade Rev., vol. 72, no. 12, Mar. 22, 1923, pp. 880-881. Experiments made under stress of war necessity result in new procedure for melting steel scrap in cupola; priming charge of pig iron deemed imperative to maintain humidity.

CUTTING METALS

Electric Arc. Cutting Metals with the Electric Arc, A. M. Candy. Iron Age, vol. 111, no. 16, Apr. 19, 1923, pp. 1098-1099, 7 figs. Hourly rate and cost of cutting; use of methods for scrapping wrecked or discarded steel freight cars; non-ferrous uses.

CYLINDERS

Fins. Research Shows to Increase Cylinder Fin Efficiency, C. B. Dicksee. Automotive Industries, vol. 48, no. 14, Apr. 5, 1923, pp. 768-772, 11 figs. Straight tapered section easy to produce and is quite light; 7-deg. taper considered best; heat-handling capacity for tapered cast-iron and sheet-steel fins of various proportions.

Molding. Molding Franklin Cylinders. Fred H. Colvin. Am. Mach., vol. 58, no. 13, Mar. 29, 1923, pp. 465-467, 9 figs. Coreboxes and cores for various parts; inserting cooling strips or vanes, assembling cores into complete mold.

Reboring. Reboring Cylinders in Situ (Zylinderausdrehen an Ort und Stelle), Samuel Gans. Werkstattsteel nik, vol. 17, no. 4, Feb. 15, 1923, pp. 97-99, 14 figs. Describes apparatus used for reboring locomotive cylinders without taking it from machine, which can be applied to any cylinder; explains operation in detail.

D

DAMS

ARCHED. Cylindrical Water Containers With Partitions and Annular Walls (Arch Barrage Dams) [Zylindrische Wasserbehälter mit Zwischenwänden und ringförmige Abschlusswände (Bogentalsperren),, Lewe, Beton u. Eisen, vol. 22, no. 1, Jan. 5, 1923, pp. 7-8, 5 figs. Design and calculation.

MOVABLE. Some Notes on the Location and Construction of Locks and Movable Dams on the Ohio River, with Particular Reference to Ohio River Dam No. 18, William H. Hall. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 4, Apr. 1923, pp. 771-779. Discussion by author of paper published in Proc., Jan. 1922.

TIETON, WASHINGTON. Building the Tieton Dam, F. T. Crowe. Pac. Builder and Engr., vol. 29, no. 4, Jan. 26, 1923, pp. 7-8, 3 figs. Details of construction of $5,000,000 dam, which will have height of 321 ft. from lowest point of core-wall foundation to crest, and will require 1,850,000 yd. of material.

DIE CASTING

DEVELOPMENTS. Historical Development of Die Casting and Modern Production Methods (Geschichtliche Entaicklung des Pressgusses und neuzeitliche Pressgussherstellung), Harry Baclesse. Giesserei-Zeitung, vol. 20, no. 4, Jan. 23, 1923, pp. 39-44, 3 figs. Historical review; American experiences; proper arrangement of die-casting plant; most useful die-casting alloys.

MACHINES. Types of Die-casting Machines, Charles Pack. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 629-631, 5 figs. Deals with plunger and compressed air type; the gooseneck machine; machines for large castings.

DIES

COMBINATION. Combination Dies for Sheet-Metal Parts, C. E. Stevens. Am. Mach., vol. 58, no. 15, Apr. 12, 1923, pp. 533-536, 7 figs. Examples of work in which several operations were completed in one set of press tools; data on construction and operation.

DIESEL ENGINES

CEMENT MILLS. Diesel Engines in a Portland Cement Plant, C. M. Carman. Power Plant Eng., vol. 27, no. 8, Apr. 15, 1923, pp. 417-420, 2 figs. Operating results secured by Western States Portland Cement Co. favourable to Diesel type of prime mover.

DOUBLE-ACTING. Double-Acting Motors of 7,000 Horse-Power. Times Trade and Eng., Supp., vol. 12, no. 247, Mar. 31, 1923, p. 62, Individual oil engines built by Burmeister & Wain, Copenhagen to be installed in the Dumana, a 17,000-ton motor liner.

EXHAUST-GAS UTILIZATION. Utilization of Waste Exhaust-Gases. Motorship, vol. 8, no. 3, Mar. 1923, pp. 212-213, 1 fig. Method of economically heating heavy fuel oil developed by Row & Davis.

MECHANICAL-INJECTION. Union Diesel Enters the Field. Pac. Mar. Rev., vol. 20, no. 3, Mar. 1923, pp. 152-154, 2 figs. Details of mechanical injection Diesel engine constructed by Union Gas Engine Co.

NEPTUNE-POLAR. New Design of Neptune-Polar Two-Cycle Engine. Motorship, vol. 8, no. 3, Mar. 1923, pp. 192-195, 9 figs. Built by Swan Hunter & Wigham Richardson; six-cylinder, reversible single-acting crosshead type, designed to burn heavy-oil fuel; stepped-piston design; 1400 i. hp. at 125 r.p.m.

PLANT COSTS. Figuring Diesel Plant Costs, P. M. Thayer. Power Plant Eng., vol. 27, no. 7, Apr. 1, 1923, pp. 372-375, 2 figs. Points out that fixed charges and operating costs should be separated.

SULZER. Twenty Years of Diesel Engine Building, L. J. Le Mesurier. Motorship, vol. 8, no. 4, Apr. 1923, pp. 290-292, 3 figs. Record of development of Sulzer 2-cycle oil engine, i.e., from 1893. Extracts from paper read before Instn. Engrs and Shipbldrs. in Scotland.

TOSI. Diesel-Tosi Engines. Indian Industries and Power, vol. 20, no. 5, Jan. 1923, pp. 149-151, 2 figs. Some details of latest type of engine developed by Franco Tosi, of Legnano, Italy, ranging in sizes of 50 to 3000 hp. per unit, 4-cycle type.

WORKING LOSSES. Investigations of Diesel Engines (Untersuchungen an der Dieselmaschine), Kurt Neumann. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 12, Mar. 24, 1923, pp. 279-283, 4 figs. Thermodynamic cycle and working losses.

DRAWINGS

NUMBERING AND INDEXING. Numbering and Indexing Drawings, Edward Heller. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 609-610, 4 figs. System established in large shop devoted to manufacture of extensive line of aluminum and enameled steel utensils; index cards; record of tools made without drawings; index cards arranged in alphabetical order.

TRACINGS, CARE OF. The care of Tracings, Dwight C. Howard. Am. Mach., vol. 58, no. 13, Mar. 29, 1923, pp. 479-480. Value of tracings; how table should be cleaned and covered; keeping cloth clean while tracing; old tracings restored.

DREDGES

TYPES. Dredging Operations (Trabalhos de Dragagem), Karl Anderson and Ruy de Lima e Silva. Revista Brasileira de Engenharia, vol. 5, no. 2, Feb. 1923, pp. 62-70, 10 figs. Describes modern dredges of various types, including those of Kahs Co., operating in Brazilian ports.

DRILLING MACHINES

AUTOMATIC FEEDING DEVICE. Automatic Feeding Device for High-speed Drilling, Charles E. Bernitt. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 621-622, 2 figs. Details of automatic feed of friction type.

HORIZONTAL MILLING AND. Horizontal Milling, Drilling, and Tapping Machine. Machy. (Lond.), vol. 21, no. 546, Mar. 15, pp. 743-745, 3 figs. Parts drilled on interchangeable lines without use of jigs.

VERTICAL. A New Vertical Drilling Machine Development. Brit. Machine Tool Eng., vol. 2, no. 19, Jan.-Feb. 1923, pp. 581-584, 5 figs. Heavy-duty machine applicable to drilling of pieces required in moderatley large quantities, built by James Archdale & Co.

EARTH

PRESSURE. Lateral Earth Pressure. The Accurate Experimental Determination of the Lateral Earth Pressure, Together with A Resume of Previous Experiments. Jacob Feld. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 4, Apr. 1923, pp. 603-666, 6 figs. Describes first complete set of tests using large-sized apparatus for measuring directly by means of platform scales components of active pressure on model wall, 6 ft. high and 5 ft. wide.

EDUCATION, ENGINEERING

INTELLIGENCE TESTS. Intelligence Tests for Engineering Students, L. L. Thurstone. Eng. Education, vol. 13, no. 5, Jan. 1923, pp. 263-348, 15 figs. Cooperative investigation to study value of various kinds of examinations, and possible practical usefulness of some new types of examinations for engineering schools, results of which might be expected to bear on question of entrance requirements and entrance examinations for engineering colleges.

EDUCATION, INDUSTRIAL

RUSSIA. The Russian Central Institute of Work. Management Eng. vol. 4, no. 4, Apr. 1923, pp. 241-244, 14 figs. Methods' and means for training workers. Translated from Official documents.

ELECTRIC DISTRIBUTION

GROUND SELECTOR FOR 3-PHASE. Ground Selector for Ungrounded Three-Phase Distribution Systems, P. Ackerman. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 311-319, 3 figs. Describes functioning of ground selector and compares in detail two systems.

THREE-PHASE FOUR-WIRE SYSTEMS. Three-Phase Four-Wire Distribution Systems, H. W. Smith. Elec. Jl., vol. 20, no. 4, Apr. 1923, pp. 144-147, 8 figs. Advantages and disadvantages; types of 4000-volt four-wire systems; transformer connections; changing over motors; lightning protection; method of transforming from 4000 volts three-phase four-wire to 230 volts two-phase.

ELECTRIC DRIVE

WOODWORKING INDUSTRY. Motor Applications in the Woodworking Industry. Gordon Fox. Power Plant Eng., vol. 27, on. 8, Apr. 15, 1923, pp. 428-430, 4 figs. Advantages of motor drives, especially induction motors; frequency changers for high speed.

ELECTRIC FURNACES

ACID. Lining Acid Electric Furnaces, J. M. Quinn. Iron Age, vol. 111, no. 16, Apr. 19, 1923, pp. 1101- 1102. Various materials which can be used and how to handle them; describes best lining.

CRUCIBLE-SHAPED. Designs New Electric Furnace, R. Sylvany. Iron Trade Rev., vol. 72, no. 13, Mar. 29, 1923, pp. 952-953. Metal melted in crucible-shaped vessel with only one opening; electrode through roof sheathed to prevent ingress of air, other electrodes placed in lateral lining in hearth.

HEAT-TREATING. Selection of Electric Furnaces for Steel Treating, C. L. Ipsen. Am. Soc. Steel Treating — Trans., vol. 3, no. 7, Apr. 1923, pp. 720-728, 10 figs. Deals with electric heat-treating resistor-type furnaces and their increasing use.

MELTING. Electric Furnace Melting Practice, E. G. Stedman. Am. Soc. Steel Treating — Trans., vol. 3, no. 7, Apr. 1923, pp. 740-745 and (discussion) 745-749. Discusses type of equipment, methods of procedure, including laboratory tests and forge and chill tests used in controlling melting practice; outlines casting; ingot forging, rolling and billet-piercing practice carried out in author's plants; points wherein, in his opinion, electric-furnace melting surpasses open-hearth practice.

NON-FERROUS. New Induction Furnace for Non-ferrous Metals (Nouveau four électrique à induction pour les métaux non ferreux), Emile Demenge. Génie Civil, vol. 82, no. 9, Mar. 3, 1923, pp. 207-209, 3 figs. Design and operation of furnace built by Compagnie Française des Métaux, producing 8 to 10 tons of brass per day.

RESISTANCE. Electrical-Resistance Furnaces and Their Uses, Chas. R. Darling. Roy. Soc. of Arts — Jl., vol. 71, no. 3670, Mar. 23, 1923, pp. 324-332 and (discussion) 332-336, 10 figs. Advantages; metal-wound furnaces; carbon resistance furnaces; appliances used in conjunction with resistance furnaces.

STEEL. Advantages of Electric Furnace in Steel Making, Ernest W. Cornelius. Can. Machy., vol. 29, no. 13, Mar. 29, 1923, pp. 17-19, 1 fig. Product of more uniform quality; better temperature control; less loss in melting and refining; more frequent heats and smaller molding floors.

TYPES. Methods of Handling Materials in the Electric Furnace and the Best Type of Furnace to Use, Frank W. Brooke. Am. Electrochem. Soc., advance paper, no. 6, for meeting May 3-5, 1923, pp. 71-81, 15 figs. Discusses design of various electric furnaces, such as plain-box type, special-box type, car type, recuperative and continuous furnaces, and refers to their advantages and disadvantages; method of handling material so that uniform temperature and high furnaces efficiency may be maintained.

ELECTRIC GENERATORS

OPERATING FEATURES. Operating Features of Generating Equipment, V. E. Johnson. Power Plant Engineering, vol. 27, nos. 5 and 7, Mar. 1 and Apr. 1, 1923, pp. 277-279, and 376-380, 19 figs. Mar. 1: Practical discussion of phenomena involved in operation of shunt-wound generators. Apr. 1: Difficulties of regulation encountered with shunt machines overcome by use of compound wound units.

ELECTRIC GENERATORS, A.C.

PARALLEL OPERATION. Operating Alternating-Current Systems in Parallel, Ralph Brown. Power, vol. 57, no. 15, Apr. 10, 1923, pp. 558-560, 5 figs. Conditions to be compiled with when operating two power plants in parallel with and without transformers; parallel operation through frequency-changer sets.

ELECTRIC LAMPS INCANDESCENT

TUNGSTEN, SPECIFICATIONS FOR. United States Government Specifications for Large Tungsten Filament Incandescent Electric Lamps. U.S. Bur. of Standards, — circular no. 13, Feb. 7, 1923, 16 pp. General and test specifications.

ELECTRIC LOCOMOTIVES

A. C., CONTROL OF. Control of A.C. Locomotives (Die Steuerung der Wechselstromlokomotiven), Iwan Dörv. Elektrotechnik u. Maschinenbau, vol. 41, no. 4, Jan. 28, 1923, pp. 69-72, 7 figs. Describes types produced by principal electric companies.

BALDWIN-WESTINGHOUSE. Electric Locomotives for the Norfolk & Western, T. C. Wurts. Ry. Age, vol. 74, no. 19, Apr. 14, 1923, pp. 945-947, 6 figs. Double cab is carried by vanadium-steel side frames with four pairs of drivers in each frame.

New 4000-Hp. Electric Locomotives for N. & W. Ry., T. C. Wurtz. Ry. Rev., vol. 72, no. 15, Apr. 14, 1923, pp. 647-650, 4 figs. New features include cab structure carried by side frames of vanadium steel, four pairs of drivers in single truck per cab, single 1000-hp. motor per mechanically interlocked forced-cooled transformer; etc.

New 180-Ton Passenger Locomotives for the New Haven. W. J. Canby. Elec. Ry. Jl., vol. 61, no. 10, 1923, p. 412. One locomotive will be capable of handling 900-ton training load, or 12 Pullman cars between Grand Central terminal and New Haven in 99 min. at schedule speed of 44 m. per hr. See also Ry. & Locomotive Eng., vol. 36, no. 4, Apr. 1923, pp. 121-123, 7 figs.

ELECTRIC MOTORS

DESIGN. Modern Electric Motor Construction, I. M. Bott and Howard Campbell. Am. Mach., vol. 58, no. 16, Apr. 19, 1923, pp. 643-647, 15 figs. Recent developments, operations in construction of specified types.

ELECTRIC MOTORS, A.C.

ASSEMBLY METHODS. Applying the Assembly Principle to Manufacture. Those Management (Lond.), vol. 9, no. 7, Apr. 5, 1923, pp. 100-103, 3 figs. [illegible] manner in which assembly principle operated [illegible] of electric motors.

INDUCTION. Characteristics of Self-Starting Induction Motors. Justin Lebovici. Elec. Rec., vol. 33, no. 3, Mar. 1923, pp. 172-174, 7 figs. Advantages to be obtained from use of such motors equipped with automatic control are explained.

SYNCHRONOUS. The Graphics of the Synchronous Motor, W. M. Wallace. Engineering, vol. 115, no. 2986, Mar. 23, 1923, p. 353, 5 figs. Author proposes diagram which, he claims, exhibits all characteristics of synchronous motor at glance and is extremely simple of construction.

TUBE MILLS, APPLICATION TO. Application of Electric Motors for Driving Tube Mills, Fraser Jeffrey. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 382-387, 12 figs. Tube-mill characteristics; application of slip-ring type induction motor to tube mill; comparison of slipring vs. squirrel-cage motor applications; application of synchronous motor.

VARIABLE-SPEED. Variable-Speed Alternating-Current Motors Without Commutators, F. Creedy. Instn. Elec. Engrs. — Jl., vol. 61, no. 316, Mar. 1923, pp. 309-326 and (discussion) 326-387, 41 figs. Explains new method of pole changing, involving use of number of phases greater than that in line, together with means for simplifying connections; phase transformer needed to produce increased number of phases; switchgear employed; machines with slip-ring characteristics; tests of rolling-mill and other motors.

ELECTRIC MOTORS, D.C.

CONTROL. Control Systems for D.C. Motors Applied to Machine Tool Drive, B. S. Pero. Am. Mach. vol. 58, no. 14, Apr. 5, 1923, pp. 515-519, 8 figs. Manually operated, remote and automatic controls: control for constant uni-directional speed; difference between adjustable and varying speeds.

ELECTRIC POWER

STEAM VS. The Cost of Industrial Power, J. A. Burnett. Eng. Jl., (Eng. Inst. Can.), vol. 6, nos. 3 and 4, Mar. and Apr. 1923, pp. 140-141 and 180-183, 3 figs. Comparison of cost of steam and electric power in industry, with discussion of operating features of latter.

ELECTRIC RAILWAYS

COST STATISTICS. Statistical Data On Electrified Railroads, W. D. Bearce. Elec. Traction, vol. 19, no. 3, Mar. 1923, pp. 113-116, 3 figs. Comparison of cost of operation by steam and electric equipment.

ELECTRIC SWITCHES

OIL. Automatic Primary Change-Over Oil Switch, F. B. Kiniskern. Elec. Jl., vol. 20, no. 4, Apr. 1923, pp. 142-144, 8 figs. Describes switch, function of which is to change over from a preferred source to a secondary source of supply in event of failure of former, and when service is again restored on preferred source to change back to his circuit.

ELECTRIC TRANSMISSION LINES

RURAL. Operating Characteristics of Rural Lines, V. L. Hein. Elec. World, vol. 81, no. 14, Apr. 7, 1923, pp. 795-796, 7 figs. Data now being accumulated indicate actual operating characteristics; factors which affect loads.

ELECTRIC WELDING, ARC

EXPERIMENTS. The Electric Arc Between Carbon and Metal (Der Lichtbogen zwischen Kohle und Metall). Autogene Metallbearbertung, vol. 16, no. 4, Feb. 15, 1923, pp. 47-50, 5 figs. Discusses electric arc welding and gives results of experiments by Electro-Thermit Company.

PENETRATION AND OVERLAP. Penetration and Overlap in Arc Welding, O. H. Escholz. Can. Machy., vol. 29, no. 6, Feb. 8, 1923, pp. 24-25 and 33, 15 figs. Line of demarcation indicates zone of fusion; liquefying of plate metal; effect of low-melting-point electrode; degree of fusion dependent on arc current.

ELECTRIC WELDING, RESISTANCE

BUTT-WELDING MACHINES. Heating Without Fire — Electric Forges and Rivet Heaters (Feuerlose Ernitzung; Elektrische Essen und Nietwärmer), Albert Neuburger. Elektrische Betrieb, vol. 21, no. 4, Feb. 24, 1923, pp. 39-40, 4 figs. Describes new electric butt-welding machine and its operation, also rivet heaters.

DEVELOPMENT. Progress in Electric Welding (Fortschritte auf dem Gebiete des elektrischen Schweissens), Wundram. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 16, Aug. 24, 1922, pp. 169-172. Discusses resistance and arc welding; current supply.

ELECTRICAL MACHINERY

TRANSIENT CONDITIONS. Transient Conditions in Electric Machinery, W. V. Lyon. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 388-407, 27 figs. Discusses methods of solving problems involving transinet conditions in electric circuits. Bibliography.

ELECTRICITY SUPPLY

FIXED-CHARGE APPORTIONMENT. The Multiple Plant Method for the Equitable Apportionment of fixed Charges, George H. Moore. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 408-411, 2 figs. Logical and fully reliable method for computing "fixed-charge" portion of commodity rate schedules; multiple-plant method is believed to combine virtues and eliminate vices of peak-responsibility and Eisenmenger methods.

ELEVATORS

ELECTRIC. Operation of Modern Electric Elevators (Sistemas y aparatos modernos de maniobra para ascensores eléctricos), C. A. Gullino. Energia Eléctrica, vol. 25, no. 4, Feb. 25, 1923, pp. 47-52. Discusses mechanical, electro-mechanical and electric operation, and apparatus required.

MECHANICAL INTERLOCKS. Mechanical Interlocks — Their Effectiveness, Clayton W. Old. Safety Eng., vol. 45, no. 3, Mar. 1923, pp. 72-79. Classes of accidents; "safety gates"; power-closed doors; inner car gates; car-gate contacts.

EMPLOYMENT MANAGEMENT

EFFICIENCY MARKING. Efficiency Marking of Employees, George H. Rock. Indus. Management (N. Y.), vol. 65, no. 4, Apr. 1923, pp. 243-246. Putting, hiring, discharging and promotion on just basis.

HUMAN NATURE IN. Human Nature in Industry, Ernest C. Gould. Indus. Management (N.Y.), vol. 65, no. 4, Apr. 1923, pp. 221-224. Sidelights on human nature accumulated by experience of employment manager.

ENGINEERING

PROBLEMS. Some Problems Confronting the Engineer of To-morrow, Carl S. Colei Sibley Jl., of Eng., vol. 37, no. 3, Mar. 1923, pp. 52-55, 1 fig. Problems in various fields of engineering.

ENGINEERS

LICENSING. Licensing Laws for Engineers. Chem. and Met. Eng., vol. 28, no. 13, Mar. 28, 1923, pp. 588-589. Survey of licensing conditions as affecting professional engineers in various states.

EVAPORATION

VAPOR-COMPRESSION. Vapor Compression or Heat-Pump Operation (Ueber Kompressionsverdampfung), W. Gensecke. Zeit des Vereines deutcher Ingenieure, vol. 67, no. 11, Mar. 17, 1923, pp. 249-255, 14 figs. Thermal economy of concentration methods, and in the sugar industry; applications of vapor compression; operating results in an evaporation plant for skimmed milk, economy of compression.

FLOOD CONTROL

CAIRO, ILL. Flood Conditions and Land Filling at Cairo, Ill., W. C. Curd. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 614-616, 1 fig. Abstract of report on flood and drainage conditions in city and drainage district. Sand boils in leveed area caused by underground sources and not by rivers; recommends raising grade of low areas.

EXCAVATION, EARTH

CALCULATION. New Method for Exact Calculation of Earth Work (Neues Verfahren zur genauen Massenermittlung bei Erdarbeiten), Hermann Treiber. Zentralblatt der Bauverwaltung, vol. 43, nos. 17-18, Feb. 28, 1923, pp. 102-104,12 figs. Develops formulas for calculation and gives diagrams for finding cubic contents in large excavation work.

EXHAUST, STEAM

UTILIZATION. Plants for Utilizing Waste Steam in Railway Works (Anlagen sur Verwertung von Abdampf in Reischsbahnwerken), Bartels. Wärme, vol. 46, no. 1, Jan. 5, 1923, pp. 6-9, 5 figs. Describes German railway workshop at Cassel and its arrangements for utilizing waste steam.

The Economical Use of Exhaust Steam, Allen F. Brewer. Combustion, vol. 8, no. 3, Mar. 1923, pp. 162-163. Unit cost of steam; general notes on utilization of exhaust steam.

EXTRUSION OF METALS

BRASS RODS. The Extension Defect in Brass Rods Extruded from a Multiple Die, R. Genders. Am. Inst. of Metals advance paper, no. 9, for meeting Mar. 7-8, 1923, 3 pp., 4 figs. Results of examination of rods of 60; 40 brass, 0.625 in. in diam., extruded from billet 5.25 in. in diam. through die having three apertures equidistant from center and about 2 in. apart.

F

FACTORIES

DESIGN. Industrial Plant Design, J. L. McConnell. West. Soc. Engrs. — Jl. (Tech. Papers), vol. 28, no. 1, Jan. 1923, pp. 1-44 and (discussion) 15-17, 11 figs. Discusses points that make for economy of space and manufacture. Describes plant of Hubbard & Co. for manufacture of pole-line hardware which was designed in author's office.

FANS, CENTRIFUGAL

CONSTRUCTIVE MECHANISM, APPLICATION OF. Constructive Mechanism and the Centrifugal Fan, George D. Beals. Heat and Vent. Mag., vol. 20, no. 1, Jan. 1923, pp. 42-47, 6 figs. Principles of constructive mechanism as applied to centrifugal fan. Uses as example multi-bladed type fan having wheel 48 in. in diameter, handling 44, 750 cu. ft. air per min. against static resistance of 2½ in. water gage, and running at speed of 415 r.p.m., peripheral velocity 5215 ft. per min., with 50-hp. motor for driving.

FEEDWATER HEATERS

MULTIPLE-STAGE. Feed Heating Reduces Steel Power Cost, Linn Helander. Iron Age, vol. 111, no. 15, Apr. 12, 1923, pp. 1023-1025, 2 figs. Points out that significant reduction in fuel consumption can be made in steel-plant power stations by use of multiple-stage heating of boiler feedwater and bleeding of main turbine.

FLIGHT

GLIDING. Soaring Flight (Segelflug), Erich Meyer, Schweizerische Bauzeitung, vol 81, no. 9, Mar. 3, 1923, pp. 103-106, 13 figs. partly on p. 107. Analysis of soaring flight. Developments and future possibilities.

FLOW OF GASES

PULSATIONS, EFFECT OF. Effect of Pulsations on Flow of Gases, Horace Judd and Donal B. Pheley. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 223-228 and (discussion) 228-229 and 270, 6 figs. Experimetal work for purpose of studying nature of pulsation and of finding practical means of reducing or eliminating pulsation or of compensating for its effects on devices used for measuring fluid flow. (Abridged.)

FLOW OF WATER

ORIFICES. Orifice Flow, Dempster Smith and William J. Walker. Instn. Mech. Engrs.—Proc., no. 1, Jan. 1923, pp. 23-36, 6 figs. Investigations for deduction of rational formula for orifice flow. All experiments were carried out on water.

FLUE-GAS ANALYSIS

CO_2 RECORDER. The Ranarex CO_2 Recorder. Engineering, vol. 115, no. 2988, Apr. 6, 1923, p. 443, 4 figs. Instrument of Continental design which is entirely mechanical in its action; essential parts are two fans kept in rapid rotation by means of small electric motor at top of instrument.

SULPHUROUS-ACID DETERMINATION. Determination of Sulphurous Acid in Flue Gases (Die Bestimmung von schwefliger Säure in den Schornsteingasen), K. Balthasar. Chemiker-Zeitung, vol. 47, no. 32, Mar. 15, 1923, pp. 225-226, 3 figs. Method and apparatus used.

WEIGHING APPARATUS. Apparatus That Weighs Furnace Gases, Thus Determining Their Dioxide Percentage. Coal Age, vol. 23, no. 12, Mar. 22, 1923, pp. 482-484, 2 figs. Apparatus devised by Z. Olsson for weighing waste gases of furnace.

FLYWHEELS

CALCULATION. Calculation of Flywheels by the Theory of Elasticity (Note sur le calcul des volants pleins par la théorie de l'élasticité), Georges Prudon. Génie Civil, vol. 82, no. 12, Mar. 24, 1923, pp. 280-282, 3 figs. Determination of molecular action in play in flywheels of great angular velocity and very large rim; calculations.

FOREMEN

PROBLEMS OF. The Problem of the Foremen, Eric N. Simons. Indus. Management (Lond.), vol. 9, nos. 5 and 6, Mar. 8 and 12, 1923, pp. 134-136 and 163-165. Practical advice based upon author's experience in large industrial establishment producing wide variety of manufactures; problems confronting organizer of modern works in regard to selection of efficient foremen, and work for which he is responsible.

TRAINING. Foremanship Training in the Medium-Sized Plant, Harold Moore. Indus. Management (N.Y.), vol. 65, no. 4, Apr. 1923, pp. 214-215. Method successfully employed at Corning Glass Works.

FORGING

Cold, Steel for. The Selection of Steel for Cold Forging, John B. Frederick. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, pp. 161-162, 1 fig. Materials best suited for cold-forging operations; cause of fibrous or "woody" fractures of cold-headed cap screws; annealing as remedy.

FOUNDATIONS

Caisson Sinking. Spread-Base Caissons in Boston Bank Foundation. Eng. News-Rec., vol. 90, no. 13, Mar. 29, 1923, pp. 577-578, 4 figs. Backfill around small shaft over working chamber acts as load to assist sinking of caissons.

Power-Plant Equipment. Foundations for Power Plant Equipment, Charles L. Hubbard. Nat. Engr., vol. 27, no. 3, Mar. 1923, pp. 117-121, 7 figs. Bearing surface to sustain loads; materials used for foundation and estimating quantity; points on construction useful to operators.

FOUNDRIES

Chemical Symbols. Chemical Symbols as an Aid to Foundry Progress, F. C. Edwards. Foundry Trade Jl., vol. 27, no. 343, Mar. 15, 1923, pp. 220-221. Symbols employed; grouping of symbols; equations; practical application.

Electric Heating in. Electric Heating in the Foundry, T. A. Reid. West. Machy. World, vol. 14, no. 2, Feb. 1923, pp. 57-58, 4 figs. Deals with electric core ovens and electrically heated pattern plates. Points out saving of time and fuel and elimination of waste obtained by use of electric heating.

Methods and Equipment. Operating Wilson Foundry, D. R. Wilson. Foundry, vol. 51, nos. 6, 7, and 8, Mar. 15, Apr. 1 and 15, 1923, pp. 218-225, 269-274 and 323-327, 45 figs. Plant and operating methods of Wilson Foundry and Machine Co., Pontiac, Mich. Sandhandling equipment; core handling; molding and coremaking methods. Producing cylinder cores for Knight motors. Metallurgical control of sand and other materials.

Sash-Weight Manufacture. New Method of Sash Weight Manufacture. Iron Age, vol. 111, no. 14, Apr. 5, 1923, pp. 963-964, 4 figs. Output of 3840 a day and molding cost of $1 per ton claimed; machine molding used; process is continuous.

FUELS

Canadian Resources. The Fuel Situation in Canada, B. F. Haanel. Eng Jl. (Eng. Inst. Can.), vol. 6, no. 4, Apr. 1923, pp. 174-176. Review of Canada's fuel resources with various suggested solutions of fuel problem.

Heating Value. Calculation of Heating Value from Constitution of the Compounds (Studien über die Berechnung des Heizwertesansder Konstitution der Verbindung), Otto H. Binder. Wärme- u. Kälte-Technik, vol. 25, no. 3, Feb. 1, 1923, pp. 21-22. Heating value of fuels; Dulong formula and its application to finding theoretical value of fuels.

Heating Values and Composition of Fuels (Heizwerte und Zusammensetzung von Brennstoffen). Zeit. des Bayer. Revisions-Vereins, vol. 27, nos. 3 and 4, Feb. 15-and 28, 1923, pp. 20 and 27-29. Examinations during 1922 in chemical laboratory of Baycrischen Revisions-Verein of anthracite, brown coal and lignite; briquets; coke; peat; wood, sawdust, etc.; and oil fuels.

Industrial Heating. The Selection of Fuel for Industrial Heating Operations, Hos. A. Doyle. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, pp. 156-160, 3 figs. Flame temperature, rate of combustion, composition of gas and of flue gases are essential; characteristics of fuel; progress in gas manufacture and fuel utilization.

Recovery from Ashes. Fuel Recovery from Furnace Residue (Die Rückgewinnung von Brennstoffen aus Feuerungsrückständen), Albert Neuburger. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 22, Nov. 24, 1922, pp. 250-253, 6 figs. Describes ash separator systems made by Krupp and other manufacturers, both magnetic and specific gravity types.

Recovery of Unburnt Fuel. Times Trade and Eng. Supp., vol. 11, no. 241, Feb. 17, p. 539, 2 figs. Methods of separation from ashes; flotation methods; special washing media; magnetic separation.

The Recovery of Unburnt Fuel From Ashes, G. Reder. Eng. Progress, vol. 4, no. 3, Mar. 1923, pp. 53-57, 15 figs. Summary of processes adopted by various firms; treatment of ashes and design of plants used for this purpose; application of various processes.

Utilization. Modern Utilization of Fuels (Neuzeitliche Verwertung der Brennstoffe), G. Fester. Zeit. für angewandte Chemie, vol. 36, no. 16, Feb. 24, 1923, pp. 117-119, 3 figs. Discusses solid and liquid fuels from standpoints of chemical raw materials and of energy carriers; carbonization of coal and lignite; tar production.

Summary of Studies Made in Great Britain on the Utilization of Fuels (Exposé des études faites en Grande-Bretagne sur l'utilisation des combustibles), E. Audibert. Revue de l'Industrie Minérale, no. 53, Mar. 1, 1923, pp. 113-149, 8 figs. Report of special investigation covering carbonization of coal, production of water gas, transformation of coal into liquid fuel, the MacLaurin furnace, handling of coal dust, chemical composition of coal, etc.

See also Coal; Lignite; Oil Fuel; Peat; Pulverized Coal.

FURNACES, HEATING

Design. Heating Furnaces (Quelques Remarques sur les Fours à réchauffer), Emm. Langlois. Vie Technique et Industrielle, vol. 5, no. 42, Mar. 1923, pp. 384-388, 8 figs. Construction of metal-bearing furnaces of two types, viz., hearth with bed, and continuous.

FURNACES, HOT-AIR

Design. Designing Furnace Systems for 140-Deg. Register Temperatures, V. S. Day. Sheet Metal Worker, vol. 14, no. 6, Apr. 13, 1923, pp. 202-203, 1 fig. Conditions to be met in designing gravity warm-air furnace installation to operate at maximum air temperature at 140 deg. at registers.

FURNACES, INDUSTRIAL

Gas-Firing. Industrial Furnaces (Gewerbliche und industrielle Feuerungen), H. Ludwig. Gas- u. Wasserfach, vol. 66, nos. 1, 2, 3 and 4, Jan. 6, 13, 20 and 27, 1923, pp. 1-4, 20-23, 36-39 and 55-57, 13 figs. Laws of combustion and heat transmission; it is shown that firing with gas is often expedient and economical, and propaganda for its use should be conducted by gas industry. Paper read before German Soc. of Gas and Hydraulic Engrs.

Small, Recuperators for. Heat Salvage in Small Furnaces, W. C. Buell, Jr. Chem. and Met. Eng., vol. 28, no. 14, Apr. 9, 1923, pp. 638-641, 7 figs. 30 per cent fuel saved on even small tool-room furnace by simple recuperator, heat resisting pipe offers ideal medium with which to build heat interchanger.

FURNACES, METALLURGICAL

Zinc-Dust Recovery. The Recovery of Zinc Dust from the Waste Gases of the Furnaces, Otto Brandt. Eng. Progress, vol. 4, no. 4, Apr. 1923, pp. 76-77, 6 figs. Details of plant for condensation of metallic vapors from smelting furnaces, utilizing heat contained in waste gases.

G

GAGING

Methods. Modern Gauging Methods, Axel Wickman. Eng. Production, vol. 6, no. 127, Apr. 1923, pp. 242-247, 24 figs. Fundamental principles governing limit gaging; describes Wickman measuring machine specially designed to permit use of slip gages as standards, and to enable transference of size to take place within guaranteed error of 0.00001 in.; use of tolerance to best advantage.

GAS ENGINES

Producer Gas. Producer-Gas Engines — Application to Navigation in the French Colonies (Les moteurs à gaz pauvre — Applications à la navigation coloniale). Bul. Technique du Bureau Veritas, vol. 5, no. 1, Jan. 1923, pp. 13-16, 3 figs. Report by Beelaerts to Brussels Colonial Society, on propulsion of river boats by producer gas, mixed gas or poor gas; production of gas and engines used.

Types. Gas Engines and Gas Producer Plants, Hugh Campbell. Inst. Mar. Engrs. —Trans., Mar. 1923, pp. 471-483 and (discussion) 483-496, 10 figs. Describes types of engines and gas plants.

Vertical. A Self-Contained Gas Power Unit. Power Engr., vol. 18, no. 203, Feb. 1923, pp. 52-63, 3 figs. Vertical gas engine suitable for running on town or producer gas, and with latter and generator forms self-contained power plant.

GARBAGE DISPOSAL

Incineration Plants. Garbage Incinerator at Chatham, Ont. Can. Engr., vol. 44, no. 12, Mar. 20, 1923, pp. 343-344, 2 figs. Garbage situation in Chatham; collection by-laws; design of top-feed two-cell 40-ton incinerator.

GAS PRODUCERS

Economical Design. A New Gas Producer. Engineer, vol. 135, no. 3510, Apr. 6, 1923, p. 364, 2 figs. New type of plant introduced by R. G. Syndicate consists of mechanically fed coal hopper, retort and producer; designed to secure higher thermal efficiency, obtain by-products more efficiently, and extend range of fuels available.

GASES

Compression, Hazards in. Safety Engineering in the Compression of Gases, A. D. Risteen. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 242-245. Outline of hazards associated with compression of gases in common use in industry, such as air, oxygen, nitrogen, argon, carbon dioxide, hydrogen, acetylene, ammonia, and chlorine.

GEAR CUTTING

Helical Gears. Quality Production of Double Helical Gears. Can. Machy., vol. 29, no. 6, Feb. 8, 1923, pp. 20-21 and 29, 8 figs. Essential features of cutting gears by hobbing process; cutting double-helical gears, calculations for tooth size and aligning teeth.

Herringbone Gears. Cutting Double Helical Herringbone Gears. Franklin D. Jones. Machy. (N.Y.), vol. 29, nos. 7 and 8, Mar. and Apr. 1923, pp. 548-553 and 613-616, 20 figs. Application of hobbing machines of single- and double-hop types. Duplex type of planer used for herringbone gears of large pitch; application of gear shapers and end-milling process.

Methods and Equipment. Quantity Production of Gears, C. A. Handschin. West. Machy. World, vol. 14, no. 3, Mar. 1923, pp. 83-84 and 89, 6 figs. Equipment and methods of gear-cutting department of C. L. Best Tractor Co.

GEARS

Ball-Friction. Transmission of Power Through Ball Friction Gearing, Carl G. Nordstrom. Am. Mach., vol. 58, no. 16, Apr. 19, 1923, pp. 592-593, 4 figs. Describes construction developed in Sweden by Gustav Rennerfelt.

Involute. Generating Involute Gear Teeth and Interference in Involute Gears. West. Machy. World, vol. 14, no. 3, Mar. 1923, pp. 85-86, 5 figs. Practice at Fellows Gear Shaper Co.

Normal Pitch as a Basic Factor in Computing Involute Gears, Ellsworth Sheldon. Am. Mach., vol. 58, no. 8, Feb. 22, 1923, pp. 285-287. Factor based upon parallelism of involutes; does away with many complications and takes account of profile errors as well as errors of spacing; normal pitch easy to measure.

Quality Control. Quality Control in Gear Manufacture, S. O. Bjornberg. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 623-626, 7 figs. Equipment employed for inspecting hob, hobbing machine, and finished gear.

GOLD DEPOSITS

Quebec. Prospects for Gold in Northwestern Quebec, Theo. C. Denis. Eng. and Min. Jl.-Press, vol. 115, no. 15, Apr. 14, 1923, pp. 674-675, 1 fig. Favourable geological features of Abitibi region; correlation with Ontario mining districts; prospecting; accessibility.

GRINDING

Regrinding Practice. Modern Regrinding Shop Practice, L. A. Hastings. Abrasive Industry, vol. 4, no. 3, Mar. 1923, pp. 70-73, 6 figs. Locating Cylinders for regrinding; selection of correct wheel; fitting oversize pistons and piston rings; importance of accurate work.

Modern Tools Regrind Auto Parts, Herbert T. Simonds. Abrasive Industry, vol. 4, no. 3, Mar. 1923, pp. 65-68, 6 figs. Equipment and methods for regrinding cylinders, crankshafts, etc.

Railway Shops. European Grinding Practice Being Extended. Ry. Mech. Eng., vol. 97, no. 4, Apr. 1923, pp. 236-239, 9 figs. Describes grinding machines and methods of proven value in British and Continental repair shops.

GRINDING MACHINES

Tools. The S. H. D. Automatic Universal Tool-Grinding Machine. Engineering, vol. 115, no. 2987, Mar. 30, 1923, pp. 396-397, 9 figs. Details of machine manufactured by Société des Anciens Établissements Hotchkiss et Cie, Paris.

H

HANGARS

Airplane, Reinforced Concrete. Reinforced Concrete Hangar for Airplanes, Constructed by the Aeronautical Department at Villacoublay (Hangar en béton armé, construit pour le Service technique de l'Aéronautique à Villacoublay [Seine et Oise]), André Lesage. Génie Civil, vol. 82, no. 10, Mar. 10, 1923, pp. 217-220, 13 figs., partly on supp. plate. Details of hangar and its equipment; two entrances, each 45 m. by 10 m., worked electrically; [illegible] surface.

HARDNESS

Scleroscope Test. The Scleroscope Hardness Test: A New Form of [illegible] Hammer, R. Gerdes. Inst. of Metals, advance paper [illegible] Mar. 7-8, 1923, 17 pp., 9 figs. [illegible] magnifier [illegible] in contour of striking portion of [illegible] are suggested. Bibliography.

HEALTH

PHYSIOLOGICAL REACTIONS TO HIGH TEMPERATURES. Some Physiological Reactions to High Temperatures and Humidities, W. J. McConnell and F. C. Houghten. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 2, Mar. 1923, pp. 131-163, 43 figs. Statement of what has been attained in present study and general reference to future work contemplated; description of facilities available and methods used, discussion of physiological findings of author's experiments.

HEAT TRANSMISSION

BUILDINGS. Heat Transmission through Building Structures, E. F. Mueller. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 2, Mar. 1923, pp. 69-73. Method and apparatus used in Bur. of Standards tests.

CALCULATION. Transfer of Heat, Terrell Croft. Combustion, vol. 8, no. 3, Mar. 1923, pp. 187-190, 4 figs. Thermal resistance and thermal conductance; transfer of heat by convection, and its many ways of utilization, i.e., in hot-water steam, and hot-air heating systems, ventilating systems, steam boilers, etc.; calculations.

HEATING

MACHINE SHOPS. Three Different Methods of Heating a Large Machine Shop, James Mackay. Domestic Eng. (Chicago), vol. 102, no. 11, Mar. 17, 1923, pp. 557-560, 8 figs. Notes with illustrations showing various methods of heating machine shop of brick construction.

HEATING, ELECTRIC

BUILDINGS. Electricity for Heating Buildings, C. Cordon Gale. Egn. Jl. (Eng. Inst. Can.), vol. 6, no. 4, Apr. 1923, pp. 183-185, 2 figs. Explanation of why general use of electrical energy for heating is impractical.

HEATING, HOT-AIR

DUCTS. Methods of Supporting and Erecting Ducts T. W. Reynolds. Heating and Vent. Mag., vol. 20, no. 3, Mar. 1923, pp. 46-47, 1 fig. Kind of material used for supports; how ducts are braced.

WASTE-HEAT UTILIZATION. Industrial Hygiene Plants and Utilization of Waste Hear (Gewerbehygienische Anlagen und Abwärmeausnutzung), Otto Brandt. Wärme, vol. 46, nos. 3 and 4, Jan. 19 and 26, 1923, pp. 25-27 and 39-41, 17 figs. Air conditions in winter; production of hot air by use of flue gas and waste steam; briquetting of scrap for fuel; unit and central heating; humidifiers; etc.

HEATING, HOT-WATER

MUSEUM. Heating and Ventilating U.S. Museum, C. R. Denmark. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 2, Mar. 1923, pp. 87-99, 8 figs. Details of forced hot-water circulation and air-exhaust systems in new museum building of natural history, Washington, D.C.

HEATING, HOUSE

FUEL-COSTS COMPARISON. House Heating with Gas Coal and Oil, H. D. Valentine. Am. Gas Jl., vol. 118, no. 15, Apr. 14, 1923, pp. 310-313, 4 figs. A seasonal cost comparison. Paper read before Ill. Gas Assn.

HEATING, STEAM

RADIATOR TRAPS. Tests of Radiator Traps, W. F. Stutz. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 2, Mar. 1923, pp. 78-86, 6 figs. Performance of eight types investigated and results compared.

VACUUM. Vacuum-Vapor Heating Systems, E. R. Pierce. Domestic Eng. (Chicago), vol. 101, nos. 11 and 13, Dec. 16 and 30, 1922 and vol. 102, nos. 1 and 4, Jan. 6 and 27, 1923, pp. 475-477, 573-576, 32-34 and 171-174, 25 figs. General history of growth of various types of vacuum, vacuum-vapour and straight vapour systems.

HIGHWAYS

DESIGN AND LOCATION. Economic Study of Highway Design and Location, O. L. Kipp. Eng. News-Rec., vol. 90, no. 16, Apr. 19, 1923, pp. 699-701. Consideration of distance, grades, alignment, width and surface in respect to cheap operation of motor vehicles. (Abstract.)

HOISTING ENGINES

REVERSIBLE. A Reversible Hoisting Engine. Practical Engr., vol. 67, no. 1878, Feb. 22, 1923, p. 101, 1 fig. Describes design developed by Rushworth Bros., Ltd., London, to meet need of moderately high-speed engine for general hoisting and crane work.

HOISTS

ELECTRIC. Electric Lifting Apparatus (Essai de classification des appareils de levage à courant électrique), H. Meuris. Revue Générale de l'Electricité, vol. 13, no. 5, Feb. 3, 1923, pp. 175-181, 11 figs. Different combinations of movement that can be effected; power required; comparison of electric motor and hydraulic motor.

HOUSES, CONCRETE

CONSTRUCTION. Can Concrete Houses be Popularized? J. C. Pearson. Contract Rec. and Eng. Rev., vol. 37, no. 12, Mar. 21, 1923, pp. 282-285. Advantages of concrete house; arguments against it; construction details.

HYDRAULIC PRESSES

LOCOMOTIVE AND CAR SHOPS. Hydraulic Presses for the Locomotive and Carriage Shops. Brit. Machine Tool Eng., vol. 2, no. 19, Jan.-Feb. 1923, pp. 587-591, 8 figs. Types of hydraulic presses for use in locomotive and car shops, produced by Fielding & Platt, Gloucester, England.

HYDRAULIC TURBINES

DEVELOPMENTS. Modern Hydraulic Turbines. Indian and Eastern Engr., vol. 51, nos. 5 and 6, Nov. and Dec. 1922, and vol. 52, no. 1, Jan. 1923, pp. 255-257, 311-314 and 29-31, 13 figs. Recent development in design of turbines as applied principally to hydro-electric work. Nov: Low-pressure turbines; draft tube known as hydraucone. Dec.: Francis turbines for moderate heads. Jan.: High-head Francis turbines.

Resent Progress in the Utilization of Hydraulic Power (Recents progrès dans l'utilization de la force hydraulique), E. Bergstrom. Annales de l'Energie, vol. 2, nos. 4, 5 and 6, July-Aug., Sept.-Oct. and Nov.-Dec. 1922, pp. 136-141, 178-183 and 217-220, 23 figs. Speed regulators for Francis turbines; characteristics and control of Pelton wheels, and examples of modern installations; low- and high-pressure conduits, of wood, concrete, and steel.

MACHINING SHAFTS. Making Shafts for Hydraulic Turbines, Howard Campbell. Am. Mach., vol. 58, no. 15, Apr. 12, 1923, pp. 557-558, 5 figs. Forging and machining operations on 24,000-hp. turbine shafts; inspection and assembly methods.

PERFORMANCE, ANALYSIS OF. The Hydraulic Turbine: Analysis of Performance, F. Johnstone Taylor. Elec. Times, vol. 58, no. 1639, Mar. 15, 1923, pp. 263-266, 9 figs. Characteristics, relations of power speed and discharge; discrepancies in head measurement, horsepower and performance; tests.

REGULATORS. Exploiting Small Water Power Resources (Vorschläge über die Ausnutzung kleiner Wasserkräfte), C. Rendl. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 21, Nov. 10, 1922, pp. 237-240, 5 figs. Describes Thomas automatic control device for d.c. turbine installations.

TYPES. Water Turbines and Their Principle, W. B. Roberts. Power House, vol. 16, no. 3, Feb. 5, 1923, pp. 25-29, 11 figs. Forces involved in converting head pressure into useful work, and means of effecting this through various types of turbines, practical installations.

HYDRO-ELECTRIC DEVELOPMENTS

CALIFORNIA. Preliminary Developments on a Hydro-Electric Project, H. K. Fox. Eng. News-Rec., vol. 90, no. 16, Apr. 19, 1923, pp. 696-698, 5 figs. 300,000-hp. system on Kings River in California begun with building of camps, roads, bridges, and gaging stations; winter quarters maintained by hydrographers.

HYDRO-ELECTRIC PLANTS

AUTOMATIC OPERATION. Station Operates Automatically. Power Plant Eng., vol. 27, no. 8, Apr. 15, 1923, pp. 403-407, 9 figs. New England Power Co. 500-kva. hydro-electric station at Wilmington, Vermont, designed for complete automatic operation; station started up by time clock or by level of storage pond.

SMALL-HEAD. Exploiting Small Water Power Resources (Vorschläge über die Ausnutzung kleiner Wasserkräfte), R. Bosselmann. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 15, Aug. 10, 1922, pp. 157-160, 4 figs. Gives two examples of installations of independent d.c. plants with storage batteries, driven by water power.

I

ICE PLANTS

FREEZING TANKS. Heat Transfer in the Freezing Tank, H. I. Lewis. Ice and Refrigeration, vol. 64, no. 3, Mar. 1923, pp. 197-202, 10 figs. Heat and work; heat transference; brine agitation and flow; relation of heat transmission and brine circulation; relation of compressor and brine-circulation power.

OIL-ENGINE-DRIVEN. Ice-Making Economy with Oil Engines. Oil Engine Power, vol. 1, no. 3, Mar. 1923, pp. 117-122, 6 figs. Describes oil-engine-driven ice plant in Jersey City, N.J., of Feigenspan Corp.; normal daily capacity of 200 tons of ice; performance of the two 300-b. h.p. and two 150-b. hp. twin-cylinder horizontal-type De La Vergne engines and ammonia compressors.

STEAM-DRIVEN. A Steam Driven Ice Plant, A. J. Volk. Refrig. World, vol. 58, no. 3, Mar. 1923, pp. 18-20, 1 fig. Cost of making ice in plant of Hudson Consumers Ice Co., Hoboken, N.J.; satisfactory results obtained.

INDUSTRIAL MANAGEMENT

ASSEMBLING METHODS. Methods Used in Assembling Sweepers, Fred. H. Colvin. Am. Mach., vol. 58, no. 8, Feb. 22, 1923, pp. 281-283, 7 figs. Layout of assembly departments with modern conveying apparatus; running motors on assembly trucks; securing co-operation by group-bonus method. Practice of Hoover Suction Sweeper Co.

ENGINEERING DEPARTMENT. The Successful Operation of an Engineering Department, W. E. Irish. Indus. Management (N.Y.), vol. 65, no. 4, Apr. 1923, pp. 225-231. Meeting emergencies.

ENGINEERING SPECIFICATIONS. Co-ordinating the Bill of Materials With Shop Requirements, G. G. Thompson. Am. Mach., vol. 58, no. 12, Mar. 22, 1923, pp. 451-454, 2 figs. Intelligent sub-assembly grouping and numbering simplifies shop methods; card file more flexible than materials sheet; chances of error and waste reduced.

ORGANIZING AND DIRECTING. The Three Divisions of Management, Joseph Mayer. Management Eng., vol. 4, no. 4, Apr. 1923, pp. 255-257, 1 fig. Organizing, preparing and directing.

PRINCIPLES. The Principles of Organization and Management, Wallace Attwood. Indus. Management (Lond.), vol. 9, nos. 4, 5, 6 and 7, Feb. 22, Mar. 8, 22 and Apr. 5, 1923, pp. 109-111, 137-139, 174-176 and 202-204, 2 figs. Indication of main points that must be borne in mind when building up efficient organization. Paper read before Instn. Production Engrs.

PRODUCTION METHODS. Works Production, G. H. Nelson. Instn. Elec. Engrs.—Jl., vol. 61, no. 316, Mar. 1923, pp. 338-352 and (discussion) 352-362, 5 figs. Describes system of organization successfully employed in works for manufacture of electrical machinery.

See also Cost Accounting; Motion Study.

INDUSTRIAL RELATIONS

PROPAGANDA THROUGH HOUSE ORGAN. How Workers React to Propaganda, Verne E. Burnett. Indus. Management (N.Y.), vol. 65, no. 4, Apr. 1923, pp. 250-253. Plant house publication as barometer.

INLAND WATERWAYS

FUNCTIONS. The Functions of Inland Waterways in the National Transport Service, Frank Rayner. Inst. Transport — Jl., vol. 4, no. 3, Jan. 1923, pp. 114-118 and (discussion) 118-119. Author summarizes functions of inland waterways.

INSULATORS, HEAT

STEAM-PIPE COVERING. Heat Insulation Applied to Steam Pipes (Les calorifuges appliqués aux tuyaux de vapeur), H. Carra. Chaleur et Industrie, vol. 4, no. 34, Feb. 1923, pp. 129-136, 14 figs. Losses due to absence of insulation; detailed explanation of proper choice of insulation for given case.

INTERNAL-COMBUSTION ENGINES

DETONATION. Laws Concerning Gaseous Detonation, Thomas Midgley, Jr. and Robert Janeway. Soc. Automotive Engrs.—Jl., vol. 12, no. 4, Apr. 1923, pp. 367-373, 12 figs. Explanation of gaseous detonation based upon what are considered incontrovertible laws. Mathematical determination of critical pressure of detonation.

FUEL PROBLEMS. Raindrops and Engineering, G. B. Upton. Sibley Jl., Eng., vol. 37 nos. 1, 2 and 3, Jan. Feb. and Mar., 1923, pp. 2-7 and 9, 32-36, and 60-63 and 65; 1 fig. Points out that laws which control size of rain drop in air supply equally well to moisture drops in steam, to gasoline and oil drops in air in internal-combustion engines, etc. Feb. Carburetion of internal-combustion engines. Mar.: Direct or "solid" injection of fuel for internal-combustion engines.

HEAVY-FUEL UTILIZATION. The Present Status and Probable Development of Internal-Combustion Engines to Consume Heavy Fuels. Oil Engine Power, vol. 1, nos. 2 and 3, Feb. and Mar. 1923, pp. 89-91 and 95-99, and 134-136 and 141, 2 figs. Paper on "How the Problem Looks to Me," by Henry L. Doherty, read before third annual meeting of Am. Petroleum Inst., and remarks by others, which include experience with fuels, effect of sulphur, overcoming peculiarities of heavy fuels, reliability of Diesel engines, capacities and efficiencies, heavy-oil engine for automobile use, etc.

High Compression. Internal-Combustion Engine Characteristics under High Compression. Soc. Automotive Engrs. — Jl., vol. 12, no. 4, Apr. 1923, pp. 354-358. Discussion of paper by J. H. Holloway, H. A. Huebotter and G. A. Young, published in Jan. 1923 issue.

Vegetable Oil, Fuel. Vegetable Oils in Internal-Combustion Engines (Utilisation des huiles végétales dans les moteurs à combustion interne), L. A. Charles. Chaleur et Industrie, vol. 4, no. 34, Feb. 1923, pp. 125-128, 4 figs. Difference in combustion of vegetable oils; application to Diesel engines; advantages of mechanical over solid injection; results of tests.

See also Automobile Engines; Diesel Engines; Oil Engines.

IRON ALLOYS

Iron-Arsenic. Contribution to the Study of Iron-Arsenic Alloys (Beitrag zur Kenntnis der Eisen-Arsen-Legierungen), P. Oberhoffer and A. Gallaschik. Stahl. u. Eisen, vol. 43, no. 12, Mar. 22, 1923, pp. 398-400, 6 figs. Investigation of diagram of state of alloys with 0 to 8 per cent arsenic.

IRON AND STEEL

Corrosion and Oxidation. Corrosion and Oxidation of Iron and Steel, T. S. Fuller. Power House, vol. 16, no. 5, Mar. 5, 1923, pp. 30-31. Cause of corrosion, showing some earlier theories advanced to account for phenomena; composition of metal has much to do with this action.

Corrosion-Resisting. Corrosion-Resisting Irons and Steels, James A. Aupperle. Cehm and Met. Eng., vol. 28, no. 15, Apr. 16, 1923, pp. 681-682. Discussion of corrosion resistance of pure iron, chromium steel and silicon cast irons. See also articles by Pierce D. Schenck, entitled Acid-Resisting Irons, p. 678, 3 figs.

IRON CASTINGS

Defects. Surface and Internal Defects in Iron Castings. J. E. Fletcher. Foundry Trade Jl., vol. 27, nos. 342 and 344, Mar. 8 and 22, 1923, pp. 200-201 and 235-236 and (discussion) 236-237. Their relationship, cause and cure.

Electric-Furnace Iron for. Advantages of Basic Electric-Furnace Iron for Castings to Resist Abrasion, Larry J. Barton. Eng. and Min. Jl.-Press, vol. 115, no. 14, Apr. 7, 1923, pp. 628-630, 2 figs. So-called synthetic iron, made in electric furnace, said to be much more satisfactory for crusher jaws, ball-mill liners, roll shells, and other parts.

Gray Iron. Some Notes on Grey-Iron Castings, M. Benbow. Foundry Trade Jl., vol. 27, no. 345, Mar. 29, 1923, p. 250. Notes on pouring cylindrical castings; casting temperatures; surface defects; cupola troubles; core oils and sands.

Test Bars. The Value and Relation of Test-Bars to Castings, S. G. Smith. Foundry Trade Jl., vol. 27, no. 345, Mar. 29, 1923, pp. 248-250. Admiralty and other specifications; test pieces for fuse bodies; standard test bars.

Tunnel Segments. Tunnel Segments Big Contract. Foundry, vol. 51, no. 7, Apr. 1, 1923, pp. 260-263, 8 figs. Manufacture of gray-iron and steel castings for lining of Hudson River vehicular tunnel. See also article entitled Jolt Machines Mold Segment Castings, in same issue, pp. 263-267, 4 figs., describing molding of cast-iron segments for vehicular tunnel on jolt ram machines.

IRON, PIG

Shipping Methods. How Britons Ship Pig Iron to U.S. Iron Trade Rev., vol. 72, no. 12, Mar. 22, 1923, pp. 871-873, 6 figs. Details of handling and shipping arrangements at ports of Middlesborough, Barrow-in-Furness, and Glasgow.

L

LABOUR

Hours of Work. The Eight-Hour Day and Its Effect on Production (La journée de huit heures et sa répercussion sur la production), Henri Poncay. Génie Civil, vol. 82, nos. 6 and 7, Feb. 10 and 17, 1923, pp. 133-136 and 156-159. Historic Review; conditions in coal mines, metallurgy, mechanical construction, railways, navigation, and public works; changes demanded.

LABORATORIES

Hydraulic. The Hydraulic Laboratory of the University of Wisconsin, Charles I. Corp. Wis. Engrs., vol. 27, no. 5, Feb. 1923, pp. 83-85 and 94, 7 figs. Purpose of laboratory is to give instruction and conduct investigation; features of design; water supply; equipment.

Metallurgical. Description of a Modern Metallurgical Laboratory, Richard Rimbach. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, pp. 163-165, 10 figs. Research Bureau Laboratory of Standard Steel Car Co. completely equipped for physical, chemical and microscopic examinations; equipment.

Research. New Research Laboratories of the General Electric Co., Ltd. Elec. Ry. and Tramway Jl., vol. 48, no. 1174, Mar. 9, 1923, pp. 111-114, 9 figs. Describes buildings, layout, lighting equipment, laboratory factory, workshops, research work and routine tests.

LIGHTING

Chart for Designing Illumination. Nomographic Chart for Designing Illumination, Emil Kun. Elec. World, vol. 81, no. 14, Apr. 7, 1923, pp. 801-803, 1 fig. Applicable to direct or indirect illumination, using photometric curve of fixture or intensity readings in one plane.

Bibliography. Bibliography of Lighting Articles in the Proceedings of the N.E.L.A., J. Carl Fischer. Nat. Elec. Light Assn. Bul., vol. 9, no. 10, Oct. 1922, pp. 621-623.

LIGNITE

Locomotive Fuel. Brown Coals and Peat as Locomotive Fuels (Braunkohle und Torf als Lokomotivbrennstoffe), H. Landsberg. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 11, Mar. 17, 1923, pp. 263-264. Production and preparation of fuels, grinding and handling of pulverized fuel, conveyance and firing of fuel on locomotive.

Utilization. The Utilization of Lignite Coal, Bancroft Gore. Black Hills Engr. (Formerly Pahasapa Quarterly), vol. 11, no. 2, Mar. 1923, pp. 84-126, 27 figs., partly on p. 127. Review of fuel situation in South Dakota, experiments made at Mining Experiment Station burning lignite in dried and undried dust form to determine best combustion conditions; use of unit pulverizers; upgrading of lignite at mine by crushing, followed by drying and removal of dust on impact screens, is important factor in adopting this fuel for domestic and industrial purposes.

LIMESTONE

Crushing Plant. World's Largest Combination Flux and Commercial Crushing Plant. Concrete Cement (Mill Section), vol. 22, no. 2, Feb. 1923, pp. 118-125, 14 figs. Double-unit plant of Kelley Island Lime and Transport Co. to have capacity of 10,000 tons in 8 hr. Details of quarry and quarry operation, primary breakers, pan conveyors, screens, etc.

LIQUIDS

Inflammable, Mechanical Handling. Handling of Inflammable Liquids (La manipulation des liquides inflammables), J. Philippe. Ouvrier Moderne, vol. 5, no. 12, Mar. 1923, pp. 477-497, 19 figs. Present methods of storing gasoline; automatic handling; describes principal types of apparatus used, including Martini & Hüneke, Mauclere, By-water, Gilbert & Barker, and Hardoll.

LOCOMOTIVES

Development. Locomotive Development. Times Trade and Eng. Supp., vol. 11, no. 242, Feb. 24, 1923, p. 567. Importance of boiler capacity; influence of load cage; recent designs; advantage of Pacific type.

Diesel-Electric. Railway Traction by Means of Diesel-Electric Locomotives (La traction ferroviaire par locomotives Electro-Diesel), J. Boudet. Vie Technique et Industrielle, vol. 4, no. 39, Dec. 1922, and vol. 5, nos. 40 and 41, Jan. and Feb. 1923, pp. 161-168, 232-236 and 299-304, 15 figs. Construction, equipment and operation of Diesel-electric locomotives on Swedish railways, Diesel-electric on railways in Saxony; Italian Diesel-electric locomotives of 1200 hp. four stroke, and 2000 hp. two stroke, comparison of steam and electric traction.

Electric. *See Electric Locomotives.*

Fuel Determination. Some Fuel Determinations Made on Locomotives Operated by the Southern Pacific System, A. H. Babcock. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 335-342, 6 figs. Study of track over Tehachapi Pass.

Geared. Willamette Geared Locomotives. Ry. Age, vol. 74, no. 16, Mar. 24, 1923, p. 808, 1 fig. Details of locomotives built for logging purposes, with side drive and 3-cylinder vertical engine capable of developing 900 hp.

Superheated. Converting Locomotives for Superheated Steam. Ry. Gaz., vol. 38, no. 12, Mar. 23, 1923, pp. 490-493, 8 figs. Experience on Great Northern Ry., Ireland.

The German Standard 2-10-0 Type Three Cylinder Locomotive, Desider Ledacs Kiss. Ry. and Locomotive Eng., vol. 36, no. 4, Apr. 1923, pp. 99-101, 3 figs. Standard consolidation-type freight engine is equipped with Schmidt superheater and feedwater preheater.

Superheater Tank. Superheater Tank Locomotives in Suburban Service, F. W. Brewer. Engineer, vol. 135, no. 3506, Mar. 9, 1923, pp. 255-256. Discussion of economic value.

Tank. Heavy Tank Locomotives for Working Coal Traffic on the South Maitland Railways of New South Wales. Ry. Gaz., vol. 38, no. 11, Mar. 16, 1923, p. 460, 2 figs. Develop tractive effort of 27,300 lb. at 75 per cent of boiler pressure which is 180 lb. per sq. in.

LOOMS

Mechanisms. Looms, Driving Reversing, Stopping and Starting, and Loom Shedding-Mechanism and Pattern Cards, Chains, Surfaces, and the Like. Abridgments of Specifications, class 142 (i), period 1909-15, 1923, 178 pp. Patents for inventions.

LUBRICANTS

Graphite. Recent Developments in Lubrication with Special Reference to Graphite, J. Thomas. Min. and Geol. Inst. of India — Trans., vol. 17, part 2, Nov. 1922, pp. 93-109 and (discussion) 190-113, 7 figs., partly on supp. plates. Notes on friction, liquid, solid and semi-solid lubricants; celloid solid lubricants; advantages of graphite as lubricant.

LUBRICATION

Researches. Some Recent Researches on Lubrication, T. E. Stanton. Instn. Mech. Engrs. — Proc., vol. 2, no. 6, Dec. 1922, pp. 1117-1145, 8 figs. Present position of problem; review of Reynolds theory; experimental investigation of characteristics of cylindrical journal lubrication under limiting conditions of pressure; conclusions based on tests.

M

MACHINE SHOPS

Analytical Data, U.S. Seeing Ourselves Through the Census. Am. Mach. vol. 58, no. 16, Apr. 19, 1923, pp. 585-588, 5 figs. Analytical data on machine shops and foundries, and steam-railway repair shops; graphical work of Nat. Indus. Conference Board.

MACHINE TOOLS

Chain Drive. Application of Chain Drives to Machine Tools. Can. Machy., vol. 29, no. 11, Mar. 15, 1923, pp. 20-22, 8 figs. Typical example of chain-drive efficiency; direct drives from motor to machine, and drive from lineshaft to machine; proper care.

Design. Methods of Machine Tool Design, A. L. DeLeeuw. Am. Mach. vol. 58, no. 8, Mar. 22, 1923, pp. 297-300, 8 figs. Use of hydraulic and pneumatic devices in feed mechanisms; friction drives of simple and complex design; Sellers friction.

Drive of Reciprocating Members. Weight and Spring-Driven Reciprocating Members, W. R. Gilpin. Machy. (Lond.), vol. 21, no. 546, Mar. 15, 1923, pp. 746-747, 1 fig. Advantages of weight drive: (1) uniform pull, (2) simplicity of application, (3) durability, advantages of spring drive: (1) comparative absence of inertia; (2) rapidity of action; (3) convenience of application.

Hydraulic-Transmission Drive. Hydraulic-Transmission Variable-Speed Drive for Machine Tools and Manufacturing Processes, Walter Ferris. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 238-241 and (discussion) 241 and 245, 10 figs. Application of Oilgear transmission to machine-tool driving, broaching, hydraulic presses, etc. (Abridged.)

Large. Design and Construction of Large Machine Tools, Geo. H. Benzon, Jr. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 215-219, 8 figs. Limitations imposed on design by materials and available shop equipment, problems involved in design and construction of large boring mills and planers.

MACHINERY

Experimental, Controlling Costs of. Controlling Costs in Building Experimental Machines, Fred H. Colvin. Am. Mach., vol. 58, nos. 12, 14 and 16, Mar. 22, Apr. 5 and 19, 1923, pp. 429-431, 503-507 and 589-591, 20 figs. Method that saves expensive shopwork, prepares for future manufacture, and shows and controls costs at all times. Apr. 5: How tools were decided upon and operation times set, system of low cost pictorial drawings. Apr. 19: How engineering changes are recorded, stock lists and complete record of all departments.

Holland, Manufacture in. The Dutch Machine Manufacturer, Henry Obermeyer and Arthur L. Greene. Am. Mach., vol. 58, no. 14, Apr. 5, 1923, pp. 521-524, 4 figs. Overcoming natural obstacles and solving contemporary problems in Holland. Diesel-engine construction; labour problems.

Wage Cost of. The Wages Paid to Machinery, Warren B. Lewis. Indus. Management (N.Y.), vol. 65, no. 4, Apr. 1923, pp. 240-242. Discussion of element of manufacturing cost which, it is claimed, is too often overlooked.

MAGNESIUM ALLOYS

MECHANICAL PROPERTIES. The Mechanical Properties of Magnesium Alloys, Leslie Aitchison. Inst. of Metals advance paper, no. 1, for meeting Mar. 7-8, 1923, 5 pp., 2 figs. Results of tests made upon electron metal and various other alloys of magnesium. See also (abstract in Metal Industry, vol. 22, no. 10, Mar 9, 1923, pp. 222-223, 2 figs.

MAGNESITE

MINING AND USES. Mining and Utilization of Magnetite. Pacific Min. News of Eng. and Min. Jl.-Press, vol. 2, no. 2, Feb. 1923, pp. 33-38, 7 figs. Mining operations in California; methods of using and properties of plastic magnesite products; uses in building construction.

MALLEABLE IRON

ELECTRIC PRODUCTION. Malleable Cast Iron and Its production in the Electric Furnace, E. F. Collins. Nat. Elec. Light Assn. Bul., vol. 9, no. 11, Nov. 1922, pp. 699-702, 4 figs. General nature of malleable iron and laws governing its production; advantages which electric heat offers malleable iron foundryman.

MAPPING

AERIAL PHOTOGRAPHY. Application of Aerial Photographs to Map Making, Douglas H. Nelles. Can. Engr., vol. 44, no. 11, Mar. 13, 1923, pp. 309-315, 9 figs. Application of aerial photography to making of city maps. Main factors to be considered in transferring data from aerial photo to city map; details of complete list of definitions as defined by British Aerial Surveying Committee.

MARINE STEAM TURBINES

MECHANICAL GEARING. Mechanical Gearing, Charles A. Parsons, Stanley S. Cook and H. M. Duncan. Engineering, vol. 115, no. 2987, Mar. 30, 1923, pp. 408-411, 7 figs. Based on experiments, it is concluded that oil quenching of large masses of nickel steel introduces risks of cracks and excessive strains and should be discontinued for turbine gears; consideration of effect of error in cutting of teeth. (Abstract.) Paper read before Instn. Nav. Architects. See also Engineer, vol. 135, no. 3509, Mar. 30, pp. 349-650.

METALS

COLD WORKING. Essential Factors in Cold Working and Recrystallization According to Tests on Metallic Bodies From Powdered Material (Ueber die wesentlichen Faktoren bei Kaltbearbeitung und Rekristallisation nach Versuchen an metallischen Körpern aus pulverförmigem Material), F. Sauerwald. Zeit. für Elektrochemie, vol. 29, no. 2, Feb. 1, 1923, pp. 79-85. Grain growth; crystallization process after cold working; iron and copper.

The Modulus of Direct Elasticity of Cold-Drawn Metals as a Function of Annealing Temperature, F. C. Lea, V. A. Collins and E. A. F. Reeve. Am. Inst. of Metals advance paper, no. 14, for meeting Mar. 7-8, 1923, 17 pp., 7 figs. Experiments on brass tubes; comparison of results with similar results for steel tubes. Includes appendix dealing with annealing of tubes.

DEFORMATION AND FRACTURE. Permanent Deformation and Fracture of Metals by Elongation or Compression (Sur les déformations permanentes et les cassures des métaux par traction ou compression), A.-H. Leblond. Technique Moderne, vol. 15, no. 1, Jan. 1, 1923, pp. 7-11, 24 figs. Results of experiments with test bar of steel, cast iron, brass, and bronze.

FATIGUE. Fatigue in Metals, C. F. Jenkin. Roy. Aeronautical Soc. — Jl., vol. 27, no. 147, Mar. 1923, pp. 89-99 and (discussion) 99-104, 12 figs. Account of Author's experiments with a model.

HIGH-TEMPERATURE. Metals for High Temperature, F. A. Fahrenwald. Chem. and Met. Eng., vol. 28, no. 15, Apr. 16, 1923, pp. 680-681. Points out that no one alloy can be used as standard; each has its limitations which must be appreciated in order to ward off failure; discusses mechanical properties at high temperatures.

OXIDATION. The Oxidation of Metals at High Temperatures, N. B. Pilling and R. E. Bedworth. Am. Inst. of Metals advance paper, no. 17, for meeting Mar. 7-8, 1923, 54 pp., 53 figs. Oxidation a phase of corrosion; oxidation reaction; classification of metals; study of typical metals of known purity.

RADIOGRAPHIC TESTING. Radiography of Metals, H. H. Lester. Army Ordnance, vol. 3, no. 16, Jan.-Feb. 1923, pp. 210-215, 10 figs. Method of radiographic testing of metals.

MICROSCOPES

RESEARCH. A New English Model Research Microscope, J. H. Barton. English Mechanic and World of Sci., vol. 117, no. 3021, Feb. 16, 1923, pp. 45-47, 1 fig. Describes new form designed by author which includes means for rapidly changing condensers without necessity of recentring, means for retaining optical centre, etc.

MILLING CUTTERS

STELLITE. Stellite Cutters for Milling, C. W. Metxger. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 589-593, 13 figs. Design of cutters for milling different metals, and directions for grinding clearance on teeth.

TIME-SAVING. Time-Saving Milling Cutters. Eng. Progress, vol. 4, no. 4, Apr. 1923, p. 78, 4 figs. Describes milling cutters, in which cutting teeth are backed off, so that they will not lose their shape when being reground.

MINERAL RESOURCES

BRITISH COLUMBIA. The Salmon River District of British Columbia and Contiguous Alaska, George J. Young. Pacific Min. News of Eng. and Min. Jl.-Press, vol. 1, no. 8, Dec. 1922 and vol. 2, no. 1, Jan. 1923, pp. 225-230 and 10-14, 15 figs. Region offers promise of success to experienced prospectors; bonanza discoveries incite activity; geology of region; history of important mining events and description of properties.

MINERALS

FELDSPAR. The Marketing of Feldspar, Arthur S. Watts. Eng. and Min. Jl.—Press, vol. 115, no. 12, Mar. 24, 1923, pp. 535-538. Varieties produced in United States; principal producing centers of crude feldspar; situation of grinding mills; annual consumption; grades of feldspar.

MONEL METAL

ANNEALING. Annealing Monel Metal. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, p. 150. Directions and suggestions.

CORROSION-RESISTING PROPERTIES. Nickel and Monel Metal, R. J. McKay. Chem. and Met. Eng., vol. 28, no. 15, Apr. 16, 1923, pp. 686-687. Properties which give these metals unique value in corrosion resisting work.

MOTION STUDY

REPETITIVE PROCESSES. Rhythm in Machine Processes, A. Whitehead. Indus. Management (Lond.), vol. 9, no. 6, Mar. 22, 1923, pp. 169-173, 4 figs. Deals with application of motion study to engineering operation, particularly with regard to repetitive processes; how rhythm makes for and sustains operating speed is shown in charts.

MOTOR BUSSES

GASOLINE-ELECTRIC. A New Petrol-Electric 2-Tonner. Motor Transport, vol. 36, no. 938, Feb. 19, 1923, p. 239. 1 fig. Combination of Thornycroft B. T. chassis and Stevens electric transmission, specially suitable for passenger-carrying services.

MOTOR SLEDS

DESIGN. The Problem of Motor Sleds. (Das Problem des Motorschlittens), H. Schiebler. Motor-wagen, vol. 25, nos. 11, 12, 13, 15 and 18, Apr. 20, 30, May 10, 31, and June 30, 1922, pp. 203-208, 225-232, 250-258, 291-294, 350-357, and vol. 26, nos. 1, 2, 3 and 6, Jan. 10, 20, 31 and Feb. 28, 1923, pp. 1-7, 25-28, 35-41 and 81-87, 192 figs. Second part of articles published in same journal in 1921 and 1922. (See Eng. Index 1922, p. 435 for reference). Contains suggestions for combination boat sleds, airplane and automobile sleighs.

N

NITRATE PLANTS

MUSCLE SHOALS, ALA. The Muscle Shoals Nitrate Plant, John E. Clement. Army Ordnance, vol. 3, no. 16, Jan.-Feb. 1923, pp. 215-218. Its relation to nitrogen supply.

NON-FERROUS METALS

SCRAP. The Status of Secondary Non-Ferrous Metals, W. M. Corse. Raw Materials, vol. 6, no. 4, Apr. 1923, pp. 136-137. Notes on practical non-ferrous scrap metallurgy; work of Navy Dept. in scientific utilization of scrap metals.

NOZZLES

STEAM, ACTION OF. First Report of the Steam-Nozzles Research Committee. Instn. Mech. Engrs. — Proc., no. 1, Jan. 1923, pp. 1-22, 12 figs. Account and results of experiments relating to action of steam passing through nozzles and steam turbines.

O

OIL

CRACKING PROCESS. Results of Cracking Panuco Topped Crude by the Dubbs Process, Gustav Egloff. Nat. Petroleum News, vol. 15, no. 12, Mar. 21, 1923, pp. 35 and 37, 1 fig. Consists in cracking heavy oils by means of distillation and condensation under pressure of generated hydrocarbon vapors and continuous return of reflux condensed oil mixed with raw charging stock to heating coil; principles of process; Dubbs apparatus.

OIL ENGINES

BRITISH INDUSTRY. Stationary Oil-Engine Industry in Great Britain, J. L. Chaloner. Oil Engine Power, vol. 1, no. 3, Mar. 1923, pp. 147-150. Review of pretent situation and progress to date; 34 manufacturers and 64 designs.

HIGH-SPEED. High-Speed Oil Engines, J. L. Chaloner. Automobile Engr., vol. 13, no. 174, Mar. 1923, pp. 84-95, 22 figs. Suggested system of classification of liquid-fuel internal-combustion engines. Internal combustion. High-speed oil engines; designing data; constructional details; power and test records; automobile oil engine. Fuel specification in light of oil-engine practice. (Abstract).

MARINE. Some Types of Marine Oil-Engines, E. T. Vincent. Instn. Mech. Engrs. — Proc., no. 1, Jan. 1923, pp. 37-45. 3 figs. Deals with Doxford, Cammellaird-Fullagar, and particularly with Still engines.

SLOW-SPEED. 1600 B.H.P. Four Cycle Engine of the Maschinenfabric Augsburg-Nürnberg (MAN), Augsburg Works. Eng. Progress, vol. 4, no. 3, Mar. 1923, pp. 45-50, 7 figs. Low- vs. high-speed engines; power and design of low-speed engines; working piston; valves and pumps; engine control; test results: vibration and strain tests.

OIL FIELDS

SAFETY DEVICES. "Safety First" in the Oilfields. Petroleum Times, vol. 9, no. 2, Mar. 17, 1923, pp. 375-376, 4 figs. Devices by Nat. Supply Corp. for protection of drillers and derrick crews.

SAMPLING. Oil-Field Sampling, Ernest R. Lilley. Eng. and Min. Jl.—Press, vol 115, no. 13, Mar. 31, 1923, pp. 581-586, 5 figs. Methods and equipment employed; coring devices preferred.

OIL FUEL

ANALYSIS AND TREATMENT. Examination, Treatment and Characteristics of Fuel Oils (Beurteilung, Behandlung und Charakteristik der Heizöle), Franz Stanek. Feuerungstechnik, vol. 11, no. 6, Dec. 15, 1923, pp. 61-65, 2 figs. Methods of investigation; storage, products of anthracite and lignite tar.

BURNERS. The Automatically-Controlled Cuenod Burner for Liquid Fuels (Brûleur "Cuénod" à réglage automatique pour combustible liquide). Bul. Technique de la Suisse Romande, vol. 49, no. 6, Mar. 17, 1923, pp. 65-70, 3 figs. Manufactured by H. Cuenod at Geneve-Chatelaine; details of design and construction. See also Génie Civil, vol. 82, no. 12, Mar. 24, 1923, pp. 284-285, 1 fig.

HANDLING BULK QUANTITIES. Handling Bulk Quantities of Fuel Oils, Robert June. Power Plant Eng., vol. 27, no. 7, Apr. 1, 1923, pp. 366-367, 2 figs. Piping arrangements, heating, pumping and measuring facilities that have proved successful.

INSTALLATIONS. How to Install and Operate a Fuel Oil System, James D. Lalor. Am. Ceramic Soc. — Jl., vol. 6, no. 2, Feb. 1923, pp. 448-459 and (discussion) 459-461, 9 figs. How to install fuel-oil system to meet requirements of Board of Fire Underwriters so as to obtain lowest rate of insurance on plant and insuring continuous operation; proper type of system to install to insure good product with lowest possible expenditure of power and fuel.

OIL SHALES

STATISTICS 1922. Oil Shale, Victor G. Alderson. Colo. School of Mines — Quarterly, supp. B., vol 18, no. 1, Jan 1923, 28 pp. 1 fig. Resume for 1922. World deposits and production. Oil-Shale bibliography for 1922.

OIL WELLS

POWER-EQUIPMENT. Power Equipment for Drilling and Producing Oil Wells, H. A. Godde and W. L. Williams. Cal. Oil Fields, vol. 8, no. 4, Oct. 1923, pp. 5-21, 5 figs. Comparative merits of use of steam, gas and electricity.

OPEN-HEARTH FURNACES

MANGANESE, BEHAVIOR OF. The Behavior of Manganese in the Basic Open-Hearth Process (Das Verhalten des Mangans im basischen Herdfrischverfahren), Paul Oberhoffer and Fritz Koerber. Stahl u. Eisen, vol. 43, no. 10, Mar. 8, 1923, pp. 329-334, 7 figs. Return of manganese from slag to bath; influence of basicity of slag, ore addition, quantity and form of manganese in charge, and of carbon content in bath; dependence of period of melting and temperature increase of bath on carbon content; dependence of strength and expansion on casting temperature. Results of tests.

Railroad Castings. Making Steel in Java. Iron Age, vol. 111, no. 12, Mar. 22, 1923, p. 820, 3 figs. Open-hearth plant at Batavia utilizing scrap principally for railroad castings; surplus sold partly for forging work.

ORE DRESSING

Hydraulic Separation. The Principles of Hydraulic Separation, Edmund Shaw. Rock Products, vol. 26, no. 5, Mar. 10, 1923, pp. 82-84, 6 figs. Discusses three principal ways of applying current of water to separate grains into different sizes, viz., top or surface current, rising current, and special form of rising current called hydraulic water.

OVERVOLTAGES

Protection. Protection Against Overvoltages in the Iron and Steel Industry, H. M. Towne. Iron and Steel Elec. Engrs. — Assn., vol. 5, no. 3, Mar. 1923, pp. 49-65 and (discussion) 65-86. Causes of overvoltage; condition found on iron and steel electric systems, and relation of these conditions to possible hazard by overvoltage and to class of protective equipment needed; characteristics and design of lightning arresters; ground connection.

OXYGEN

Manufacture, Electrolytic. Electrolytic Oxygen-Hydrogen Production, Eric A. Lof. Chem. Age. (N.Y.), vol. 31, no. 3, Mar. 1923, pp. 109-114, 4 figs. Use of oxygen and hydrogen; electrolytic process; current and voltage characteristics; type and capacity of cells; power supply; control equipment; procedure of operation.

OXY-ACETYLENE WELDING

Essentials of. Fusion Welding — Getting Results, H. S. Card. Car Foremen's Assn. of Chicago — Official Proc., vol. 17, no. 5, Feb. 1923, pp. 34, 37-40, 43-46, 49-52, 55-58, 61-63 and (discussion) 63-64 67-70 and 73-74, 7 figs. Essentials to good oxy-acetylene welding; preparing weld; causes and remedies of most common defects; oxygen and acetylene cylinders; regulators and torches; annealing.

OZONE

Ozonizers. Ozone and Ozonizers, F. E. Hartman. Chem. Age, (N.Y.), vol. 31, no. 3, Mar. 1923, pp. 125-129, 8 figs. Ozone as a disinfectant; disinfection of water; vital factors in design and operation of water ozonizers; ozone generator; application of ozone to industrial and research chemistry.

P

PAINTS

Furfural as Paint Remover. Notes on Furfural, Henry A. Gardner. Paint Mfrs.' Assn. of U.S. and Nat. Varnish Mfrs.' Assn. — Circular, no. 171, Feb. 1923, pp. 140-147, 2 figs. Its use as paint and varnish remover.

PAPER MANUFACTURE

Hollander Operation. Practical Notes on Hollander Operation. Paper, vol. 31, no. 22, Mar. 21, 1923, pp. 7-10. Effect of quality of raw materials on power consumption; method of comparing efficiency of different hollanders; factors in construction of engines which have had effects on power and quality of product. From Wochenblatt für Papierfabrikant. 1922, pp. 3775-3778.

Pulp, Strength Testing. The Determination of the Effect of Pressure on the Strength of Test Sheets in the Strentgh Testing of Pulp, E. P. Cameron. Paper Mill, vol. 47, no. 6, Feb. 10, 1923, pp. 14, 16, 18, 20, 38 and 40, 13 figs. From results of series of tests, it seems imperative that basis weight of test sheets used and pressure applied in their formation should be accurately specified in any standard method for testing of pulp strength. Paper read before Can. Pulp and Paper Assn.

Rubber Latex in. Use of Rubber in Making Paper, Ismar Ginsberg. Paper, vol. 31, no. 24, Apr. 4, 1923, pp. 7-8. Tests to determine effect on elasticity and folding qualities of paper product; possibility of latex opening up new field in use of paper board as substitute for linoleum, leather, composition, etc.

Sulphite Cellulose. Highly Compressed Sulphite Cellulose, G. K. Bergman, E. Almberg and K. E. Ekholm. Paper, vol. 31, nos. 23 and 24, Mar. 28 and Apr. 4, 1923, pp. 9-12 and 9-11. Details of experiments carried out to discover real value of sulphite pulps and causes of difficulties encountered in United States mills in bleaching and manufacturing paper from highly-compressed pulp imported from Finland. Comparison of chemical properties of highly-compressed sulphite pulp and ordinary pulp. Translated from Papierfabrikant.

Swelling and Beating. The Degree of Swelling and of Beating, Carl G. Schwalbe. Paper, vol. 31, no. 21, Mar. 14, 1923, pp. 7-10, 23 and 25. Explanation of phenomenon of swelling of paper and its connection with degree of heating to which paper is subjected, processes involved in swelling phenomena, methods of determining degree of swelling. Address before Soc. Paper Chemists and Engrs. in Berlin.

Weight, Variation in. Causes of Variation in Weight of Paper, G. M. Johnson. Paper, vol. 31, no. 21, Mar. 14, 1923, pp. 11-12 and 14, 2 figs. Irregularity in "making" while machine is operating continuously; changes in wire speed while stuff delivery remains constant; irregulate operation of fixed drive; irregular concentration of paper stuff. From Pappers och Traevarutidskrift foer Finland, no. 16, 1922; Papierfabrikant, 1923.

PAPER MILLS

Electric Drive. Sectional Paper Machine Drive, Clarence F. Rasmussen. Wis. Engr., vol. 27, no. 6, Mar. 1923, pp. 97-98 and 114-116, 3 figs. Features and difficulties of news-print paper manufacture and methods used if overcoming difficulties, drive of Fourdrinier machines.

PEAT

Firing in Industrial Plants. Peat Firing (Torffeuerung), H. Moritz. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 11, Mar. 17, 1923, pp. 262-263, 2 figs. Conditions under which peat can be used as fuel in large industrial plants and suitable furnace arrangements for its economical use.

PRESSES

Safety Devices. Safety in Industrial Work (La sécurité du travail industriel), Usine, vol. 32, no. 7, Feb. 17, 1923, p. 19, 7 figs. Describes safety devices for presses and punching machines.

Tools. A Set of Progressive Press Tools, Fred F. Johnson. Am. Mach., vol. 58, no. 14, Apr. 5, 1923, pp. 509-510, 2 figs. Designed for quantity production of small sheet-metal clips, press runs continuously.

PATTERNMAKING

Preparation of Lumber. Preparing Suitable Pattern Making Lumber, F. B. Gordon. Can. Foundryman, vol. 14, no. 2, Feb. 1923, p. 15, 2 figs. Characteristics of wood, laws governing warping and cracking, shrinkage, quarter sawing.

PAVEMENTS, WOOD-BLOCK

Seal-Coat Application. Wood-Block Pavements Restored by Seal Coat, James A. McElroy. Eng. News-Rec., vol. 90, no. 12, Maz. 22, 1923, p. 531. Buckled and dried-out pavements put into good condition by applying bituminous seal coal covered with sand.

PETROLEUM

Sulphur Distribution in Products. Distribution in Petroleum Products, Gustav Egloff and Jacque C. Morrell. Chem. and Met. Eng., vol. 28, no. 14, Apr. 9, 1923, pp. 633-635. Particularly with reference to primary products resulting from cracking distillation of hydrocarbon oil; found to be closely analogous to distribution of nitrogen in destructive distillation of shale oil.

PIERS

Reinforced-Concrete. Reinforced Concrete Pier at Shellhaven, (Tahmes River), Engineering, vol. 115, no. 2985, Mar. 16, 1923, pp. 319-320, 33 figs. partly on supp. plate and p. 334. Consists of approach 560 ft. long and pierhead 370 ft. long; shore jetty was built on 14-in. octagonal reinforced-concrete piles of lengths running up to 50 ft.; construction details.

PIPE, CAST-IRON

Cement Joints. Cement for Water Pipe Joints, William Wheeler. N. E. Water Works Assn. — Jl., vol. 37, no. 1, Mar. 1923, pp. 62-74. Describes use of cement joints for force mains at Winchester, Ky.; results of leakage tests.

Engineering Aspects. Some Engineering Aspects of Cast Iron, Richard Moldenke. N.E. Water Works Assn. — Jl., vol. 37, no. 1, Mar. 1923, pp. 1-8 and (discussion) 8-11. Problems in manufacture; limitations on side of consumer and producer, and lack of co-operation between the two.

PIPE, STEEL

Tars for Coating. Present Day Tars for Pipe Coating, W. R. Conard. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 304-308. Suggests that research should be along lines to indicate (1) apparatus necessary for present-day volume of production, and (2) using present apparatus and methods, some material to mix with cheaper distilled tars to get coating as lasting and protective as old Smith process, or better.

POLES, CONCRETE

Trolley. A New Idea in Concrete Trolley Poles. Elec. Traction, vol. 19, no. 2, Feb. 1923, pp. 83-84, 3 figs. Design and construction of poles of Schenectady Ry. Co. made at company's quarry. Details of casting, cost per pole, and cost of installation.

PULVERIZED COAL

Boiler Firing. New Arrangements and Experiences in Pulverized Coal Firing (Neuere Einrichtungen und Erfahrungen auf dem Gebiete der Kohlenstaubfeuerung), F. Schulte. Glückauf, vol. 59, nos. 9 and 10, Mar. 3 and 10, 1923, pp. 205-208 240-247, 13 figs. Pulverizing; conveying of powdered coal; burners; combustion; types of furnace construction; results of tests with pulverized coal firing; advantages and drawbacks.

Pulverized Coal Firing (Ueber Kohlenstaubfeuerungen), P. Müller. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 20, Oct. 24, 1922, pp. 225-226. Drying, pulverizing, conveying; combustion; technical difficulties.

Brown Coal. Electric Energy from Pulverized Brown Coal, Roy, N. Buell. Australasian Elec. Times, vol. 1, no. 12, Dec. 27, 1922, pp. 766-771, 4 figs. Describes Buell system of drying, pulverizing, transporting and burning of pulverized fuel, particularly as it relates to generation of electrical energy, at Pulverized Coal (Australasia) Ltd.; describes plant of Maize Products Pty. Ltd., Footseray for production of steam superheated to 160 deg. Fehr., employed in electric generating station, exhaust steam being used for process work in factory.

Equipment. System of Pulverized Coal Meets Specific Needs, W. B. Roberts. Power House, vol. 16, no. 4, Feb. 20, 1923, pp. 23-27, 4 figs. Principal advantages of pulverized coal; most suitable coals; describes Quigley pulverized fuel equipment, a system complete with appliances for preparing, distributing and burning powdered coal; results of 11 steaming tests on Edge Moor Boilers, burning powdered coal, at Oneida St. power station, Milwaukee.

Lignite. Installations for Production and Firing of Pulverized Brown Coal in the Becker Steel Works, Willich, Germany (Die Braunkohlenstaub Erzeugungs- und-Feuerungsanlagen der Stahlwerk Beeker Akt.-Ges., Willich), W. Behling. Stahl u. Eisen, vol. 43, no. 12, Mar. 22, pp. 393-398, 10 figs. Experimental plant for drying and pulverizing, central drying and pulverizing plant, pneumatic conveyors; pulverized-coal furnaces.

PUMPING STATIONS

Reinforced-Concrete. Reinforced Concrete Pumping-Station at Aberdeen, James Mitchell. Concrete and Constrn. Eng., vol. 18, no. 3, Mar. 1923, pp. 154-168, 16 figs. Consists of pump chamber, sump chamber, and inlet culvert, all constructed of reinforced concrete.

PUMPS

Air Lifts. The Paradox of the Air Lift in Action, Frank Richards. Power, vol. 57, no. 16, Apr. 17, 1928, pp. 591-593, 4 figs. Explains what actually happens in air lift.

Vacuum. High Vacuum Pumps (Ueber Hochvakuumpumpen), Alfred Schacht. Fordertechnik u. Frachtverkehr, vol. 16, no. 3, Feb. 2, 1923, p. 29, 1 fig. Describes Elmo rotary pump, built by Siemens-Schuckert, and use of McLloyd vacuum meter in connection with it.

PUMPS, CENTRIFUGAL

Diesel-Engine-Driven. Diesel Engine-Driven Centrifugal Pumps Irrigate 50,000 Acres in India, J. A. Colaco. Eng. News-Rec., vol. 90, no. 16, Apr. 19, 1923, p. 702. Describes Dav[illegible] pumping station employed in irrigation system connected with Godavari and Kistna Rivers.

R

RADIO COMMUNICATION

Fire Departments, Application to. Adapting Radio to Fire Alarm Work, Charles K. Ahearn. Fire and Water Eng., vol. [illegible], no. 13, Mar. 28, 1923, pp. [illegible] and 555. Practical uses to which wireless can be put in communicating between stations and apparatus, also with other cities.

RADIOTELEGRAPHY

Towers and Masts. The Design of Radio Towers and Masts, Wind Pressure Assumptions, C. F. Elwell. Instn. Elec. Engrs. — Jl., vol. 61, no. [illegible], [illegible] 1923, pp. 407-412 and (discussion) 412-416, 2 figs. [illegible] safe and economic values of wind pressure for design purposes, and the standardization of wind-pressure assumptions.

RADIATORS

MANUFACTURE. Making Radiators Under New Conditions, Gilbert L. Lacher. Iron Age, vol. 111, no. 12, Mar. 1923, pp. 805-809, 9 figs. Use of tumbling barrels; pouring molds set three-high; layout and material-handling equipment.

RAILS

FRACTURE. The Breakage of Rails, George Charpy and Jean Durand. Ry. and Locomotive Eng., vol. 36, no. 4, Apr. 1923, pp. 123-124, 1 fig. (Abstract.). Report of investigation by French engineers presented to Acad. of Sci. in France.

RAILWAY ELECTRIFICATION

FRANCE. French Progressing with Electrification Project, J. C. Thirwall. Elec. Ry. Jl., vol. 61, no. 10, Mar. 10, 1923, pp. 410-411. Comments on developments under way on three great transportation systems; fuel savings through electrification.

GERMANY. The Electrification of Railways in Germany. Eng. Progress, vol. 4, no. 4, Apr. 1923, pp. 71-73, 3 figs. Review of five systems in use: one in Baden, two in Bavaria and two in Prussia.

PARIS SUBURBAN TRAFFIC. The Suburban Traffic Problem of Paris. Ry. Gaz. vol. 38, no. 11, Mar. 16, 1923, pp. 452-456, 3 figs. Batignolles tunnel at Saint-Lazare station Paris now being opened out and suburban line electrified; nature of traffic problem and extent of present scheme.

PROGRESS. Two Main-Line Railway Electrifications. English Elec. Jl., vol. 2, no. 3, Jan. 1923, pp. 130-135, 7 figs. Progress made in Arthur's Pass tunnel, New Zealand and Midi Railway of France.

RAILWAY MAINTENANCE

LABOUR SAVING. How the Lehigh Valley Gets More Work With Less Men, G. L. Moore. Ry. Eng. and Maintenance vol. 19, no. 3, Mar. 1923, pp. 92-99, 12 figs. Description of methods which have been developed to increase output of forces employed including utilization of locomotive cranes, adoption of tie tampers, heavy rail, treated ties, rail anchors, etc.

E.J. and E. Equipment Earns 125 Per Cent on the Investment, Frank H. Masters. Ry. Eng. and Maintenance, vol. 19, no. 3, Mar. 1923, pp. 107-109, 4 figs. Description of some labour-saving devices of Elgin, Joliet & Eastern Ry. and saving effected by their use.

Opportunities for Further Development of Labour-Saving Devices. Ry. Eng. and Maintenance, vol. 19, no. 3, Mar. 1923, pp. 100-104, 2 figs. Three articles pointing out needs for additional equipment and more general use of existing machines: Opportunities in Track Work, B. M. Cheney; Possibilities in Bridge Work, J. S. Huntoon; and Cost Analysis Promotes Use of Equipment, James Sweeney.

RAILWAY MOTOR CARS

DIESEL-ELECTRIC. A New Railway Motor Car of Standard Gage (Una nuova automotrice per ferrovie a scartamento normale), P. Ostertag. Ingegneria, vol. 2, no. 2, Feb. 1, 1923, pp. 39-42, 11 figs. Describes Sulzer Diesel-electric car of 200 to 250 hp. at 400 r.p.m.; speed 70 k.m.p.h.; Ward-Leonard distribution; construction and operation, and results of tests.

Sulzer Diesel-Electric Rail Motor Car. Ry. Elec. Engr., vol. 14, no. 3, Mar. 1923, pp. 81-82, 1 fig. Car with 200-hp. Diesel engine seats 69 passengers and shows low fuel consumption on Swiss railways.

RAILWAY OPERATION

FREIGHT-TRAIN RESISTANCE. Freight Train Resistance and Tonnage Ratings, Richard J. McCarty, Jr. Ry. Mech. Engr., vol. 97, nos. 2, 3, and 4, Feb., Mar. and Apr., 1923, pp. 83-86, 146-150 and 204-207. Feb.: Method of determining adjustment factor and applying it under various operating conditions. Mar.: Formula for adjusted ratings, selection of values and analysis of adjustment. Apr.: Importance of care in selecting values for adjustment; effect of car weight, weather and temperature.

TRAIN CONTROL. Automatic Control Company's Apparatus Is Tested on Big Four. Ry. Signal Engr., vol. 16, no. 4, Apr. 1923, pp. 162-164, 6 figs. Describes train control apparatus of electrically-controlled mechanical trip type, essentially an all-air equipment, and tests made.

Test of the Automatic Control Company's Device. Ry. Age, vol. 74, no. 17, Mar. 31, 1923, pp. 861-862, 5 figs. All-air type of train-control equipment operated by movable trip demonstrated on Big Four.

The Federal Automatic Train Control. Ry. Signal Engr., vol. 16, no. 4, Apr. 1923, pp. 164-165, 1 fig. Describes system developed by Federal Signal Co., based on fundamental principle of closed circuit operation and providing continuous indication of conditions ahead of train from track rails in advance.

RAILWAY SIGNALING

MAINTENANCE SYSTEM. Signal Maintenance on an Oregon Railway, H. J. Charters. Elec. Ry. Jl., vol. 61, no. 11, Mar. 17, 1923, pp. 468-471, 4 figs. Excellent results obtained by Portland Ry., Light and Power Co. by systematic inspection and repair work, which covers all devices of warning character used to protect patrons and expedite operation.

RAILWAY TIES

CREOSOTE TREATMENT. Treating Ties with Creosote in Two Minutes. Ry. Age, vol. 74, no. 18, Apr. 7, 1923, pp. 911-913, 3 figs. Results of tests with Century high-pressure treatment with which ties of various wood have been treated successfully in two or three minutes.

RAILWAYS

AMALGAMATION IN GREAT BRITAIN. The Grouped Railways — Statistics of 1922 and 1923. Ry. Gaz., vol. 38, no. 12, Mar. 23, 1923, pp. 495-501. Series of tables comparing railway revenue and expenditure, mileage, rolling stock, passenger journeys, freight traffic, etc., in Great Britain at present and 10 years ago.

REAMERS

MANUFACTURE. Manufacture of Adjustable Reamers, James B. Dillard. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 598-601, 10 figs. Operations performed on body, nuts, and blades.

STANDARDIZED. Successful Standardized Machine Reamers, Frederick Cooke. Machy. (London.), vol. 21, nos. 544 and 546, Mar. 1 and 15, 1923, pp. 689-691 and 753-755, 5 figs. Describes and gives in tabulated form design of range of machine reamers from ⅜ in. to 3¾ in., which, under test, have proved successful. Mar. 1: Features of positive rake and unequally spaced teeth. Mar. 15: Adjustable inserted blade reamers; adjustable shell reamers.

RECTIFIERS

HOT CATHODE. The Hot Cathode Rectifier as Applied to Radio Transmitters, D. G. Little. Elec. Jl., vol. 20, no. 4, Apr. 1923, pp. 139-141, 12 figs. Hot cathode rectifier, using tubes of high vacuum electron type, offers very convenient means of obtaining d.c. power from a.c. supply when current required is 5 amperes or less and voltage 2000 to 20,000 volts or even higher.

POWER. Modern Power Rectifiers, R. J. Morrison, Engineer, vol. 135, no. 3506, Mar. 9, 1923, pp. 258-260, 6 figs. Fundamental principles and question of efficiency; advantages. See also editorial on p. 264.

REFRACTORIES

DURABILITY. The Durability of Refractories, W. J. Rees. Roy. Soc. of Arts — Jl., vol. 71, no. 3671, Mar. 30, 1923, pp. 338-348 and discussion 348-353, 8 figs. Analysis and classification of failures; variations in chemical composition and principal physical properties of most important refractories, factors on which durability is dependent. Bibliography.

PROPERTIES AND MANUFACTURE. Refractory Materials (Les matériaux réfractaires), H. Drouot. Technique Moderne, vol. 15, nos. 1, 2, 3, 4, 5 and 6, Jan. 1, 15, Feb. 1, 15, Mar. 1 and 15, 1923, pp. 1-6, 37-43, 71-75, 104-111, 144-148 and 170-176, 60 figs. General properties, principal methods of manufacture; gyratory crushers, grinders, screens, mixers, molding machines, brick-cutting machines, drying furnaces, detailed discussion of various materials and their application; selection of refractory materials; acceptance tests. Bibliography.

The Properties and Testing of Refractories (Die Eigenschaften und die Prüfung feuerfester Stoffe), Reinhold Ricke. Gas- u. Wasserfach, vol. 66, nos. 3, 4 and 5, Jan. 20, 27 and Feb. 3, 1923, pp. 33-36, 53-55 and 66-68, 4 figs. Raw materials for refractories; requisites and properties of refractories: chemical composition, structure, specific weight, strength at ordinary temperature, melting capacity, specific heat, heat conductivity, volume changes with heating, resistance to change in temperature; softening under load, chemical resistance. Paper read before German Soc. of Gas and Hydraulic Engrs.

REFRIGERATING MACHINES

AIR. New Maurice Leblanc Air Refrigerating Machine (Die neue Luftkältemaschine nach Maurice Leblanc), Edmund Altenkirch. Zeit. für die Gesamte Kälte-Industrie, vol. 30, no. 1, Jan. 1923, pp. 1-3, 5 figs. Describes Leblanc process of using air as refrigerating medium which is claimed to be able to compete successfully with ammonia process without drawbacks of latter.

REFRIGERATION

COMPRESSION CYCLE. The Compression Refrigerating Cycle, H. Motz. Refrig. Eng., vol. 9, no. 9, Mar. 1923, pp. 267-274 and 279-280, 12 figs. Calculation of refrigerating effects (horsepower requirements, water requirements, etc.) of ammonia. Principles of thermodynamics underlying operation of compression refrigerating system.

RESERVOIRS

BALANCING. A Balancing Reservoir, Wm. A. Megraw. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 243-246. Reservoir built in connection with Gunpowder River improvements to Baltimore water supply, function of which is to supply deficiency to pumps when too little water is being admitted to tunnel, and to absorb excess when too much is being admitted.

ROAD CONSTRUCTION

CROWN FORMULAS. Methods for Determining Street Pavement Crowns, F. S. Besson. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 627-629, 7 figs. New crown formula; symmetrical and unsymmetrical distribution explained; inverted crowns for alloys.

MACHINERY. Road Machinery and Its Economic Aspect, Fred L. Macpherson. Can. Engr., vol. 44, no. 13, Mar. 27, 1923, pp. 357-361, 1 fig. Justification for use of road construction and maintenance machinery; selection of suitable equipment; purchasing; recording of plant; operation records; care and handling of equipment. From paper before Can. Good Roads Assn.

MARL, USE OF. The Use of Marl in Road Construction, Charles H. Dow. University of Minn. Eng. Experiment Station — Bul., no. 1, vol. 26, no. 2, Feb. 7, 1923, 67 pp., 71 figs. Definition and properties of marl, distribution in Minnesota; laboratory experiments; experimental roads.

ROADS

DESIGN. Results of U.S. Government Road Investigations, A. T. Goldbeck. Can. Engr., vol. 44, no. 14, Apr. 3, 1923, pp. 367-371, 6 figs. Results of tests at Arlington Experiment Station in Virginia in connection with structural design of roads and investigations of road materials; subgrades and surfaces. Presented before Am. Road Builders' Assn.

MAINTENANCE. Patrol Methods of Road Maintenance, G. E. Stephenson. Contract Rec., vol. 37, no. 10, Mar. 7, 1923, pp. 220-221. Combustion of maintenance and construction in preferable way to handle large mileage of bad roads. Describes condition of roads in Bruce County, Ontario, facilities for obtaining road materials, and general organization.

SURFACES. Bituminous Concrete and Penetration Surfaces for Roads, E. A. James. Contract Rec. and Eng. Rev., vol. 37, no. 12, Mar. 21, 1923, pp. 278-280. Practical methods for construction of these kinds of roads; relative merits of hot mix and penetration types; curb design.

ROADS, CONCRETE

DESIGN. Developments in Concrete Pavement Design, Willis D. P. Warren. Municipal and County Eng., vol. 64, no. 3, Mar. 1923, pp. 89-91. Early history of design; Bates experimental road; application of new data; longitudinal joints; circumferential reinforcing.

REINFORCEMENT, BAR. Merits of Bar Reinforcements for Concrete Pavements, W. S. Edge. Can. Engr., vol. 44, no. 13, Mar. 27, 1923, pp. 354-355. Economy of deformed bar reinforcement particularly for heavy work; standard bar reinforcement; New Jersey construction. From paper read before N.J. Highway Assn.

STRESS DETERMINATION. Pocket Strain Gage Gives Stresses in Concrete Roads, A. T. Goldbeck. Eng. News-Rec., vol. 90, no. 13, Mar. 29, 1923, pp. 575-576, 3 figs. Instrument slightly larger than fountain pen gives well co-ordinated results in field tests.

ROLLING MILLS

ALLOYS. New Eastern Mill for Rolling Alloys, E. Cooper Wills. Blast Furnace and Steel Plant, vol. 11, no. 4, Apr. 1923, pp. 224-225, 2 figs. New hot rolling mills, built by author for Driver-Harris Co., for turning out alloy metals and steel in wire rod, strip, sheet and merchant stock.

HOT ROLLING. Experimental Research on Hot Rolling of Iron (Recherches expérimentales sur le laminage du fer à chaud), Norbert Metz. Revue Universelle des Mines, vol. 16, no. 5, Mar. 1, 1923, pp. 331-349, 76 figs. partly on supp. plates. Deformation of metal in rolling; experiments to explain its mechanism; difference with varying pressures; movement of particles in contact with rolls; general conclusions.

Hot-Rolling Experiments, Norbert Metz. Iron and Coal Trades Rev., vol. 106, no. 2973, Mar. 23, 1923, p. 424, 1 fig. Conclusions drawn from experiments on square and rectangular bars. Translated from Revue Universelle des Mines.

RATE OF PERFORMANCE. Standard Guide for the Performance of Mill Trains (Massstab für die Leistung unserer Walzenstrassen), Wilh. Tafel and Er. Schneider. Stahl u. Eisen, vol. 43, no. 11, Mar. 15, 1923, pp. 370-374, 1 fig. Determination of theoretical or ideal hourly production, production without loss, and actual production; criticism of 31 investigated mills.

SPEED AND RATING. The Speed and Rating of Rolling Mills, M. E. Poncelet. Iron and Coal Trades Rev., vol. 106, no. 2874, Mar. 30, 1923, p. 461. Author suggests scheme for rolling merchant bars and other steel products.

S

SAFETY

ORGANIZATION PLAN. Du Pont Plant Shows Fine Safety Record. Power Plan Eng., vol. 27, no. 7, Apr. 1, 1923, pp. 353-360, 7 figs. Power department of more than 50 men at Deep Water Point, N.J., goes 3 years without lost-time accident. Plan of organization work begun in 1919.

SAND BLAST

EFFICIENCY. The Efficiency of Sand Blasts (Leistung von Sandstrahlgebläsen), W. Kaempler. Stahl u. Eisen, vol. 43, no. 13, Mar. 29, 1923, pp. 425-430, 14 figs. Influence of air consumption and air pressure, quantity and grade of sand, type of nozzle, etc., on performance of sand blasts; suggestions for selection of sand blasts; performance data.

SAWS

TYPES. Two New Sawing Machines. Practical Engr., vol. 67, no. 1878, Feb. 22, 1923, pp. 103-104, 2 figs. Describes horizontal log band saw and colonial-type saw bench, for woodwork, brought out by John Pickles & Son, Ltd., Hebden Bridge, Lond.

SEMI-STEEL

METALLURGY. The Metallurgy of Semi-Steel — II, David McLain. West. Machy. World, vol. 14, no. 2, Feb. 1923, pp. 60-62, 8 figs. Notes on nomenclature; study of wedge sections; medium phosphorus; scientific melting; annealed semi-steel.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Economics of the Activated-Sludge Process, C. Lee Peck. Eng. News-Rec., vol. 90, no. 12, Mar. 22, 1923, pp. 522-526. Sedimentation, skimming and aeration before activation, with acidulation of surplus sludge proposed and use of catalysts to reduce power consumption.

Microbiology and Theory of Activated Sludge, A. M. Buswell and H. L. Long. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 309-321. Presents analytical data referring to samples taken from aeration chambers of two-tank Dorr-Peck activated sludge unit, treating 65,000 gal. per day.

The Mechanics of the Activated Sludge Process, J. A. Coombs. Surveyor, vol. 63, no. 1626, Mar. 16, 1923, pp. 253-255. Methods of artificial aeration; mechanical agitation; advantages of process.

SETTLING TANKS. The Treatment of Sewage, H. Münkner. Eng. Progress, vol. 4, no. 4, Apr. 1923, pp. 79-81, 4 figs. Different types of settling plants; application of OMS process; activated -sludge domestic sewage plant; clarification plants for obtained foul and fresh sludge.

TREATMENT. New System of Sewage Treatment at Graham, Texas, Henry E. Elrod. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 620-623, 2 figs. Septicizaation precedes activation; storage comes automatically into use when blower shuts off; return sludge reduced; system, known as sept-aer-sed does not require technically skilled operatives.

SEWER CONSTRUCTION

DROP-DOWN CURVE. Application of the Drop-Down Curve in Chicago Sewers, C. D. Hill. Eng. News-Rec., vol. 90, no. 16, Apr. 19, 1923, pp. 707-709, 2 figs. To obtain desired cover for Aberdeen St. sewer through stock yards, drop in sewer was introduced; method of design.

SEWERS

STORM. Design of Storm Overflow Sewers, Hamilton, Ont., H. S. Phillips. Can. Engr., vol. 44, no. 13, Mar. 27, 1923, pp. 249-352, 7 figs. Growth of city necessitated extensions to sewer systems; extent of drainage areas; rainfall and run-off investigations; considerations affecting design; details of twin-box and horseshoe sections.

SHAFT SINKING

FREEZING PROCESS. Shaft Sinking by the Freezing Process, Max A. R. Brunner. Ice and Coal Storage, vol 26, no. 299, Feb 1923, pp. 35 Principles of process; surrounding strata; refrigeration required.

SHOVELS

ELECTRIC. St. Joseph Lead Company's New Mining Shovel, Arthur K. Mitchell. Min. and Metallurgy, vol. 4, no. 196, Apr. 1923, pp 181-184, 4 figs. Design of new type; dipper is mounted on longitudinally traveling and vertically swinging boom consisting of cross-member and two tubular legs; method of propulsion; power and performance.

SLATE

QUARRYING AND USES. Slate, Nature's Most Versatile Material, C. H. Thomas. Raw Material, vol. 6, no. 3, Mar. 1923, pp. 105-108, 5 figs. Salient facts regarding quarrying and uses, properties

STADIUMS

DESIGN. Stadium Design. West Soc. Engrs. — Jl. (Tech. Papers), vol. 28, no. 3, Mar. 1923, pp. 69-96, 20 figs. Contains following articles: Stadium Design, H. J. Burt. Structural Features of Grant Park Stadium, J. C. Sansberry. Grant Park Stadium Electric Wiring, L. A. Bates. Expansion Joints, University of Illinois stadium and Grant Park Stadium, A. M. Korsmo. Stadia Sight Lines, Bert M. Theobald.

STANDARDIZATION

AUSTRIA. Standardization in Austria, James A. G. Pennington. Am. Mach., vol. 58, no. 8, Feb. 22, 1923, p. 288. Progress of standardization and causes that led up to it.

STANDARDS

GERMAN N. D. I. REPORTS. Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie). Maschinenbau, vol. 2, no. 10, Feb. 21, 1923, pp. N67-N78, 22 figs. Proposed standards for brass, copper and aluminum plate, cold rolled; copper and brass tubes, seamless, round, flat and brass, copper and aluminum.

Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie). Maschinenbau, vol. 2, no. 11, Feb. 28, 1923, pp. N79-N83, 5 figs. Tentative proposals for drawings of tolerances and fits, copper for works material, ball bearings.

STAYBOLTS

FRACTURES. Staybolt Fractures in Locomobiles (Stehbolzenbrüche an Lokomobilen) Zeit. des Bayer. Revisions-Vereines, vol. 27, no. 4, Feb. 28, 1923, pp. 25-27, 1 fig. Discusses causes and prevention of fractures.

STEAM

PROPERTIES. Fundamental Properties of Steam (Sur les propriétés fondamentales de la vapeur d'eau), M. Strauven. Revue Universelle des Mines, vol. 16, nos. 4 and 0, Feb. 15 and Mar. 1, 1923, pp. 289-301 and 363-376, 2 figs. partly on supp. plate. Discusses work of Callendar and Eichelberg and compares their equations and values, including specific heat, heat of vaporization, saturation pressures and temperatures, etc.; favours Eichelberg data.

STEAM ACCUMULATORS

RUTHS. First Installation of a Ruths Accumulator in Germany, J. H. Blakey. Power Plant Eng., vol. 27, no. 8, Apr. 15, 1923, p. 410, Data on cost of boiler equipment both before and after installation of accumulators at Lauchhammer establishments. Abstacted and translated from Stahl u. Eisen.

Ruths Steam Accumulator (Dr. Ruths Dampfspeicher), &. Müller. Elektrische Kraftbetriebe u. Bahnen, vol. 20, no. 18, Sept. 24, 1922, pp. 193-197, 4 figs. Advantages are: elimination of fluctuations in taking steam from boiler uniform and economic boilers load; accumulation of excess steam; fewer boilers for same steam power; prolongs life of boiler.

STEAM-ELECTRIC PLANTS

CARPET MILL. The Power Plant and Electrical Installation of a Large Carpet Mill, H. Ketton. English Elec. Jl., vol. 2, no. 3, Jan. 1923, pp. 142-158, 15 figs. Installation in existing works of 4000 hp. of motors, together with necessary power plant, with practically no stoppage of work and with saving in costs of production, space, etc., and improvement in working conditions.

OIL-BURNING. Remodeling Power Plant for Fuel Oil Use. Elec. Ry. Jl., vol. 61, no. 12, Mar. 24, 1923, pp. 505-508, 5 figs. Berkshire street railway, Pittsfield, Mass., is changing over 6 boilers, using steam-atomizing system; 1,000,000-gal. oil tank, filled from tank cars by gravity, provides ample reserve supply of fuel.

PARLIAMENT BUILDINGS, CANADA. Parliament Buildings, Regina, Have Model Plant. Power House, vol. 16, no. 4, Feb. 20, 1923, pp. 19-22, 6 figs. Description of power plant designed for maximum efficiency, including power house, engine room, boiler house, pumps, etc.

WASTE ELIMINATION. Power Generation Costs Reduced 35 per cent, D. E. Druen. Elec. Ry. Jl., vol. 61, no. 11, Mar. 17, 1923, pp. 438-443, 10 figs. Elimination of waste by improvements in practices in 50,000-kw. station of Kansas City railways resulted in saving of $1000 per day, accomplished by methods readily available in many railway power plants.

STEAM ENGINES

TESTS. Steam-Consumption and Efficiency Tests on Steam Engines in 1921 (Dampfverbrauchs- und Leistungsversuche an Dampfmaschinen in Jahre 1921). Zeit. des Baverischen Revisions-Vereins, vol. 27, no. 1, Jan. 15, 1923, pp. 1-5. Data giving results of test on single-cylinder, double- and triple-expansion engines.

UNIFLOW. Unaflow Engines Pump Water Economically. Power, vol. 57. no, 16, Apr. 17, 1923, pp. 581-587, 5 figs. Reasons why Philadelphia water works replaced compound engines by uniflows at Torresdale station; results of economy tests; data giving net cost of pumping water.

Uniflow Engine Principle and Design, Fred W. Bosch. Power Plant Eng., vol. 26, nos. 23 and 24, Dec. 1 and 15, 1922, pp. 1144-1146 and 1197-1199 and vol. 27, no. 2, Jan. 15, 1923, pp. 124-126, 12 figs. Dec. 1: Thermal advantages of uniflow and some of its drawbacks. Dec. 15th: Methods of preventing unduly high compression; engine of improved design. Jan. 15: Application to steel industry.

STEAM GENERATION

EFFICIENCY. Some Elements of Efficient Steam Generation, David Brownlie. Combustion, vol. 7, no. 6, Dec. 1922, and vol. 8, no. 3, Mar. 1923, pp. 323-326 and 360, and 158-162, 1 fig. Amount of money to be saved and reasons of present general efficiency. Economical fuel utilization and economy in design of fuel-burning installations. Amount of steam or power used auxiliary to production of steam.

STEAM POWER PLANTS

MAXIMUM-PRESSURE. Progress in Steam Power Plants by Using Maximum Pressure Steam (Fortschrite by Using Maximum Pressure Steam (Fortschritte in Dampfkraftmaschinenbau durch Verwendung von Höchstdruckdampf), O. H. Hartmann. Glückauf, vol. 59, nos. 8 and 9, Feb. 24 and Mar. 3, 1923, pp. 181-190 and 209-215, 24 figs. Describes experiments of Schmidt with boiler of 60-atmos. pressure, also tests with low- and high-speed piston engines, design of maximum-pressure-contra-pressure machines and constructional advantages of maximum-pressure-contra-pressure turbines. Concludes that misgivings entertained against high-pressure steam should be considered dispelled.

STEAM TURBINES

CONDENSATION. Design and Construction of the G. M. A. Steam Turbine (Der konstructive Aufbau der G. M. A.-Dampfturbine). Praktische Maschinen-Konstrukteur, vol. 56, nos. 4, 5 and 6, Jan. 26, Feb. 2 and 9, 1923, pp. 35-39, 45-49 and 57-58, 20 figs. Construction and operation of condensation turbine coupled to polyphase generator of 1000 kw., describes two-pressure type of normal condensation turbine; counter-pressure turbines, i.e., high-pressure turbines whole waste steam of which is used for heating plant.

DE LAVAL. Self-Entering of De Laval Turbines (De que depende le autoentraje del eje de la turbina de laval), Ramon G. Lovarte. Universidad Nacional de la Plata — Contribution al Estudio de las Ciencias Fisicas y Matematicas, vol. 3, no. 53, June 1922, pp. 91-103, 6 figs. Velocity of rotation and stable equilibrium, formulas and calculations.

MACHINING BLADES. Machining Blades for Steam Turbines, Fred H. Colvin. Am. Mach., vol. 58, no. 15, Apr. 12, 1923, pp. 547-549, 10 figs. Important operations handled by both internal and external grinding, drilling and milling operations; how blades are assembled.

MARINE. See *Motor Ships, Turbine*.

MIXED FLOW AND RADIAL. Heat Balance Obtained by Special Turbine. Power Plant Eng., vol. 27, no. 8, Apr. 15, 1923, pp. 411-412, 3 figs. Combined mixed-flow and radial-type unit furnishes power and steam at reduced pressure to textile mill at Norwalk, Conn.

REGENERATORS AND CONDENSERS. Steam Turbine Regenerators and Condensers, Terrell Croft. Nat. Engr., vol. 27, no. 4, Apr. 1923, pp. 148-152, 10 figs. Discussions for use of regenerator and adjustment to serve requirements; computing size of condenser for steam turbine service.

STEEL

BASIC BESSEMER. Correlation between the Physical and Chemical Properties of Basic Bessemer Steel. Iron and Coal Trades Rev., vol. 106, no. 2873, May 11, 1923, p. 716. Writer points out that behavior of metal does not always depend entirely on its chemical composition, but also, and perhaps to greater extent, on its sensible heat. Review of paper by Otto Boltzenthal before Amer. Chemical Ironmasters.

SECONDARY STRUCTURES. Secondary Structures in Steel, N. T. Belaiew. Chem. and Met. Eng., vol. 28, no. 12, Mar. 21, 1923, pp. 537-540, 5 figs. Author believes that by suitable altering velocity of cooling through granulation zone and zone of secondary crystallization any one of three types of structures can be produced, this shows that type of structure depends in first instance not on chemical composition, but on conditions of cooling.

STAINLESS. Stainless Steel. Its Properties and Some of its Engineering Applications, J. H. G. Monypenny. Iron and Coal Trades Rev., vol. 106, no. 2871, Mar. 9, 1923, pp. 312-313. Corrosion differences, effects of heat treatment; air-hardening properties; resistance to corrosion; mechanical properties and composition; applications. (Abstract.) Paper read before Cleveland Instn. Engrs.

TESTING, ELONGATION. Reason for Formation of Curve Parallel to Abscissa in Elongation Test of Mild Steel (La cause de la formation du palier dans l'essai de traction des aciers doux), Ch. Fremont, Génie Civil, vol. 82, no. 8, Feb. 24, 1923, pp. 176-178, 9 figs. Explains that when limit of elasticity is reached there is a sudden decrease or increase of resistance followed by a constant resistance.

STEEL CASTINGS

HEAT TREATMENT. Heat Treatment of Steel Castings H. C. Ihsen. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, pp. 138-142, 17 figs. Steel Castings, their characteristics in raw and thermally treated condition; consideration of correct treatment with relation to size and composition of casting.

STEEL, HEAT TREATMENT OF

MOLTEN SALTS IN. The Use of Molten Salts in Heat Treating, Wm. J. Merten. Forging and Heat Treating, vol. 9, no. 3, Mar. 1923, pp. 148-150, 8 figs. Importance of heating finished steel parts protected from oxidizing gases; selection of proper salts to eliminate pitting and decarbonization; freedom of bath from impurities essential.

QUENCHING. On the Cause of Quenching Cracks. Kotaro Honda, Tokujiro Matsushita and Sakae Idei. Am. Soc. Steel Treating — Trans., vol. 3, no. 7, Apr. 1923, pp. 729-739, 9 figs. Account and results of investigation.

TEMPERING. Tempering of Steel and Alloys (La trempe de l'acier et des alliages métalliques), Albert Portevin. Génie Civil, vol. 82, no. 7, Feb. 17, 1923, pp. 151-154, 4 figs. Character and classification of changes due to heat treatment generally; physico-chemical and structural changes.

STEEL, HIGH-SPEED

HARDENING. Difficulties in Hardening High-Speed Steel, O. G. Simmons. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 627-628, 2 figs. Experiments show that mere heating of some steels to certain temperatures, and cooling, will not harden them; some will remain soft when heated to so-called hardening temperature in presence of carbon-monoxide gas and cooled in oil.

LATHE BREAK-DOWN TESTS. Lake Breakdown Tests of Some Modern High-Speed Tool Steels, H. J. French and Jerome Strauss. U.S. Bur. of Standards — Technologic Paper, vol. 17, no. 228, Feb. 17, 1923, pp. 183-225, 17 figs. Data based on analysis of 65 lots, representing 40 brands, produced by various manufacturers during 1919-1922; comparative lathe cutting tests for various-type compositions; discusses limitation of competitive breakdown tests, and recommendations regarding its applications.

STEEL MANUFACTURE

CASTING STEEL. A Great Forward Step in the Manufacture of Steel for Castings, L. W. Spring. Raw Material, vol. 6, no. 4, Apr. 1923, pp. 155-157, 2 figs. Methods and precautions used by Crane Co., Chicago to ensure highest possible quality.

TOP DISCARD. Top Discard in Its Relation to Quality, A. E. White. Am. Soc. Steel Treating — Trans., vol. 3, no. 7, Apr. 1923, pp. 750-757. Author makes appeal to steel mills to increase their tonnage output by adopting methods and devices for reducing amount of piping and segregation, thereby increasing their total yield per ton of metal cast into ingot molds.

STOKERS

GAS WORKS. Mechanical Stokers for Gas Works, Hartland Seymour. Gas Engr., vol. 39, no. 561, Feb. 1923, pp. 37-39, 4 figs. Savings which may be expected from mechanical stoking; discusses several types.

STREAM POLLUTION

MEASUREMENT. Stream Pollution Measured in Terms of Sanitar, Quality of Drinking Water, Russell Suter. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923 pp. 220-229, 4 figs. Suggestions as to use of colon count of water; attempt is made to evaluate phenomenon of "self-purification" as aid to combating popular misconception as to rapidity of process. Bibliography.

STRESSES

AUTOMATIC RELIEF. Initial Relief and Automatic Relief of Stress, David C. Coyle. Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 631-632. Cases of readjustment of relations of parts of structures tending to affect safety.

STREET RAILWAYS

CARS. New Safety Devices Developed in Tri-Cities. Elec. Ry. Jl., vol. 61, no. 9, Mar. 3, 1923, pp. 369-371, 7 figs. Scheme of control operates electrically instead of by air valves; devices claimed to be simple and comparatively inexpensive in first cost and maintenance.

STRUCTURAL STEEL

ASSEMBLY OF SHAPES. Steel Structures, Ulrich A. Peters. Blast Furnace and Steel Plant, vol. 11, no. 4, Apr. 1923, pp. 240-242, 8 figs. Analysis of factors entering into assembly of steel shapes.

REINFORCING. Specification Outline for Reinforcing Steel. Am. Architect and Architectural Rev., vol. 123, no. 2415, Mar. 14, 1923, pp. 257-258 and 260.

SPECIFICATIONS. Adopts Structural Specifications. Iron Trade Rev., vol. 72, no. 14, Apr. 5, 1923, pp. 1020-1023, 3 figs. Code on structural building material prepared by Am. Inst. of Steel Construction; design, fabrication and erection are included.

STRESSES FOR BUILDING. Higher Stresses for Steel Buildings Proposed by Fabricators. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 670-671. Basic working stress of 18,000 lb. per sq. in. proposed in specification for structural steel for buildings adopted by Am. Inst. Steel Constrn.

SUBSTATIONS

AUTOMATIC. Automatic Substation Experience in Cleveland. L. D. Bale. Elec. Ry. Jl., vol. 61, nos. 9, 10 and 11, Mar. 3, 10 and 17, 1923, pp. 359-364, 405-408 and 477-480, 10 figs. Mar. 3. Design features of building and equipment. Mar. 10. Sequence in operations of present substations of Cleveland railway, designed particularly to give reliability to power supply. Mar. 17. Advantages of remote supervisory control, design of future substations.

SUPERHEATED STEAM

ADVANTAGES. Advantages of Superheated Steam, R. C. Denary. Nat. Engr., vol. 27, no. 4, Apr. 1923, pp. 155-157, 4 figs. Elimination of steam-line condensation; power demands at reduced pressures. Types of superheaters and installations.

T

TAPS

DRILL SIZES. Tap Drill Sizes of Tap and Die Institute. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 617-620. Presents tables for machine screws and screw threads, and table of sizes for screws with U.S. form of thread.

TELEGRAPHY

INTERNATIONAL CODE. An International b-Unit Telegraph Code, Donald Murray. Telegraph and Telephone Age, vol. 41, no. 4, Feb. 16, 1923, pp. 78-79. Discusses problem of universal b-unit code which it is claimed, will solve itself by extension of use of typewriter keyboards in place of b-key Baudot transmitter.

TELEPHONY

AUTOMATIC. Automatic Telephones in Large Buildings, T. M. Inman. Power Engr., vol. 18, no. 203, Feb. 1923, pp. 65-70, 7 figs. Construction and operation of telephonic appliances generally and automatic gear particularly.

MACHINE-SWITCHING SYSTEM. Machine Switching Telephone System for Large Metropolitan Areas, E. B. Craft, L. F. Morehouse and H. P. Charlesworth. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 320-334, 27 figs. Describes system and its application to typical large metropolitan area and means for permitting its gradual introduction into existing plant.

PUBLIC ADDRESS SYSTEMS. Public Address Systems, I. W. Green and H. P. Maxfield. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 4, Apr. 1923, pp. 347-358, for amplifying voices of public speakers and music. Describes equipment as brought to commercial state and now in use in United States and other countries.

TEMPERATURE MEASUREMENT

METHODS. The Measurement of Heat, James Mackay. Domestic Eng. (Chicago), vol. 102, no. 11, Mar. 17, 1923, pp. 514-517, 1 fig. Detailed explanation of how temperature is measured in degrees Fahrenheit and centigrade, with conversion chart. Notes on calorimeter, thermometer, specific heat of water, radiation, convection and conduction.

TERMINALS, RAILWAY

FREIGHT. Freight Terminal Improvement at Denison, Texas, M. K. & T. Railway. Ry. Rev., vol. 72, no. 10, Mar. 10, 1923, pp. 393-400, 9 figs. Extensive double-hump yard layout, involving minor revision of line and complete new car and locomotive facilities.

TESTING MACHINES

LOAD-MEASUREMENT APPARATUS. Load Measurement and Checking with High Accuracy, J. S. Primrose. Metal Industry, (Lond.), vol. 22, no. 10, Mar. 9, 1923, pp. 217-219, 4 figs. Various methods for checking and standardizing load-measurement apparatus such as used on testing machines.

TEXTILE MILLS

HEAT CONSERVATION. Heat Conservation in the Textile Industry (Warmewirtschaft in der Tectilindustrie), Chr. Eberle. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 11, Mar. 17, 1923, pp. 256-261, 5 figs. Principal desiderata for erection of heating and power plants in textile factories; utilization of engine or turbine steam for room heating and manufacturing purposes; heat utilization in drying apparatus; test results from cloth-drying machines.

TEXTILES

FIBRE, ASBESTOS AS. Asbestos as a Textile Fiber, J. Merritt Matthews. Color Trade Jl., vol. 12, nos. 2 and 3, Feb. and Mar. 1923, pp. 73-76 and 117-120, 13 figs. Different varieties of asbestos; physical and microscopical properties; Canadian fiber; resistance to heat and chemicals; classification of asbestos fibers; Canadian and Italian asbestos; method of preparing and spinning asbestos.

THERMODYNAMICS

LAWS. Recent Attacks on the Second and Third Thermodynamic Laws (Neuseitliche Angriffe gegen den 2, sowie 3. Wärmesatz und deren Berechtigung), Schmolke. Wärme, vol. 46, no. 1, Jan. 5, 1923, pp. 1-5, 4 figs. Shows that these attacks are untenable.

TIDAL POWER

UTILIZATION. Tidal Power on the Patagonian Coast (Estudio y utilizacion de las mareas de la costa patagonica), Horacio Damianovich and Nicolas Besio Moreno. Ingenieria, vol. 27, no. 2, Feb. 1923, pp. 62-68. Discusses different forms of todal-power utilization and proposes appointment of commission to study Patagonian problem.

TOLERANCES

STANDARDIZATION. Standardization of Tap Thread Tolerances. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 607-608. What has been accomplished toward standardization by co-operation among manufacturers in tap industry.

TOOLS

HIGH- AND LOW-GRADE STEEL. Investigation of Relative Economy of Tools of High-Grade Steel and Tools of Low-Grade Material with Welded-On Edges, Particularly Lathe and Planing Tools (Vergleichsuntersuchungen zwischen Werkzeugen aus vollem, hochwertigem Stahl und solchen aus S. M.-Stahl mit aufgeschweisster Schneide, insbesondere der Dreh- und Hobelstahle), H. Eberts. Maschinenbau, vol. 2, no. 10, Feb. 21, 1923, pp. 589-593, 6 figs.

STANDARDIZATION. Standardization in the Industries, Carl J. Oxford. Machy. (N.Y.), vol. 29, no. 8, Apr. 1923, pp. 611-612, 1 fig. Various aspects of standardizing mechanical products, with particular reference to small tools.

TRACTORS

Caterpillar. Caterpillar Tractors in Forestry Work (Forstwirtschaft und Raupenschlepper), G. Mayer. Motorwagen, vol. 26, no. 5, Feb. 20, 1923, pp. 65-67, 2 figs. Describes special type of tractor and its use for removal of lumber and planting of trees.

Types. Track-Laying Transport. Motor Transport, (Lond.), vol. 35, nos. 929 and 930, Dec. 18 and 25, 1922, pp. 777-781 and 821-824, 18 figs. Evolution of this system of carriage that will greatly influence development of new countries.

TRANSFORMERS

Parallel-Running. The Problem of Transformers in Parallel (Das Problem der parallel arbeitenden Transformatoren auf experimenteller Grundlage), Emil Wirz. Schweiz. Elektrotechnischer Verein Bul., vol. 14, no. 1, Jan. 1923, pp. 25-43, 12 figs. Necessity for same constants at no load; superiority of transformers with disk windings over cylinder windings.

TRANSPORTATION

Railway. The Problem of Railroad Transportation, James C. Davies. Ry. Age. vol. 74, no. 17, Mar. 31, 1923, pp. 869-872. Notes on government control; federal operation; Transportation Act of 1920; value as fixed for rate-making purposes; government ownership; available remedies.

TUBES

Forging. Forging Steel Tubing Instead of Drawing It, Chester Warner. Raw Material, vol. 6, no. 3, Mar. 1923, pp. 90-91, 5 figs. How problem of successfully forging tubing instead of drawing it was solved; process invented by author and E. Warner; economic advantages.

TUNNELS

Excavating Machine. The Whitaker Tunnel Excavating Machine (La machine à creuser les tunnels — système Whitaker). Génie Civil, vol. 82, no. 9, Mar. 3, 1923, pp. 193-195, 8 figs. Constructed by Wm. Arrol & Co., Glasgow, for circular tunnels 12 ft. or more in diameter; details of design and operation.

Grouting and Gravel Packing. Effects of Grouting and Gravel Packing Around Tunnel, W. E. Thompson, Eng. News-Rec., vol. 90, no. 14, Apr. 5, 1923, pp. 617-619, 4 figs. Experience in removal of material over and between cast-iron-lined tunnels of N.Y. Rapid Transit under Willoughby St., Brooklyn.

Pressure. Elastic Stresses in the Rock Surrounding Pressure Tunnels, Charles P. Dunn. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 4, Apr. 1923, pp. 661-670, 9 figs. Study of elastic stresses caused by internal pressure in circular tunnel, and method of applying results of study to tunnel design.

Relining with Concrete. Precast Concrete Units Used for Relining Railroad Tunnels. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 669-670, 3 figs. Ribs placed in halves by special crane with universal jaw; cost said to be less than usual methods of lining.

TURBO-COMPRESSORS

Impellers. Calculation of Impellers (Sur le calcul des roues centrifuges), Alfred Carrard. Technique Moderne, vol. 15, nos. 3 and 4, Feb. 1 and 15, 1923, pp. 65-71, and 100-104, 35 figs. Formulas and calculations for impellers for turbo-pumps and turbo-compressors. Describes trials to test calculations. Bibliography.

V

VACUUM TUBES

Applications. The Future of High-Power Electron Tubes (Le rôle industriel futur des lampes électroniques de grande puissance), Maurice Leblanc. Société Française des Electriciens — Bul., vol. 3, no. 21, Jan. 1923, pp. 3-27, 22 figs. Industrial application of three-electrode tubes for transforming d.c. to a.c. being modified by mercury-vapour tubes so as to produce ions; also a.c. to d.c.

VARNISHES

Asphalt. United States Government Specification for Asphalt Varnish. U.S. Bur. of Standards — Circular, no. 104, Jan. 30, 1923, 7 pp. Sampling; laborator examination; basis of purchase.

Manufacture. The Manufacture of Varnish, G. N. Hill. Can. Chem. and Metallurgy, vol. 7, no. 3, Mar. 1923, pp. 60-63. Classes of varnishes: development of varnish formula; discusses varnish making with particular reference to oil; resin varnishes. Paper read before Toronto Club of Paint and Varnish Supts.

VENTILATION

Prisons. Ventilating Problems in Prison Work. Heating and Vent. Mag., vol. 20, no. 3, Mar. 1923, pp. 37-40, 7 figs. Features of mechanical equipment for north wing of Washington State Reformatory, Monroe, Wash.

VIADUCTS

Flat-Slab Concrete. Flat-Slab Designs for Two Railway Elevated Stations, M. Hirschthal. Eng. News-Rec., vol. 90, no. 13, Mar. 29, 1923, pp. 568-573, 6 figs. Varying conditions at adjacent sections of Lackawanna's East Orange grade elevation viaduct required two different types of flat-slab details and design.

VIBRATIONS

Machinery. Insulation of Machine Vibrations and Noises (Isolierung von Maschinen-Erschutterungen und Gerauschen), Walter Ritter. Praktische Maschinen-Konstrukteur, vol. 56, no. 3, Jan. 19, 1923, pp. 25-27. Ways of elimination vibration and results of tests with insulating materials.

Machinery Foundations. Vibrations in Foundations, Ernst Schmidt. Mech. Eng., vol. 45, no. 4, Apr. 1923, pp. 248-250, 11 figs. Method of investigation based on use of vectors. Effect of elastic intermediary layer between machine and foundation. Translated from Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 2, Jan. 13, 1923, p. 33.

VISCOSIMETERS

MacMichael. The Improved MacMichael Viscosimeter, Finslow H. Herschel. Optical Soc. of Am. — Jl., vol. 7, no. 4, Apr. 1923, pp. 335-353, 6 figs. Described viscosimeter is a constant-deflection torsional instrument, discusses sources of error, measurement of moments, experimental results with dial readings.

W

WAGES

Piece-Rate Methods. Piece-Work System in Car Maintenance. Elec. Ry. Jl., vol. 61, no. 11, Mar. 17, 1923, pp. 443-446, 9 figs. I.R.T. Co. in New York City has secured excellent results from its use on routine jobs; men make more and company saves money.

WASTE HEAT

Utilization. The Utilization of Waste Heat from Gas-Works Furnaces (Die Verwertung der Abhitze der Gaswerksöfen), L. Litnsky. Feuerungstechnik, vol. 11, no. 11, Mar. 1, 1923, pp. 121-124, 4 figs. Utilizable heat sources of gas-works furnaces; excess heat in flue gases; steam consumption of gas works; steam volumes available from flue gases; draft conditions; waste-heat boilers; arrangement and economy of waste-heat installations.

WATER

Sonic Depth Finder. Marine Sounding by Sound: The Sonic Depth Finder. Eng. and Contracting (Water Works), vol. 2, no. 3, Mar. 14, 1923, p. 60. Instrument developed at U.S. N. Eng. Experiment Station, Annapolis, for quickly and accurately measuring small and great depths in water by reflection of sound.

WATER ELEVATORS

Bolton. The "Bolton" Water Elevator. Ry. Gaz., vol. 38, no. 13, Mar. 30, 1923, p. 519, 2 figs. Elevator raises water by means of endless band, and can be run at high speed.

WATER METERS

Manufacture. Special Methods in Water Meter Manufacture, Fred H. Colvin. Am. Mach., vol. 58, no. 16, Apr. 19, 1923, pp. 569-572, 11 figs. Describes novel method of chucking work; use of balls for locating and gaging; milling and slotting fixtures for handling difficult work.

WATER PIPES

Concreting Steel. Concreting Steel Water Pipe in California, R. W. Whitaker. Concrete, vol. 22, no. 3, Mar. 1923, pp. 91-92, 4 figs. Method employed in concreting 33,452 ft. of pipe; success of system.

Friction Heads. Formulas for Calculating Friction Heads in Water Pipes, F. E. Giesecke. Heating and Vent. Mag., vol. 20, no. 3, Mar. 1923, pp. 33-36, 4 figs. What is wrong with those commonly used and how they should be modified to fit actual conditions.

WATER POWER

France. Water Power in Central France (La Houille Blanche dans le Massif Central Français), Raoul Blanchard. Houille Blanche, vol. 21, no. 71-72, Nov.-Dec. 1922 and vol. 22, no. 73-74, Jan.-Feb. 1923, pp. 204-206 and 9-19, 5 figs. Physical and hydrological conditions; drainage areas; rainfall; water-power resources; hydro-electric developments.

Italy. Water Resources and a Register of Artificial Lakes (Il problema delle riserve idrauliche e l'opera svolta dal Servizio Idrografico per la compilazione di un elenco generale dei laghi artificiali), Luigi Cozza. Giornale del Genio Civile, vol. 60, Nov. 30, 1922, pp. 721-741. Report to Minister of Public Works giving reservoirs in existence and under construction, and details of Italian developed and undeveloped water resources.

Norway. Water Powers of Norway, C. N. Anderson. Elec. World, vol. 81, no. 12, Mar. 24, 1923, pp. 676-682, 6 figs. With maximum of 12,000,000 available hp., there is average of 100 hp. per sq. mi. and more than 5 hp. per individual. Review of developments.

WATER SOFTENING

Lime-Soda Process. General Aspects of Water Softening, Charles P. Hoover. Eng. and Contracting (Water Works), vol. 59, no. 3, Mar. 14, 1923, pp. 616-622. Losses due to hardness; lime-soda, process for general municipal purposes; quick lime versus hydrated lime in water softening; temperature and time factors; carbonation. Paper read before Indiana Water Supply and Sanitary Assn.

Results. Water Softening at Columbus, Ohio — Results and Studies, Charles P. Hoover. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 671, 1 fig. Long settling periods probably unnecessary; overtreatment of small portion desirable. (Abstract.)

WATER SUPPLIES

Hazards to Sanitary Quality. Dangers to the Sanitary Quality of Public Water Supplies, F. Sherman Chase. N.E. Water Works Assn. — Jl., vol. 37, no. 1, Mar. 1923, pp. 16-41 and (discussion) 42-43, 9 figs. Discusses hazards to surface supplies to ground water supplies and to supplies in distribution systems. Includes list of certain outbreaks of water-borne disease.

WATER SUPPLY

Forestation. Forestation, a Problem in Public Service Accounting, Edward Field. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 206-213. Writer points out that time has arrived when policy should be adopted and consistent method prescribed for taking care of cost and revenue incident to forestation.

Metering. Chicago Water Works and Effect of Meters, L. R. Howson. Eng. and Contracting, (Water Works), vol. 59, no. 3, Mar. 14, 1923, pp. 609-615, 3 figs. Need for and savings that would result from universal metering; popular objections to metering; effect of metering in other cities. Paper read before Indiana Sanitary and Water Supply Assn.

Microscopic Organisms in Reservoir. Microscopic Organisms in Reservoirs in Relation to the Esthetic Qualities of Potable Waters, Charles A. Kofoid. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 187-191. Deals with odors which owe their origin to growth of microscopic organisms.

Surface, Canada. Surface Water Supply of Canada. Part 10, Drainage Basin of British Columbia and Yukon Territory, R. G. Swain, Can. Dept. of Interior, Water Resource Paper, no. 35, 1923, 198 pp., 2 maps. For calendar year 1920-21.

WATER TREATMENT

ACIDITY CORRECTION. Use of Deep Well Water to Secure Alkalinity for Treating Surface Waters, Geo. P. Womble. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 204-205. Describes method of using well water for correction of deficient alkalinity.

CHLORINATION. Plant Control of Chlorination by the Excess Chlorine Method, as Employed in New York City's Supplies, Frank E. Hale. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 247-264, 5 figs. Comparison with previous results; cost of increased dosage; relation to typhoid fever taste and odor.

HYDROGEN ION CONCENTRATION. Report of Committee No. 4, on Colloidal Chemistry, of the Council on Standardization. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 273-280, 1 fig. Determination of hydrogen ion concentration and its significance in management of water works.

WATER WORKS

MAINTENANCE AND REPAIR, EQUIPMENT. Equipment and Shop Facilities for Maintenance of Water Works Systems, George E. Cripps. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 281-288, 6 figs. Equipment of waterworks distributing system of Rochester, N.Y., used in maintenance and repair division.

MANAGEMENT. Water Works Management, Chas. B. Burdick. Am. Water Works Assn. — Jl., vol. 10, on. 2, Mar. 1923, pp. 214-219. Aspects of management based on author's experience.

METERING. What Metering would do for the Chicago Water Works, L. R. Howson. West. Soc. Engrs. — Jl. (Tech. Papers), vol. 28, no. 4, Apr. 1923, pp. 142-155, 9 figs. Discusses results that would be accomplished by metering; it is estimated that over 85 per cent of all economies that could be effected in Chicago water works could be secured by universal metering.

WAVES

WIND EFFECTS ON. Winds and Barometric Effects on the Great Lakes, John F. Hayford. Eng. News-Rec., vol. 90, no. 15, Apr. 12, 1923, pp. 635-668, 1 fig. Condensation of Publication 317 of Carnegie Inst. of Wash.

WELLS

HYDRAULICS OF. Some Notes on the Hydraulics of Wells, Melvin L. Enger. Am. Water Works Assn. — Jl., vol. 10, no. 2, Mar. 1923, pp. 199-203. Discusses laws of flow into wells of three classes, namely, wells in fissured rock, ordinary and artesian wells.

WEIGHTS AND MEASURES

CONVERTING MILLIMETERS TO INCHES. A Useful Conversion Chart. Eng. Production, vol. 6, no. 127, Apr. 1923, p. 234, 1 fig. Graphic method of ascertaining English and metric equivalents.

WELDING

ALUMINUM AUTOMOTIVE PARTS. Welding Aluminum in Automotive Parts Manufacture, Horace C. Knerr. Automotive Industries, vol. 48, no. 13, Mar. 29, 1923, pp. 726-731, 14 figs. It is claimed that dependable joints are secured only by this method; aluminum sheet less subject to corrosion and lighter than terneplate.

See also Electric Welding, Arc; Electric Welding, Resistance: Oxy-Acetylene Welding.

WELDS

COMPRESSED-AIR TANK. Explosion of Compressed-Air Tank With Autogeneous Welds (Explosion d'un réservoir à air comprimé soudé à l'autogène), V. Kammerer. Associations Françaises de Propriétaires d'Appareils à Vapeur — Bul., vol. 4, no. 11, Jan. 1923, pp. 39-44, 5 figs. One of group of three exploded; examination showed that certain welds of good appearance and having passed hydraulic test, may be very poor and insecure.

WELFARE WORK

PERMANENT EXHIBITION, GERMANY. Permanent Welfare Exhibition, H. Bertheau. Eng. Progress, vol. 4, no. 3, Mar. 1923, pp. 61-63, 6 figs. Establishment of German exhibition; department for prevention of accidents; department for industrial hygiene.

SYSTEM AT STEEL WORKS. Practical and Commercial Welfare at Stanton. Iron and Coal Trades Rev., vol. 106, no. 2874, Mar. 30, 1923, pp. 451-452, 6 figs. System employed by Stanton Ironworks Co., Nottingham, England.

WIND MOTORS

TYPES. Power from the Wind, J. H. Crabtree. Power Eng., vol. 18, no. 203, Feb. 1923, pp. 59-61, 5 figs. Main types of British windmills and outstanding features of their operation

WIRE ROPE

DESIGN AND USE. The Philosophy of Wire Rope, Henry M. Hall. Eng. and Min. Jl.-Press, vol. 115, no. 14, Apr. 7, 1923, pp. 631-632. Reflection upon its place in modern industries and problems solved by manufacturer in its design and use.

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TESTS. Some Tests of Steel-Wire Rope on Sheaves, Edward Skillman. U.S. Bur. of Standards — Technologic Papers, vol. 17, no. 229, Mar. 2, 1923, pp. 227-243, 14 figs. Tests of wire rope of 6-strand, 19-wire construction were made on sheaves of 10-14- and 18-in. diam. to determine their strength under static load; it was found that strength on sheaves was less than that of straight ropes.

You'd scarcely believe that this smooth, dustless, easy-traction road was ever in the wretched condition shown at the left. Yet the two views are of the same section of Yonge Street, near Holland Landing, Ontario, before and after Tarvia Construction.

Tarvia transforms old-fashioned mud roads into mudless, dustless highways

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Throughout the Dominion our engineers have demonstrated to scores of road officials the sound economy resulting from a definite policy of Tarvia construction and maintenance.

This popular road material is unequalled for building new roads, for resurfacing wornout macadam, for repairing and maintaining improved roads of every type. Special grades are made for specific uses.

Tarvia roads are an indispensable part of every Good Roads Program. They are comparatively low in first cost, and are so much more economical over a term of years that the saving makes a more extensive road program possible.

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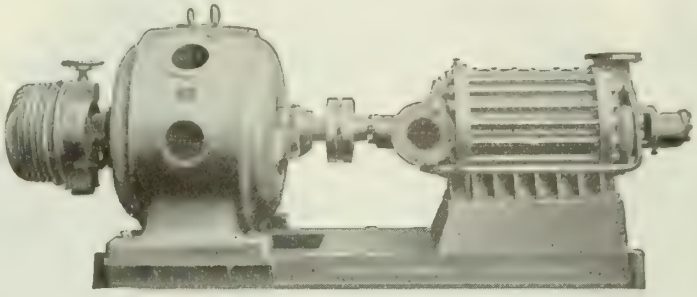

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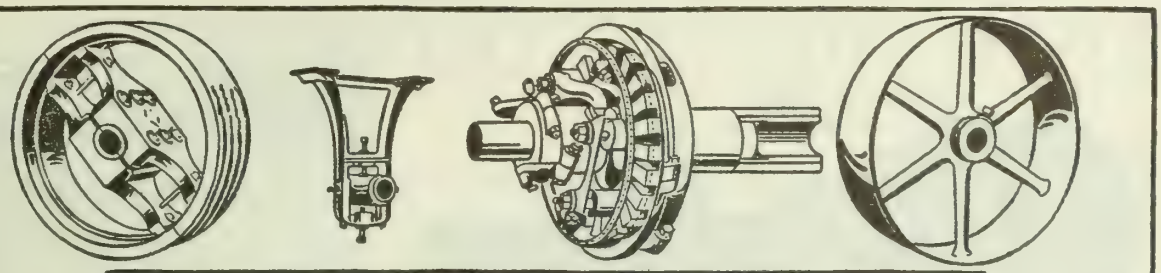

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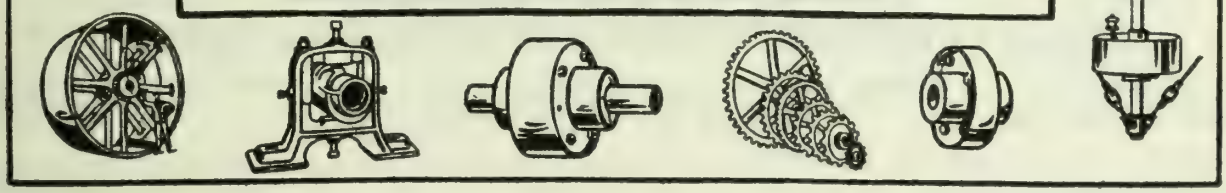

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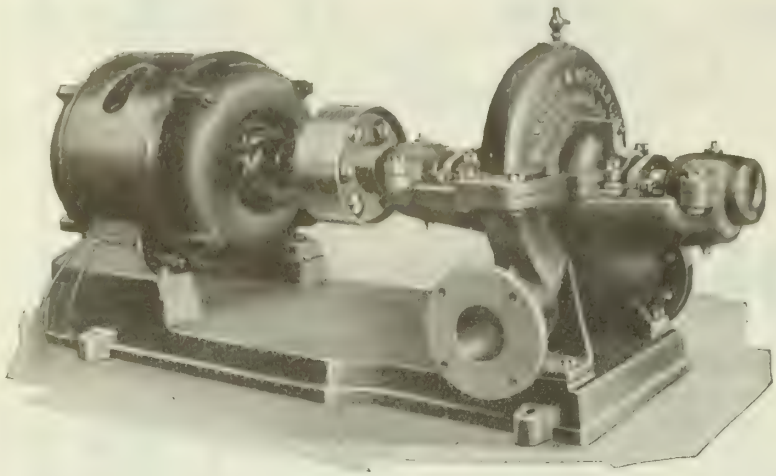

This type is built for capacities up to 1000 Imperial Gallons per minute.

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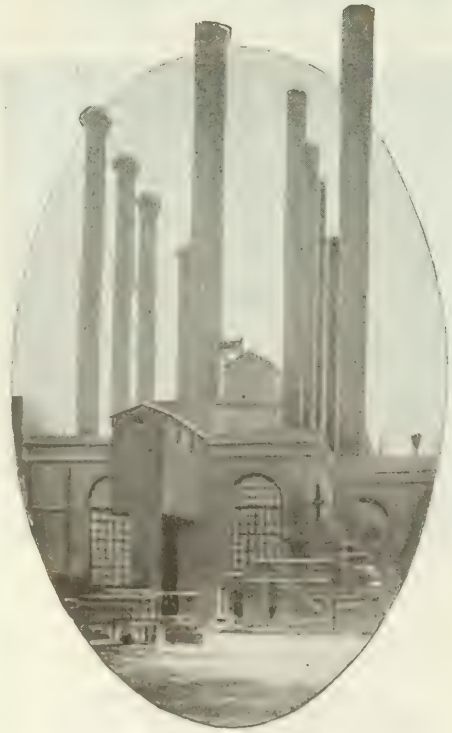

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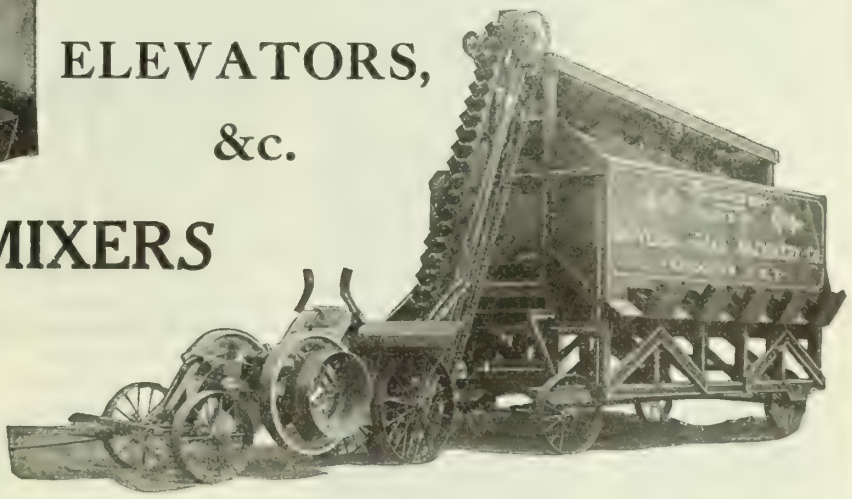

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RAILWAY AND HIGHWAY BRIDGES, SWING AND BASCULE SPANS, BUILDINGS OF ALL KINDS; HEMISPHERICAL BOTTOM AND OTHER TANKS; TRANSMISSION POLES AND TOWERS; RIVETED PIPE; CAISSONS; BARGES, TURNTABLES, ELECTRIC AND HAND POWER CRANES, HOISTING APPLIANCES, LIFT LOCKS, HYDRAULIC REGULATING GATES, ETC. GEAR CUTTING AND GENERAL MACHINE WORK.

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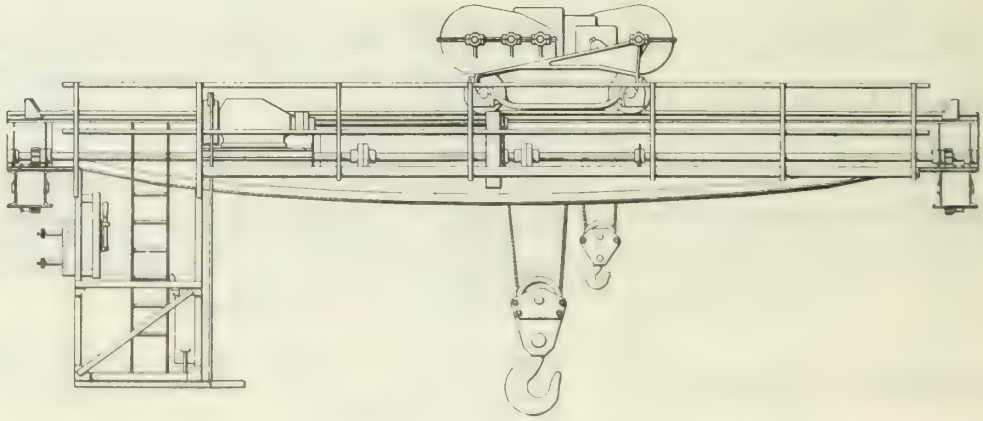

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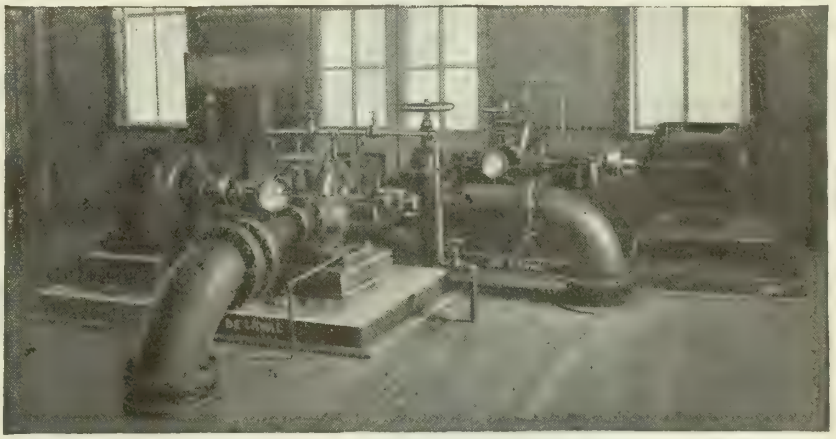

THE City of Barrie, Ont., has installed three De Laval Pumping units, two of which are shown herewith. The 4-in. two-stage series pump in the foreground delivers 600 gal. per minute against 230 ft. head when running at 1750 r.p.m., while the single-stage pump near the wall has a capacity of 1,200 gal. per min. against 200 ft. head, at the same speed. A third pump, driven by a gasoline engine, serves as a standby or spare.

When using purchased electric power, each one percent gain in pumping efficiency is important. De Laval pumps not only develop exceptionally high efficiencies on test, but also maintain such efficiencies for years. The labyrinth wearing rings reduce leakage, as compared with plain flat rings, and also last longer. The power taken by a DeLaval pump reaches a maximum at the rated delivery, and it is not necessary to install an oversized motor in order to provide against emergency overloads, which favors higher average motor efficiency and also higher power factor with induction motors. Due to their low starting torque, De Laval centrifugal pumps can also be driven by self-starting synchronous motors. De Laval centrifugal pumps, driven by geared steam turbines, electric motors, internal combustion engines or water wheels, deliver water at the lowest total cost. Ask for Book W-103, "Ten Years' Progress in Water Works Pumps."

De Laval

Steam Turbine Company

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THE E. LAURIE COMPANY
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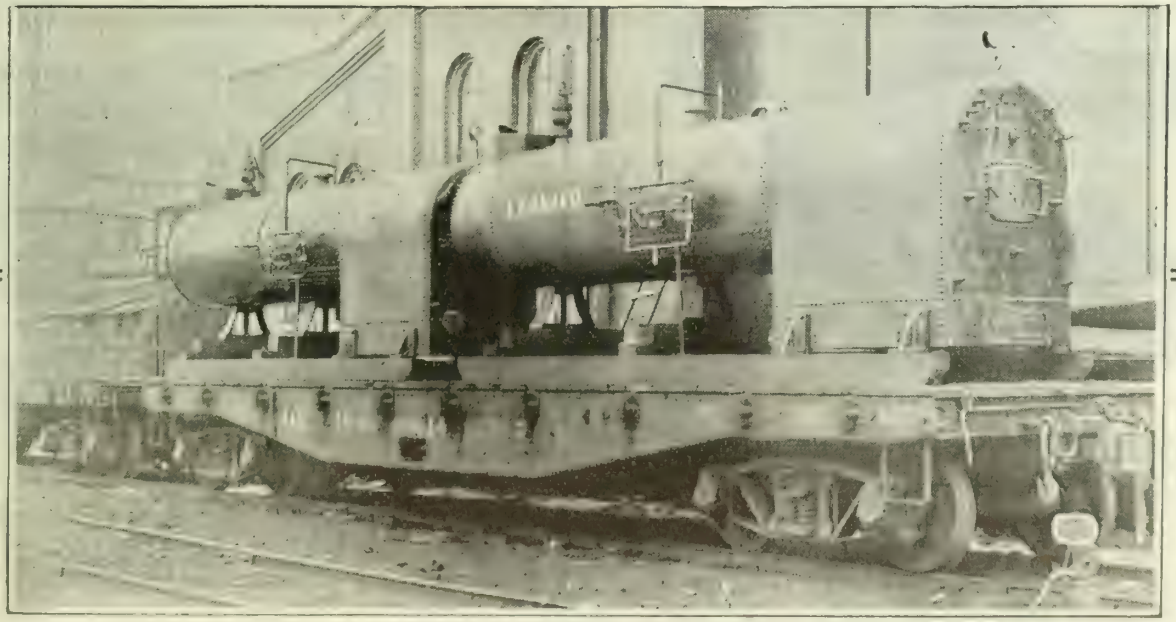

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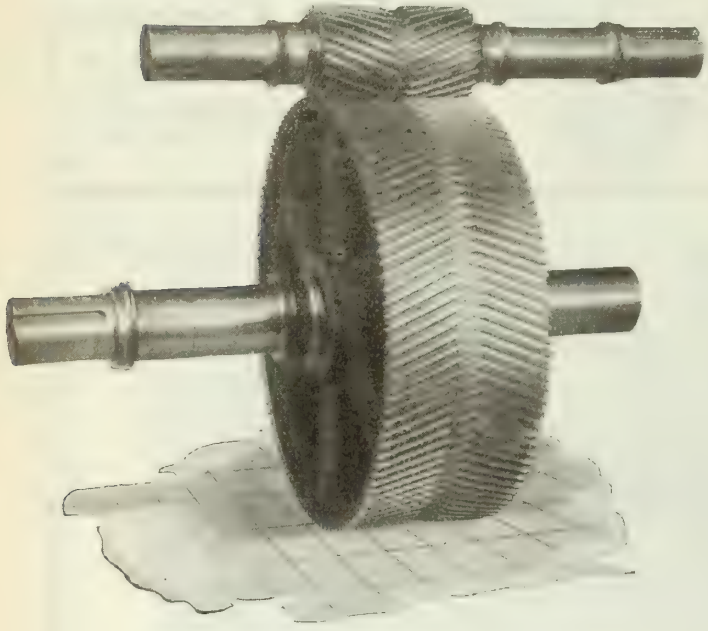

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A hard carbon excellent for ordinary service.

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Very hard. Can also be supplied copper coated, making it suitable for heavy welding work and also for use as a cutting electrode.

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Rather soft and graphitic. Has high conductively. Used where a high amperage is required; also on general work.

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Analyses and Tests of all Materials including Steel, Brass, Coal, Oils, Water, Ores, Sands, Cement.
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SPRINGS
OFFICE and WORK: Ontario St. East
DARLING and DAVIDSON
MONTREAL

JENKINS
Bronze
Swing Check Valve

Fig. 475

Adapted for use in horizontal or vertical position.

A strong handsome and durable valve equipped with Disc Holder and Composition Disc.

The Disc lifts well out of the passage and offers no more resistance to the flow than the best gate valve.

Fig. 475, shown here, is the screwed standard pattern for 150 pounds working pressure. This Valve can be furnished with flanged ends if desired (Fig. 476). These Valves have the *renewable* disc feature, and like all genuine Jenkins Valves have the Diamond Trade Mark on the Body.

Catalog No. 9 tells about these valves in detail. Write for free copy.

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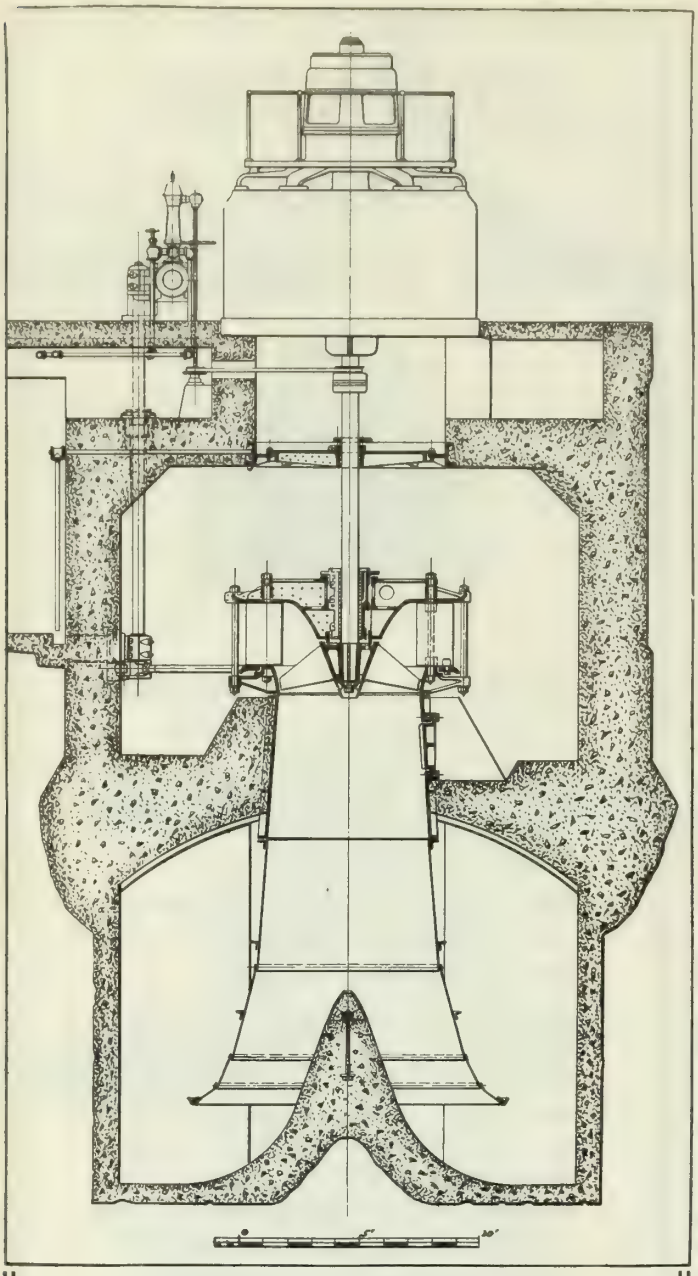

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Dominion Engineering Works

LIMITED

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THE HUB OF CANADA'S LARGEST AND RICHEST PROVINCE

QUEBEC CITY

City of Quebec

Province of Quebec

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Total value of assessable property	$120,540,965
Building permits issued, 1921	3,693,397
Bank clearings, 1921	302,237,674
Port Statistics, Imports 1921	26,663,862
" " Exports, 1921	28,799,768
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Number of Industries and Workshops	835
Number of Industrial Employees	18,000
Value of Production in 1919	33,126,504

QUEBEC—has plenty of electrical power at reasonable rates.

QUEBEC—means good steady labour.

QUEBEC—offers exceptional opportunities for new industries with nine railways entering the City and six miles of deep water front.

QUEBEC PROVINCE—offers over 2700 miles of unsurpassed motor roads radiating to Quebec City.

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Please apply to

THE INDUSTRIAL COMMISSIONER,
BOARD OF TRADE,
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Light forms of various depths used with reinforced concrete in floor construction. They form a series of regularly spaced joists or T beams, uniform in size and spacing and in which is combined the essential amount of reinforcement and concrete to support the desired loading.

Decreases Dead Load Saves Material

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Heavy Duty Electric Travelling Crane, covering 14,000 square feet of assembly floor.

Railway Siding for placing cars in factory.

New Modern Vacuum and Impregnating Plant.

Large capacity Steam Drying Rooms.

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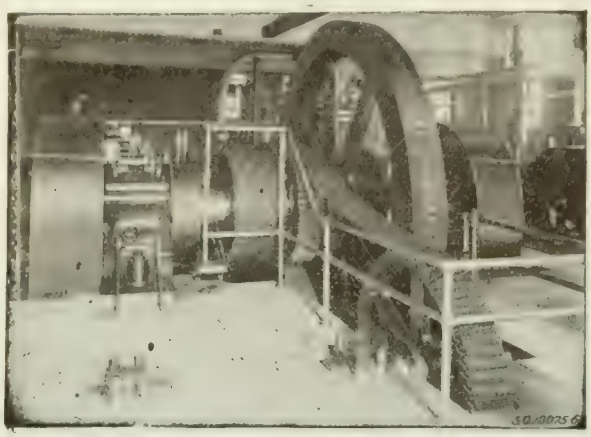

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CAST IRON PIPE

Flanged Ts., Bends, etc., made to any specification.

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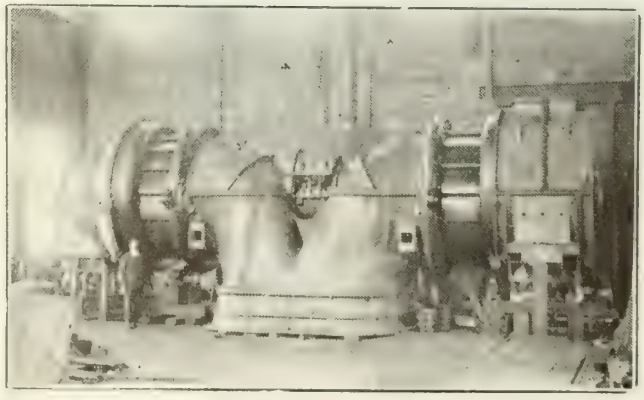
"Let us send you particulars of the lines you are interested in."



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HIGHEST EFFICIENCY.
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OUR HYDRAULIC TURBINES ENSURE A SOUND INVESTMENT.

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Every size for Water, Gas, Culvert or Sewer, Carried in Stock at

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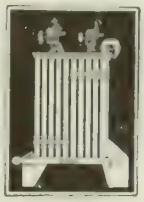

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PUTS AIR TO WORK

Save Coal

Using pre-heated water, with Sturtevant fuel economizer systems. Our engineers will prove savings of 10% to 20%.

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of Canada, Ltd.
MONTREAL GALT TORONTO

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—IN THE—
PROVINCE OF QUEBEC

To obtain authorization for the utilization of water-powers in the Province of Quebec, application should be made to the Honourable Minister of Lands and Forests.

They are granted under emphyteutic leases, the conditions of which are upon the following lines:

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7.—The grantee must submit plans of his works mills, etc., to the Dept., previous to their installation

For further information, please write to the Dept. of Lands and Forests, P.Q.

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Chief of Hydraulic Service: Arthur Amos, A.M.E.I.C.

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Structural Steel

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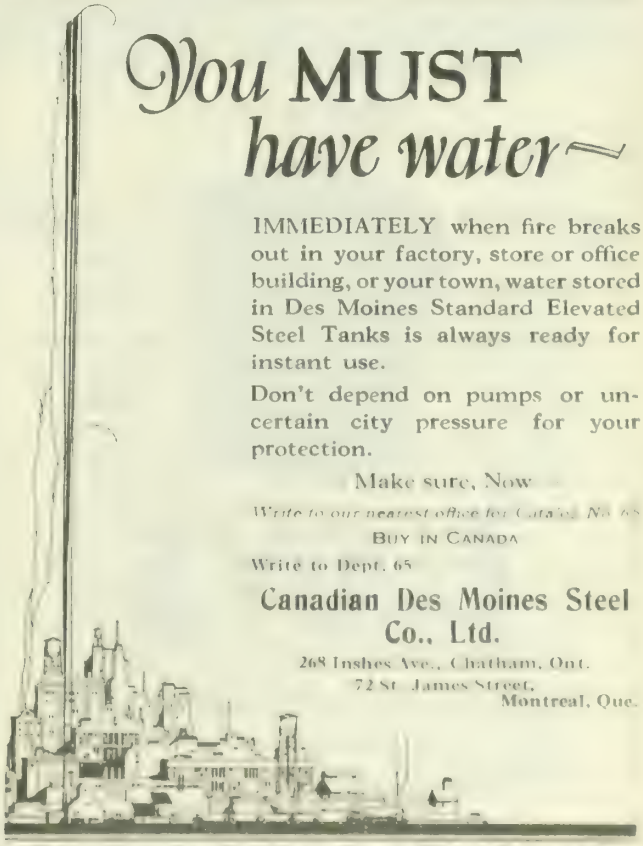

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Don't depend on pumps or uncertain city pressure for your protection.

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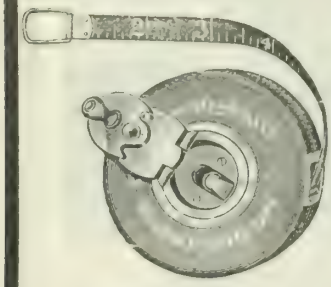

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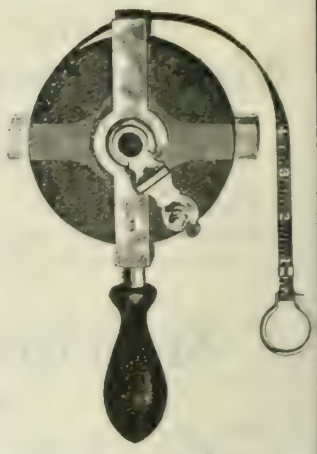

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"CAST IRON PIPE has the Greatest Resistance to Corrosion."

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NO HOOPS TO SLIP

NO JOINTS TO LEAK

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INDURATED FIBREWARE

Built of chemically treated wood fibre, it is the safest and surest emergency pail.

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Our facilities enable us to give prompt and efficient service

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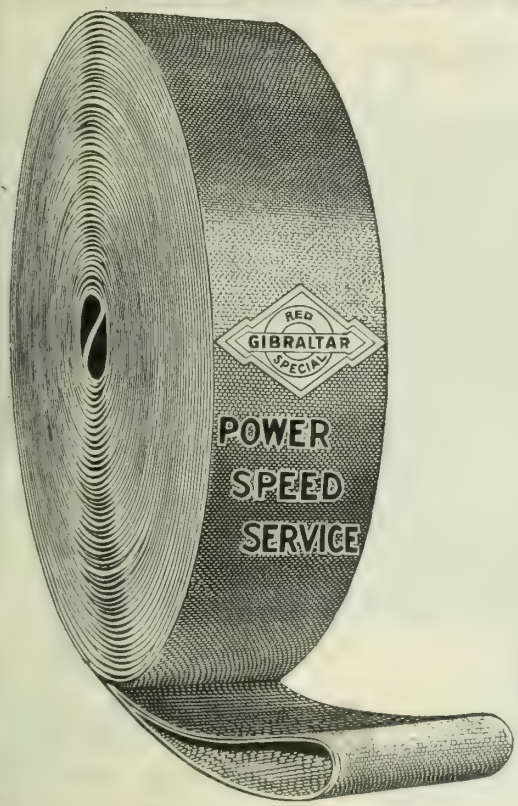

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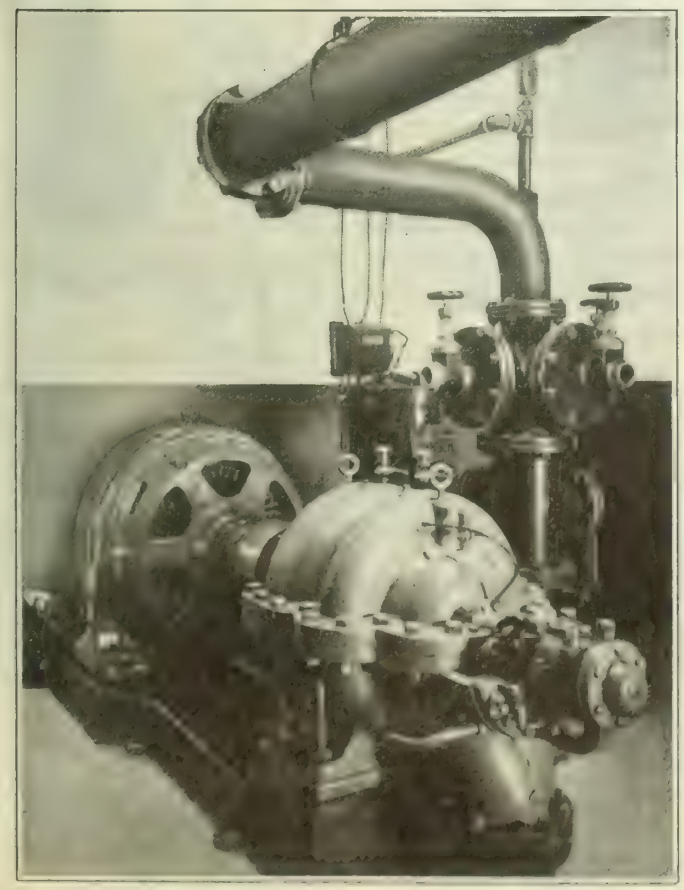

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Every advertiser is worthy of your support.

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A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 60

A

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Alumina Sulphate;
Nichols Chemical Co., Ltd.
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Crane Ltd.
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Jenkins Bros., Ltd
Automatic Underfeed Stokers:
Taylor Stoker Co., Ltd.

B

Balls, Chromang Grinding:
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Bar Benders:
Koehring Co., of Canada, Ltd.
Bar Cutters:
Koehring Co., of Canada, Ltd
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British Empire Steel Corp., Ltd.
Bars, Steel & Iron:
Steel Co., of Canada Ltd.
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Hamilton Bridge Works Co., Ltd.
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Openshaw & Bennett, Ltd.
Bearings, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
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Jones and Glassco, Regd.
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Blowers, Centrifugal:
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Combustion Engineering Corp. Ltd.
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Waterous Engine Works Co., Ltd.
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Taylor Stoker Co., Ltd.
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E. Leonard & Sons, Ltd
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Steel Co., of Canada, Ltd.
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Bridges, Steel:
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Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
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Marconi Wireless Telegraph Co., of Canada, Ltd.
Northern Electric Co., Ltd.
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Mussens Ltd.
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Jno. E. Russell Co., Ltd.
Building Papers:
Barrett Co., Ltd.
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Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
MacKinnon Steel Co , Ltd

C

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Car Equipment Specialties:
Dominion Insulator & Mfg Co Ltd.
Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.
Casements, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
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Castings, Brass:
Superheater Co., Ltd.
Castings, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Castings; Ferro-Alloy.
Canadian Steel Foundries, Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Superheater Co., Ltd.
Castings, Steel:
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Cement, Waterproofing:
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Canadian Link-Belt Co., Ltd.
Chains, Silent:
Jones and Glassco, Regd.
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Hamilton Bridge Works Co., Ltd.
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Mussens Ltd.
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Diamond State Fibre Co., of Canada Ltd.
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E. O. Leahey & Co., Ltd.
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Gartshore Thomson Pipe and Foundry Co., Ltd.
Pedlar People, Ltd.
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Pedlar People, Ltd.
Culverts, Road:
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D

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E

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Exhaust Steam Injectors, Locomotive:
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Expanded Metal:
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F

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G

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Gauges:
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Gears:
Canadian Link-Belt Co., Ltd
Dominion Engineering Works, Ltd
Hamilton Gear & Machine Co.
Gears, Machine Cut:
Jones and Glassco, Regd
Gears, Silent, Waterproof:
Diamond State Fibre Co., of Canada Ltd
Gears, Double Helical:
De Laval Steam Turbine Co
Generators:
Canadian Westinghouse Co Ltd
Ground Joints Unions:
Dart Union Co., Ltd

H

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I

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J

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K

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L

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M

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N

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O

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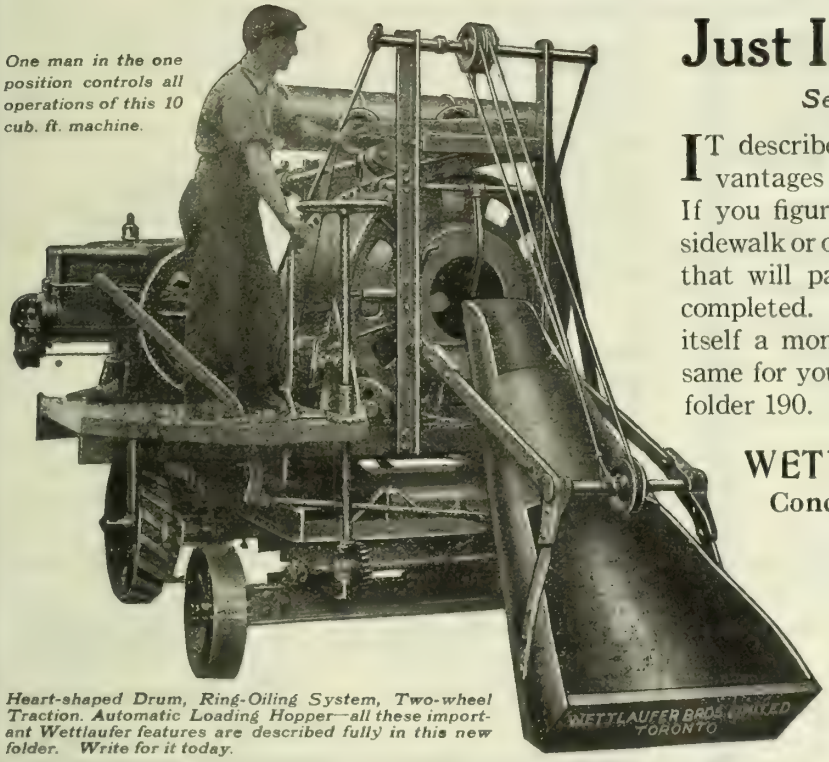
CONCRETE MACHINERY



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WILL REMEDY ALL THESE DEFECTS
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A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 60

P

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Dominion Paint Works, Ltd.
Paints, Anti-Corrosive:
Dominion Paint Works, Ltd.
Paints, Concrete:
Dominion Paint Works, Ltd.
Paints, Damp-proof:
Dominion Paint Works, Ltd.
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Dominion Paint Works, Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd.
Dominion Paint Works, Ltd.
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Pinions:
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Superheater Co., Ltd.
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Jno. E. Russell Co., Ltd.
Pipe Couplings, Union
Dart Union Co., Ltd.
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Steel Co. of Canada, Ltd.
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Canada Lock Joint Pipe, Ltd.
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Gartshore-Thomson Pipe and Foundry Co., Ltd.
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Pumps Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil,
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R

Radiator Valves:
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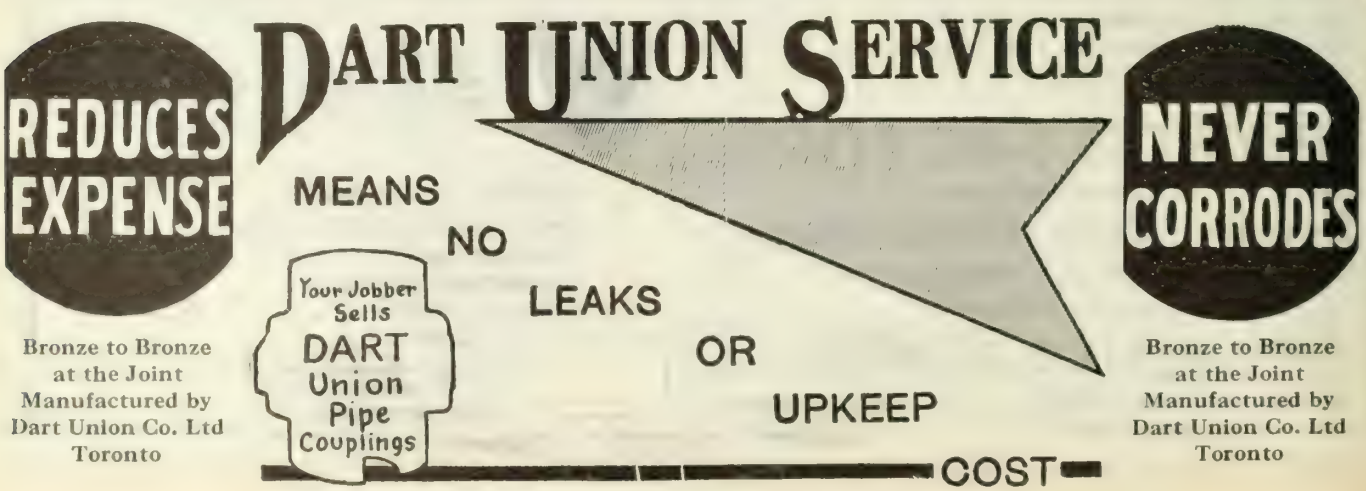

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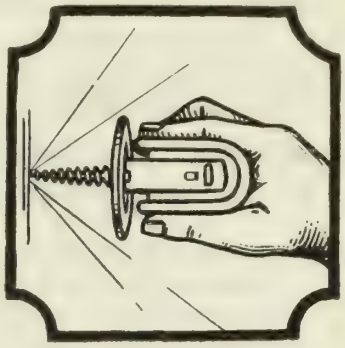

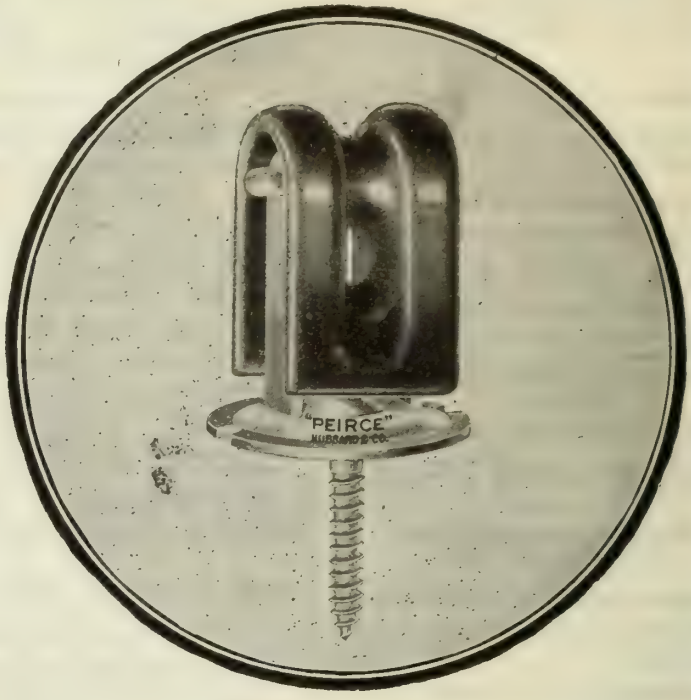

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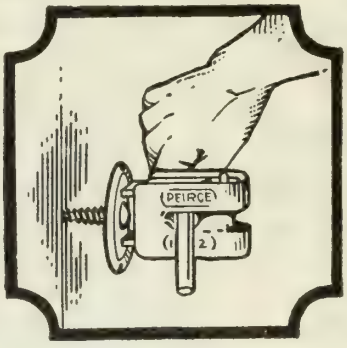

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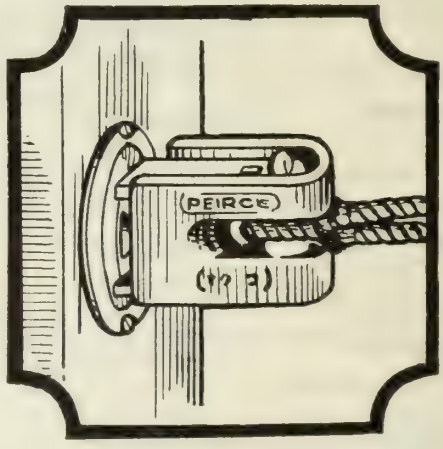

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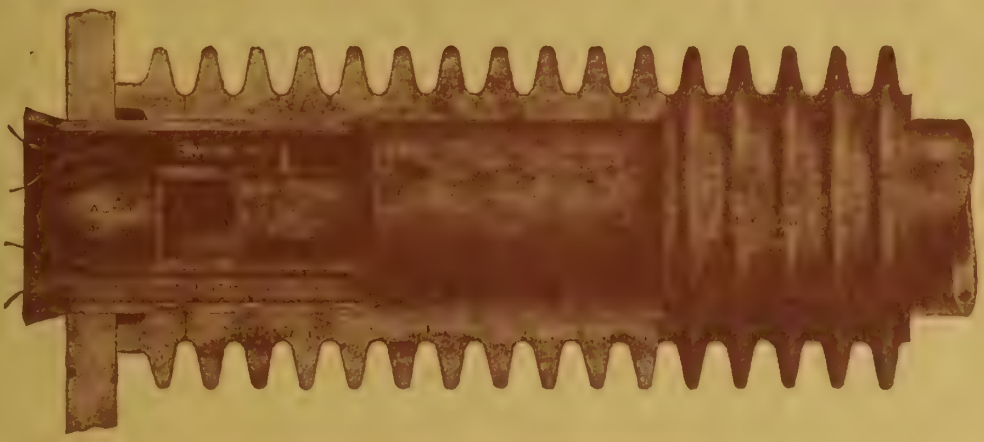

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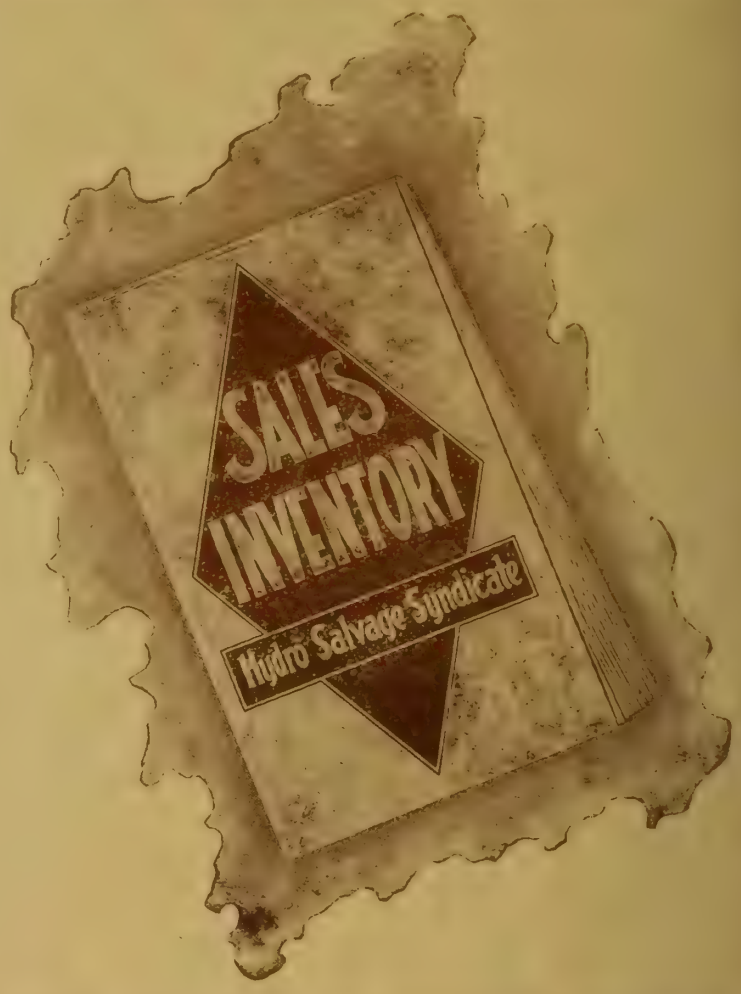

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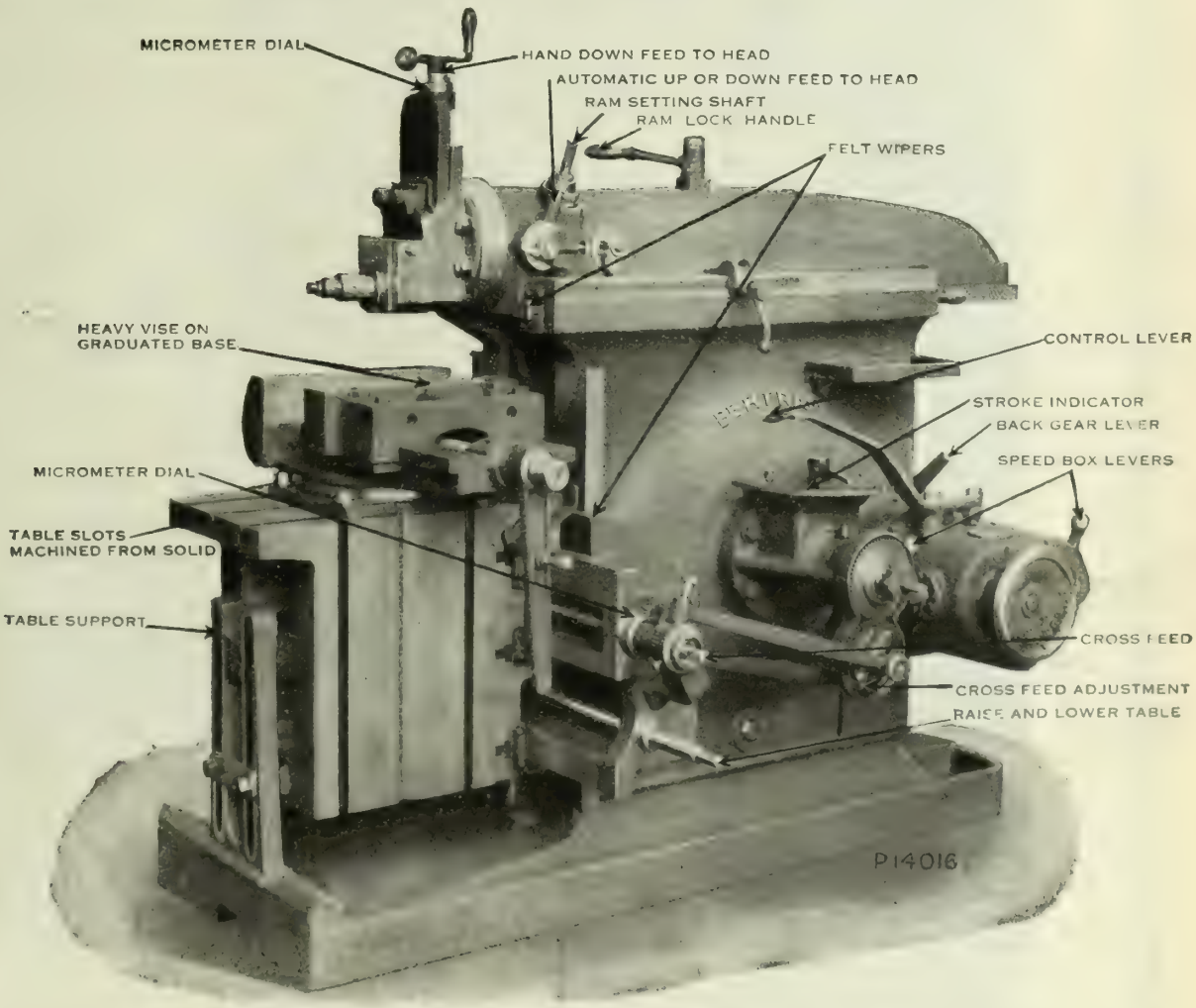

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723 Drummond Bldg.	32 Front St., West	609 Bank of Ottawa Bldg.	103½ Sandwich St.	1205 McArthur Bldg.	Roy Bldg.

Men of influence consult Journal Advertising.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.

We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

N. Slater Company, Limited

Hamilton, Ontario.

When purchasing equipment consider The Journal advertiser.

ST. EUSTACHE PARISH, QUEBEC.
DOMTAR-2 ON WATER BOUND
MACADAM, 1922.

Domtar

The
National
Bitumen

FOR PATCHING, SURFACING and PENETRATION CONSTRUCTION

For the solution of each of these serious Highway Problems, there is a **Domtar** *to fill your needs satisfactorily.*

Literature, etc. on request.

Dominion Tar & Chemical Company, Limited

SYDNEY, N.S. MONTREAL, QUE. TORONTO, ONT. SAULT STE. MARIE, ONT.

Every advertisement is a message to you.

NO. 1 BOILER HOUSE, THE TEXAS COMPANY, WEST TULSA WORKS

CRANE REFINERY PIPING EQUIPMENT

For continuous and unfailing service in the power plants of oil refineries, Crane refinery piping equipment can be installed on the basis of dollar-efficiency as revealed in the quality and permanence of the service rendered.

CRANE

CRANE LIMITED, GENERAL OFFICES: 386 BEAVER HALL SQUARE, MONTREAL
CRANE-BENNETT, LTD., HEAD OFFICE: 45-51 LEMAN STREET, LONDON, ENG.

Branches and Sales Offices in 21 Cities in Canada and British Isles
Works: Montreal, Canada, and Ipswich, England

Every advertiser is worthy of your support.

LIGHT RAILS

Light Rails for Mines, Construction Operations
and General Contractors' Use
(from 12 to 45 pounds per yard)

BRITISH EMPIRE STEEL
CORPORATION LIMITED

CANADA CEMENT BUILDING MONTREAL, CANADA

Western Representatives, Bissett & Webb, Limited Winnipeg

Advertisements have an educational value. Read them carefully.

LT. COL. R. G. STEWART, PRESIDENT
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E. O. LEAHEY, MAN. DIRECTOR
J. D. CUNNINGHAM, SECY. TRES.

E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:
OTTAWA,
Ont.

Journal advertisers are discriminating advertisers.

Water Supply Lines Built of Reinforced Concrete Pipe

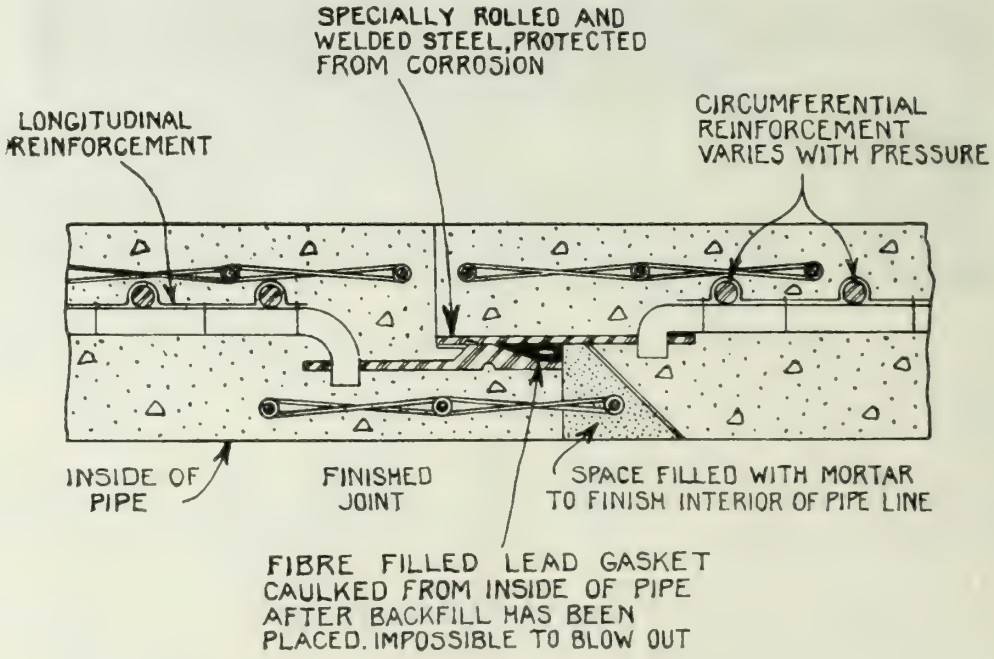
— ARE —

Permanent, Strong, Watertight, of Large Carrying Capacity, Economical, Founded on Experience.

Every Joint is a True Expansion Joint

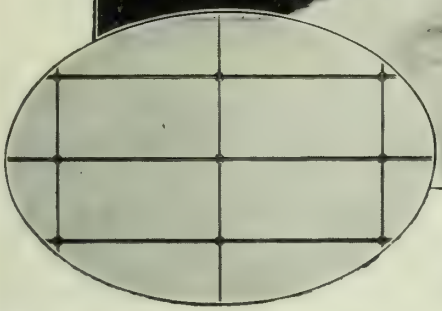
— AND —

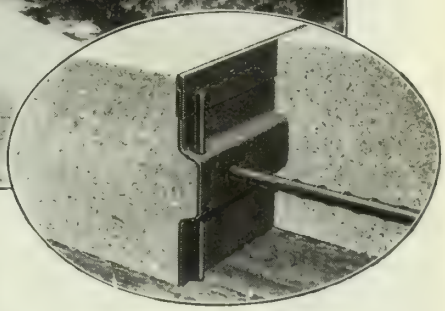
Settlement of backfill or of foundation cannot cause loss of water at the joint.



CANADA LOCK JOINT PIPE, LIMITED

65 Pleasant Boulevard, Toronto, Ont.





The Standard Concrete Road

Reinforced with Flat Sheets of Truscon Wire Mesh

Truscon Wire Mesh, furnished in flat sheets cut to lenght, saves time and labor; no cutting, straightening, uncoiling, etc. Rigidly connected joints keep sheets true and flat. Weights and areas as desired.

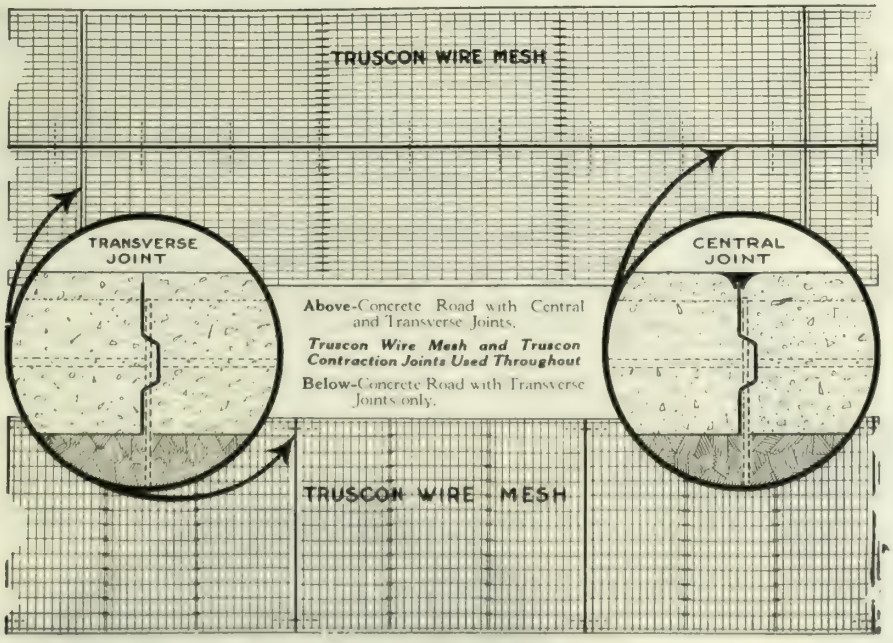
Contraction Joints Formed by Truscon Contraction Plates

Provide a definite plane of weakness in the pavement and thus form a straight regular crack for contraction and expansion. Used longitudinally, they offset lifting of pavement edges from the sub-grade and act as a permanent traffic marker. Truscon Contraction Plates are rigid, substantial, easy to install.

Trussed Concrete Steel Co. of Canada Limited

WALKERVILLE, ONTARIO

Branches: TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER



Truscon Wire Mesh and Contraction Joints

The Choice of Men Who Know

THE small user of oxygen and dissolved acetylene can take full advantage of Dominion Oxygen Service.

There are many shops where a comparatively small amount of welding and cutting is done. These shops require the same pure oxygen and acetylene in conveniently handled cylinders and the same assurance of being able to receive their supplies promptly as the mills and factories where larger quantities are used.

We give the small order for one or more cylinders the most careful and prompt attention. Cylinders are of uniform size so that shipping becomes simply a matter of "how many?"

With a widely distributed system of plants and warehouses we are in a splendid position to give you a fresh supply when you need it. This enables you to take care of your requirements satisfactorily and economically.

Our prices show a distinct saving. Be convinced by placing your next order with us.

Dominion OXYGEN

5

DOMINION OXYGEN COMPANY LIMITED

General Offices: 80 Adelaide St. East, Toronto

Distribution Points: Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, and Winnipeg.

Prest-O-Lite DISSOLVED ACETYLENE

Operating the Welding and Cutting Gas Division of Prest-O-Lite Company of Canada, Limited.

KOEHRING Dragline

All Koehring Built!

KOEHRING draglines are all Koehring-built from the ground to the boom peak — from the foundry through the machine shops to the loading of the flatcars in the erecting shops.

This alone makes possible strict adherence to Koehring Heavy Duty standards in every detail — and when you know the detail of Koehring construction, you will recognize All-Koehring-built as an unusual value in excavating machinery — as an important, additional factor of greater capacity performance, lowest maintenance and longest trouble-free service life.

Dragline Capacities

No. 1. ¾ cu. yd. at 30 ft. radius.

No. 2. 1 cu. yd. at 40 ft. radius.

No. 3. 1½ cu. yd. at 40 ft. radius. May be adapted for crane-excavator and shovel.

Write for catalog.

Cr 35

KOEHRING COMPANY OF CANADA, LIMITED,

105 Front St., East, Toronto, Ont. Phone Main 1498

616 Canada Cement Bldg. Montreal, Que. Phone Uptown 3026

E. N. & W. E. SOPER, 63 Sparks Street, Ottawa, Ont. Phone Queen 3435

Concrete Block Building as it appeared 20 minutes after fire was lighted. Water being applied.

Appearance of Concrete Block Building after fire was completely extinguished.

CANADA CEMENT
CONCRETE
FOR PERMANENCE

CONCRETE MATERIALS PUT TO A SUPREME FIRE-TEST

An interesting demonstration of fire-proof home construction was arranged by the Concrete Products Association of Minnesota.

A house was built of Concrete Block, with Cement Stucco surface, Cement Asbestos Shingles, and Concrete Sills and Lintels.

This building, filled with highly inflammable material, was set on fire, and the fire permitted to rage thirty minutes.

Although the fire was extinguished by a heavy stream of cold water applied to the intensely hot walls, close inspection of the interior disclosed the fact that not a single crack was in evidence in either the Block, or Concrete Sills and Lintels.

The only parts of the building damaged at all, were the Doors and Window Frames of wood.

This test, and its remarkable result, serves to emphasize the sound structural qualities of Concrete Block Stuccoed. The Concrete Block gives strength and permanence. The Stucco lends beauty and charm, in addition to being weather-proof, fire-proof and rot-proof.

When it is considered that the walls of this fire-tested dwelling were only ten days old, and the Stucco and Plaster only three days old, the results of the demonstration are truly significant.

SPECIFY
CANADA CEMENT
UNIFORMLY RELIABLE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

CANADA CEMENT COMPANY BUILDING

Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary

P · A · X

Private Automatic Exchange

ACTION

The Automatic Telephone

Anything is delay which retards action. Your plant intercommunication may be handled as efficiently as the means permit and yet delay exists. For there is only one rapid means of intercommunication between the widely separated units of a great plant. It is P. A. X.

"A Pair of Wires and a Dial" telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
QUEBEC LONDON REGINA VANCOUVER

"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
Fire Alarm Systems
Radio Sending and receiving Equipment

DISTRIBUTING
Construction Material
Illuminating Material
Power Apparatus
Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

ALGOMA STEEL
CORPORATION LIMITED
SAULT STE. MARIE, ONTARIO

THE ALGOMA STEEL CORPORATION LIMITED

announce to their customers and the Canadian trade that they can supply American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼", ZEE BARS for car builders and general purposes; small and large ROUNDS, SQUARE and FLAT BARS. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process, and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

MARK OF ALGOMA O.H. QUALITY

+++

Order from us and you will get both quality and prompt service. A trial is convincing.

+++

Our extensive warehouse facilities ensure prompt delivery.

DISTRICT SALES OFFICES:

606 McGill Building, Montreal,
1428 Bank of Hamilton Building, Toronto

Open Hearth - Alloy Steels

Chrome-Vanadium,
Chrome-Nickel,
Nickel Steel

All of these steels we supply in Hot Rolled Bars or Billets.

++

WE ALSO FURNISH

Blooms, Billets, Slabs,
Structural Steel,
Merchant Bars,
Concrete Reinforcing Bars,

++

STEEL RAILS, Open Hearth quality, all sections from 12 lbs., to 105 lbs., per yard.

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Angle Bars, 100% Joints,
Continuous Standard Joints,
Steel Tie Plates

PIG IRON

Basic, Foundry, Malleable,

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Sulphate of Ammonia
Sulphuric Acid Nitre Cake

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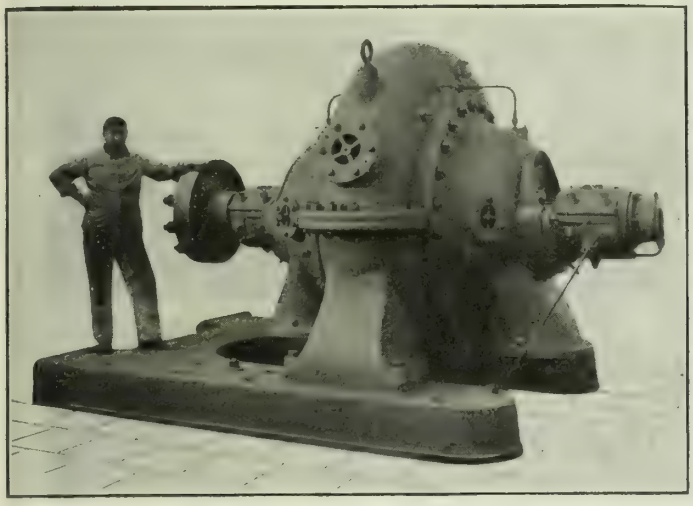
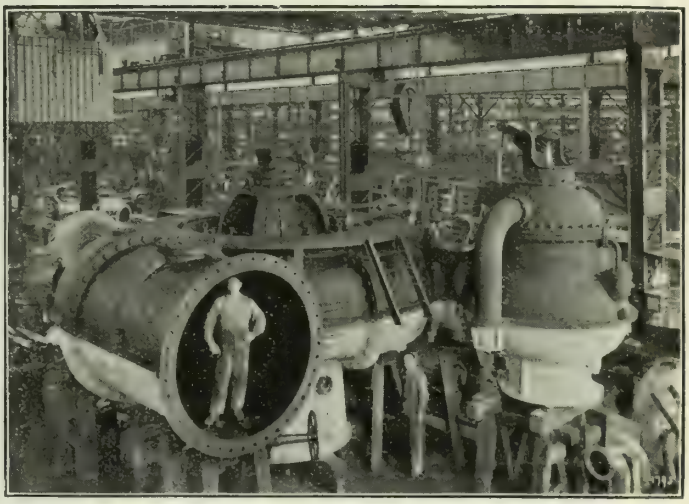
Nova Scotia: F. J. Owen Connolly, The Maritime Trust Building, 91 Hollis St., Halifax, N.S.

ESCHER WYSS & Co. Zurich Switzerland





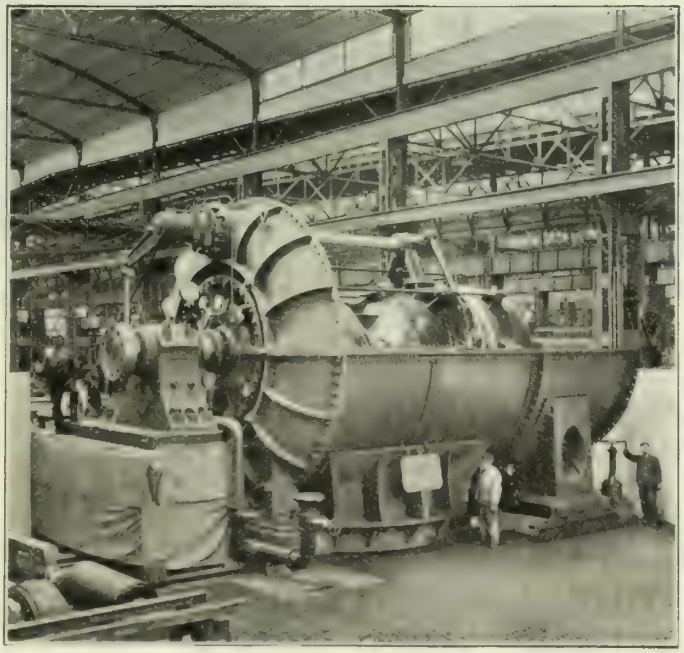
(Above)

20,000,000 Imperial Gal-Pump, Two Stage, Double Suction, Single Discharge 26″D.

78% Efficiency Guaranteed.

84% Efficiency Obtained.

ESCHER WYSS CO. Makes All Sizes



(Above)

Zoelly 2000 kw Geared Steam Turbine Operating at 6000 r.p.m.

Reduced through Gears to 3600 r.p.m. for Generator.

Steam Consumption Full Load 9.72# per h.p. h.r.

Francis Enclosed Type Horizontal Water Turbine Assembled in Zurich Shops.

This represents one of Many Types Made by

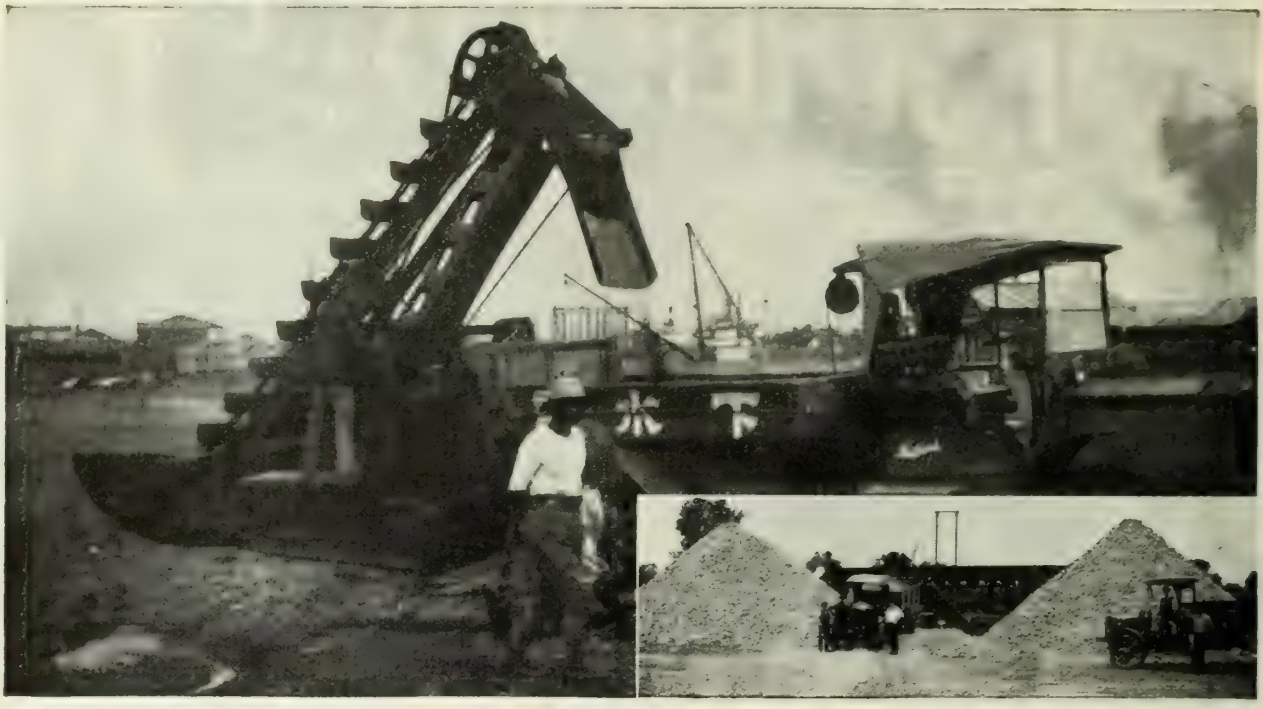
ESCHER WYSS

CANADIAN REPRESENTATIVES

The General Supply Co. of Canada, Limited

OTTAWA

MONCTON, MONTREAL, TORONTO, NORTH BAY, WINNIPEG, VANCOUVER.



Even in Tokyo, Japan, where shovel labor is cheap, a Barber-Greene Bucket Loader saves money by replacing shovel men

Shovel Labor is Getting Scarce and Going Up

We specialize in Labor-Saving Equipment

BARBER-GREENE BUCKET LOADERS
and
PORTABLE BELT CONVEYORS,

BYERS CRANES - Full Revolve,
AUTO CRANES and TRUCKRANES,

BUCYRUS SHOVELS and DRAGLINES,
WESTERN DUMP CARS, SCRAPERS, GRADERS, etc.

LINN TRACTORS and TRAILERS,
SMITH MIXERS, MARSH HOISTS,
INSLEY CONCRETE CHUTING, BUCKETS,
HOPPERS, etc.

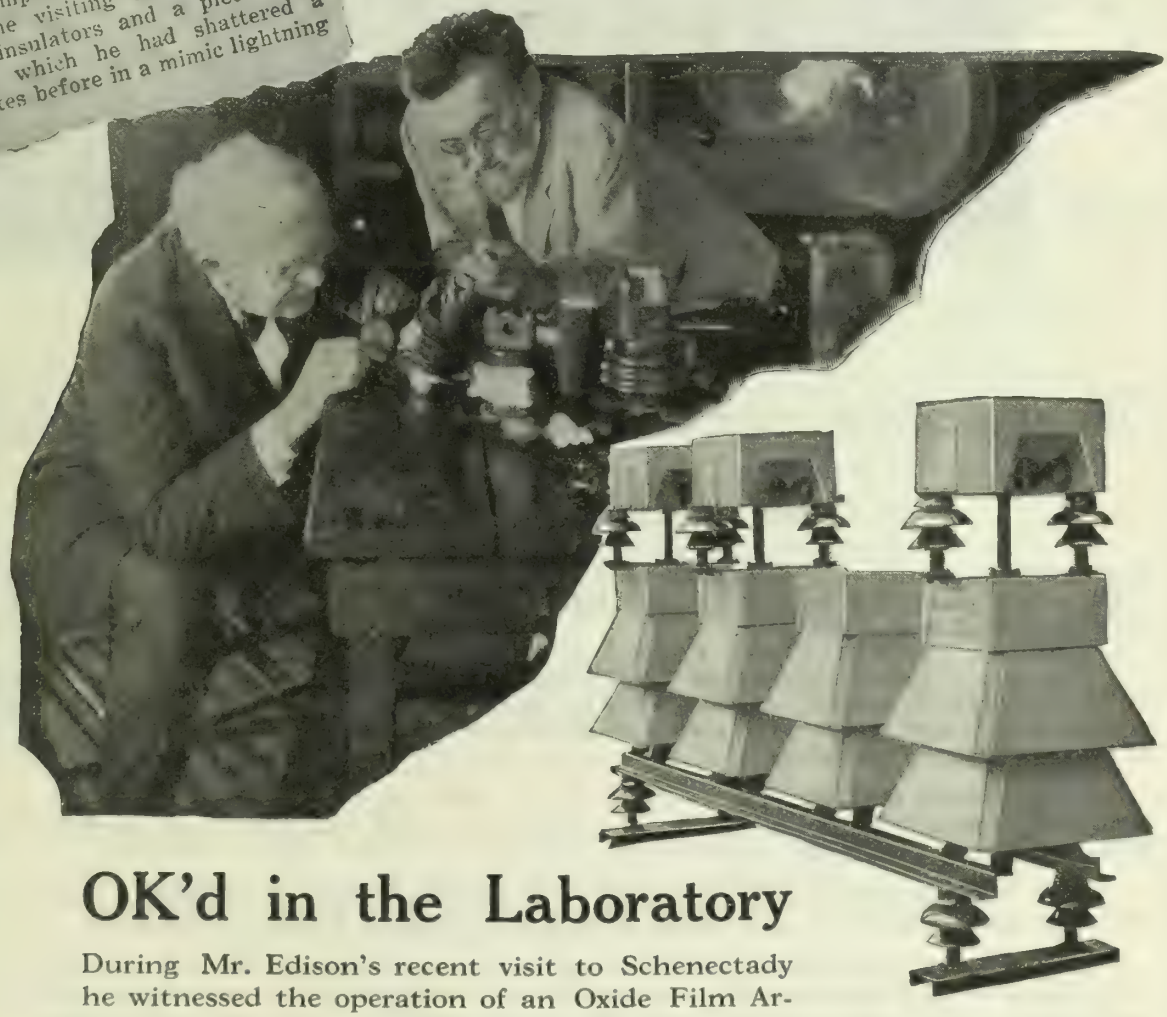
-- Complete Line of Machinery and Supplies --

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver

Oxide Film Arresters—seven years of service is proof of their reliability

Dr. Steinmetz gave an exhibition of his artificial lightning-making machine for Mr. Edison's benefit, and in the accompanying illustration he is showing the visiting inventor broken porcelain insulators and a piece of a tree limb which he had shattered a few minutes before in a mimic lightning storm.



OK'd in the Laboratory

During Mr. Edison's recent visit to Schenectady he witnessed the operation of an Oxide Film Arrester used to protect a 2300-volt bus bar insulator when subjected to a discharge from the lightning generator developed by Dr. Steinmetz. When subjected to the same discharge without the arrester on the circuit, the insulator was shattered.

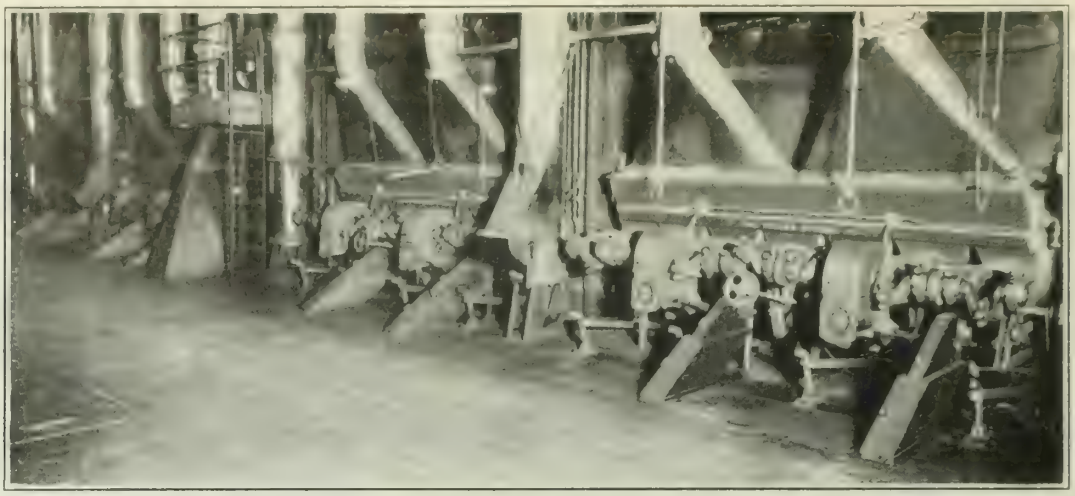
This test, using man-made lightning, is one of many which are made in the G-E Laboratory, where the Oxide Film Arrester was invented and perfected. Seven years of successful operating experience have thoroughly demonstrated the soundness of the theory, the thoroughness of the development, and the practicability of its design.

"Made in Canada" by

Canadian General Electric Co., Limited

HEAD OFFICE TORONTO

Branch Offices: Halifax, Sydney, St John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.



Part of the boiler room of the great Waterside Station of the New York Edison Co., showing some of the 145 TAYLOR Stokers.

The important part in New York's daily life played by the TAYLOR Stoker

THERE is much to be learned from the way in which the Public Service Companies of this great city handle what is unquestionably the biggest power production problem in the world.

Myriads of people depend on the Service of these Companies to whirl them daily to their work and play by subway, elevated and surface lines. Hundreds of thousands of offices, shops and homes, leagues of streets, a skyfull of electric signs depend on this Service for the current that turns night into day.

And because it never fails few ever think "How is this vast Service made so absolutely dependable day in and day out?" The answer to that question leads us first of all to the Public Service Companies' boiler rooms.

Here is the source of the Service and of its dependability. And in all of these boiler rooms carrying the loads easily and faithfully you will find the TAYLOR STOKER.

Need greater proof than this be offered of the reliability of the Taylor Stoker, its ability to produce steam economically in slack hours, to multiply boiler output swiftly when the peaks come, to conserve boiler investment, power house area, coal and labour.

The list of "Taylor" installations serving the Big City leads one to observe that certainly New York's power is "Taylor" made.

New York Edison Co.....	84,155 h.p.	Interboro Rapid Transit.....	54,960 h.p.
Brooklyn Edison Co.....	40,850 h.p.	Brookly Rapid Transit.....	46,800 h.p.
United E. L. & Power Co....	50,400 h.p.	Pennsylvania R.R.....	16,900 h.p.
New York Central R.R.....	2,500 h.p.	N.Y., N.H. & Hartford R.R....	12,950 h.p.
Richmond Light & Ry. Co...	6,000 h.p.	Bush Terminal Company.....	3,520 h.p.

Naturally you are interested in the features that give the Taylor Stoker the dependability and flexibility so vital to Public Service; also in the results from the "Taylor" in plants of every class burning a wide variety of fuels.

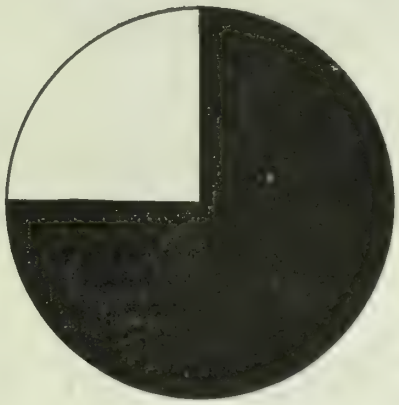
Write to-day for the book of FACTS, "Are Mechanical Stokers a Good Investment?" and also the Taylor Stoker Catalog. They give you the reasons why the "Taylor" is so universally chosen.

THE TAYLOR STOKER COMPANY, LTD.

TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

REDUCE YOUR COAL BILL



75% OF STEAM PRODUCTION COST IS REPRESENTED BY COAL BILLS, 25% BY MISCELLANEOUS EXPENSE. YOUR GREATEST SAVING IS NATURALLY THROUGH REDUCING THE COAL BILL.

OUR WIDE EXPERIENCE IN COMBUSTION ENGINEERING AND FAMILIARITY WITH CANADIAN COALS HAS ENABLED US TO MATERIALLY REDUCE COSTS IN SCORES OF CANADIAN POWER PLANTS.

WE WILL BE GLAD TO CONSULT WITH YOU ON ANY BOILER ROOM PROBLEM.

We manufacture and supply

Coxe Stokers
Self-contained Stokers
Detrick Flat Arches
Uehling Recording Instruments
Combusco Ash Conveyors
New Frederick Stokers
Type "K" Stokers
Lopulco Pulverized Fuel Systems
Quinn Oil Burning Equipment
Custodis Radial Brick Chimneys
Economisers and Air Heaters
Green Stokers

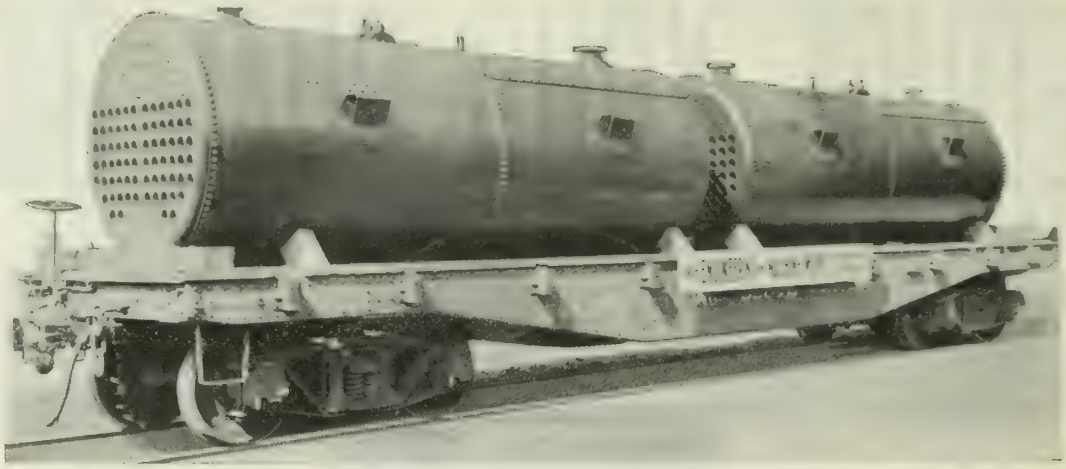
Everything in the boiler room except the boilers.

COMBUSTION ENGINEERING CORPORATION
LIMITED

A. J. T. Taylor, President **John T. Farmer, Chief Engineer**

MAIN OFFICE: TORONTO

VANCOUVER **MONTREAL** **WINNIPEG**



We build Boilers of all types—

our prices are moderate.

Having been building steel plate work for 35 years we have gathered a wide experience in the industry. Our facilities are very complete, with shop practice that is thoroughly modern and in some respects exclusive. We have a reputation for first class workmanship, yet our prices are certainly moderate. Here in St. Catharines our shipping facilities by rail or water, east or west, are very favorable. If you need a new Boiler for power or for heating, you will do well to test our service. We also control the National Hand Fired Stoker—admirable for plants up to 500 h. p.

We have designed and built a large line of Pulp Mill machines, including Grinders, Flat Screens, Wet Screens, Cylinder Moulds, Diffusors and Tanks for all duties, Chippers, Brass Castings, etc.

We build the famous Keystone Excavator—a traction excavator that by the use of different scoops gives you four machines in one. Thus it has the adaptability —and the power—to fit it for 95% of the excavation work offered in Canada.

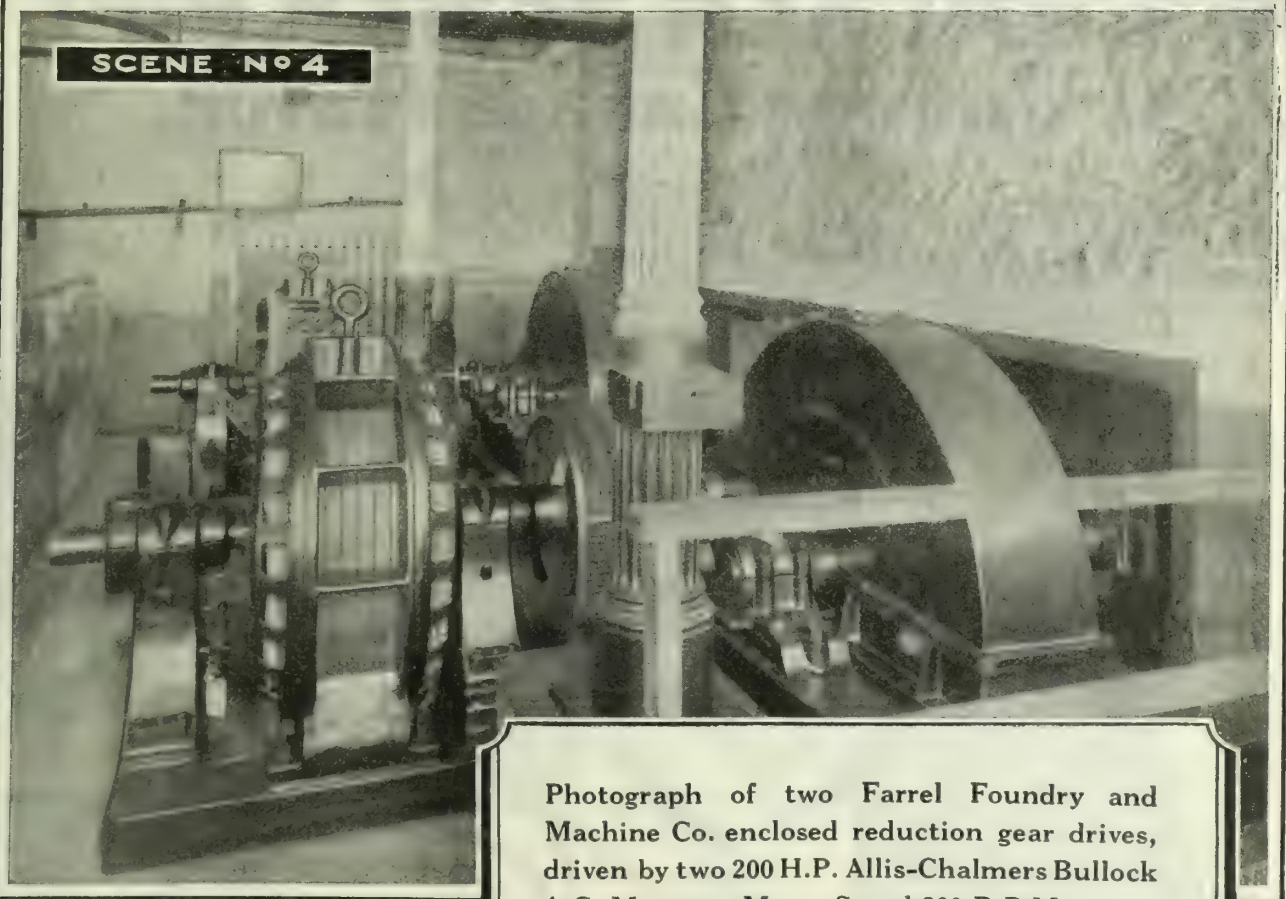
Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices: Hall Machinery Co., Sherbrooke, Que., and Birks Bldg., Montreal.

Winnipeg Agents: Powell Equipment Company, Limited. Vancouver Agents: M. Grindley Co.

Consider the advertiser, his course is that of wisdom.



Photograph of two Farrel Foundry and Machine Co. enclosed reduction gear drives, driven by two 200 H.P. Allis-Chalmers Bullock A.C. Motors. Motor Speed 290 R.P.M.

Imperial Lubricants in use:—

Imperial Renown Oil.
Imperial Polarine Transmission Oil.

IMPERIAL LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS
Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
Imperial Beaver Cylinder Oil

ENGINE AND MACHINE OILS
Imperial Solar Red Oil
Imperial Atlantic Red Oil
Imperial Renown Oil
Imperial Bayonne Engine Oil
Imperial Polar Machine Oil
Imperial Ario Compressor Oil
Imperial Turbine Oils
Imperial Eldorado Castor Machine Oil

FOR VARIOUS INDUSTRIAL USES
Imperial Black Oils
Imperial Cutting Oils
Imperial Tempering Oils
Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.

It is not at all unusual for plant operators to report lubrication savings up to 35 per cent. following standardization on Imperial Lubricants. Economies which are immediately evident reflect our exhaustive study of industrial requirements as well as the scientific methods which govern the manufacture of our complete line of industrial oils and greases. Write our nearest branch for information on any lubrication problem. Your letter will be followed up personally by our expert lubrication engineers.

IMPERIAL OIL LIMITED

McCRACKEN SEWER PIPE
Is Winning Canada's Favor

A.F. Mc.Callum, Commissioner of Works, Ottawa Says:-

In reply to published criticism of the action of city council in adopting the McCallum recommendation for concrete pipe as against vitrified clay pipe. (See Ottawa Citizen April 20th, 1923).

Mr. McCallum's letter to the Board of Control Reads:-

Concrete pipe is not an experiment. It was used in the United States eighty-five years ago, being imported from Scotland. It was so high in cost that after a few years clay pipe was substituted for the smaller sized sewers, but several cities have concrete pipe laid from 50 to 80 years ago.

"Brick was used in larger sewers until the price of cement had lowered sufficiently to use concrete and in most cases brick is no longer used. Yet this same agitation was started by the same people in favor of brick about 15 years ago using the same arguments.

"The clay pipe people do not question the strength of concrete pipe for obvious reasons. The city engineer at St. Lambert, Que., made tests of 18-inch clay and concrete pipe such as we are getting. The clay pipe broke at 4,610 pounds and the concrete at 11,285 pounds.

"They then base all on supposed acids, in sewage. Sewage flowing in sewers is not septic and putrefaction does not take place until it reaches the disposal works or outlets. Yet these disposal works are all made of concrete and no failures have been recorded in this country.

Write for complete information and quotations.

General Sales Agents

Jno. E. Russell Co., Limited

Harbor Administration Building, TORONTO

McCracken Pipe is manufactured in accordance with standard specifications issued by American Society for Testing Materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

McCRACKEN SEWER PIPE

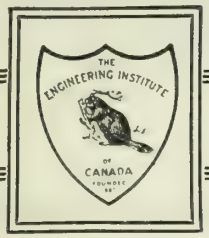
"The Pipe That Endures"

Consult the advertiser, his information is valuable.

— THE —

ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA



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Modern Tendencies in Engineering Education

An Historical Review of Engineering Education, Analyzing, the Curricula of Various Engineering Colleges.

H. W. McKiel, A.M.E.I.C.,
Professor of Engineering, Mt. Allison University

Paper read before The Moncton Branch, The Engineering Institute of Canada, February 9, 1923.

The profession of engineering is one of the earliest to appear in the growth of civilization, developing just after, if not before, priestcarft or theology. We know that some six thousand years ago the pyramids of Egypt were built, and it seems probable that even at this early period the Hindu metallurgists and miners had developed a process for the manufacture of wrought iron, and even had in operation a primitive blast furnace. Within the next two thousand years engineering developed somewhat slowly, but we have records of the construction of the great walls of Ninevah, and the introduction of the industrial chemist into Egypt where glass blowing had become common and iron, steel and bronze were in ordinary use. At about this time, too, is to be noted, in China, the first achievements in structural engineering. Early pagodas, of this period, though built of timber, were constructed on the style of our modern steel building, the load being carried on columns and floor beams, the walls merely serving to enclose. A little later, somewhere about 1000 B.C., we find Jewish engineers building aqueducts to carry water from the Pools of Solomon to Jerusalem. Their knowledge of surveying, however, was very limited, as having started an eleven hundred foot tunnel simultaneously from both ends, they had to sink shafts periodically to keep track of their course. In spite of these precautions the ends were driven past one another, and the tunnel developed an extreme length of seventeen hundred feet. The whole aqueduct was approximately twenty miles in length, and constitutes the earliest accomplishment in the line of water supply.

In later years, in Greece, about 625 B.C., an aqueduct was built to Athens, involving tunnels and siphons, and even a ventilating tunnel to keep the water sweet. We are all familiar with the Roman aqueducts, carried on their systems of arches, and even underground in channels fitted with lead and bronze pipes. By this time, not only fortification, water supply, highway engineering and architecture had developed considerably, but also mining and metallurgy, as evidenced by the use of gold, silver, tin, iron, bronze and steel; and applied chemistry shown by the manufacture of dyes, alcoholic beverages, glass, textiles and the great progress made in ceramics. This development continued throughout the middle ages, the work, owing to the military traditions of the time, being largely done by soldier labour, directed at first by knights and later by officers. Here arose the military engineer, who by 1250 A.D. had become recognized as such. His work consisted of the construction of roads, bridges, fortifications and engines of war, the purposes of all of which were martial.

This condition continued till after Shakespeare's time for we find him saying in Hamlet, "For 'tis sport to hoist the engineer with his own petar". Shortly after his day, however, somewhere about 1750 a new class of engineer arose, a type which built bridges, roads, buildings, wharves and general works, the purposes of which were not military, and the labour on which was not performed by soldiers. In distinction from the *military* engineer, these men were called *civil* engineers, and here began our profession as we recognize it to-day. As an evidence of what was then considered engineering, the charter of the Institution of Civil Engineers of Great Britain, given in 1828, defines engineering as "the art of directing the great sources of power in nature, for the use and convenience of man, as the means of production and traffic in states, both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks for internal intercourse and exchange, and in the construction of ports, harbours, moles, breakwaters, lighthouses, and in the art of navigation by artificial power for purposes of commerce; and in the construction and adaptation of machinery; and in the drainage of cities and towns." This seems a pretty comprehensive programme considering the possibilities of the period.

Commencement of Specialization in Engineering

About sixty years before this time, in 1763, Watt had invented his steam engine, which by 1800 had been improved to such an extent that it was in fairly common use. In 1804 it was adapted for traction and we have the appearance, in Wales, of the first locomotive, invented by Trevithick. In 1829 Stephenson's improved model was developed and put in successful operation. The impetus which these developments gave to industry and transportation broadened the field of engineering so that specialized types made their appearance, the mechanical engineer in the manufacturing industry, and the mining and metallurgical engineers in the coal and metal trades. With the development of electrical machinery, a still further specialization occurred, and from the mechanical branch was brought forth the electrical engineer, a curious hybrid in his early stages part engineer and part physicist. Thus arose our four major divisions of engineering, from which ultro specialization has produced, in our time, not only those already mentioned, but a multitude of others, such as chemical, sanitary, highway, automotive, structural, geological, efficiency, forestry, industrial, etc., and engineering includes many diverse activities. This is well brought out by the clause defining professional engineering in our own New Brunswick act which lists the numerous works of which engineering consists.

This then is the profession with the preparation for which we are concerned. In considering its phenomenal growth and expansion it is not surprising to find an accompanying development and change in the training and apprenticeship required. In the earlier days the student served an apprenticeship under an older and experienced engineer, just as the beginner does to-day in the manual arts. After spending some years in this manner the young engineer might branch out for himself, if he so desired. The military engineer was of course trained in the military schools of the time, and served his apprenticeship as a junior officer in the field. With the ever growing specialization of the past hundred years, a different type of training was considered necessary, and we find springing up schools designed to give the fundamentals of the various branches. Hence it is only within the last century that we find any organized training. When we consider this fact in connection with the long history and imposing traditions of medical and legal education, we can more readily understand the difficulties in which engineering education finds itself to-day.

Development of Specialized Courses in Engineering Schools

In 1740 was founded at Paris the Ecole des Mines, and a little later the Ecole des Ponts et Chausées. Schools representing other branches were founded from time to time, the Ecole Polytechnique, the banner school of the French educational system, being founded in 1794. These schools were followed rapidly by similar ones in England, Germany and America, the earliest engineering school in the latter country being Rensselaer Polytechnical Institute, founded at Troy, N.Y., in 1824. From this time on engineering education received a great deal of attention and the schools increased enormously in number, till now several hundred are carrying on work in America, in Canada alone there being ten degree conferring technical colleges.

The courses in the early schools were comparatively standardized, and the engineer was graduated as a civil engineer. With the development of different branches an attempt was made to meet their particular requirements by adding specialized courses to the already full curriculum. This necessitated, in most cases, the elimination of some of the so called less essential subjects, and has eventually resulted in our present highly specialized and almostly completely technical course. Speaking of this gradual change, W. F. M. Goss, President, Railway Car Manufacturing Association, says:— "The tendency of these changes has, on the whole, been to intensify the technical character of the course, and the process of course making, to which we have become committed, has required us to crowd into the measure, a little more than the measure can easily hold. As a result some very serious and common defects have appeared".

Present Matriculation Requirements

Before discussing these defects let us examine the type of training given to-day. Practically all colleges in Canada and the United States require senior matriculation in mathematics, many of them in English, and in Canada, Toronto and Queen's, at least, in addition to these subjects, demand French, German or physics. It is the writer's opinion that Mount Allison and the University of New Brunswick are the only colleges in America, which could not enforce a senior matriculation standard. The educational department of the province, in theory, provides a certificate of this grade, but the school system provides no machinery whereby a student wishing to obtain this certificate may do so. But one school in the province, so far as the author is aware, teaches work beyond grade eleven, and the pupils of that school write only their own school examinations. Thus as no one applies for these advanced examinations, none are set, and the universities must add to the ordinary work of the first year the English and mathematics which universities in other provinces require the high schools to do for them. The result, of course, is an overloading of the first and second year of the course, but it has one advantage, as the standard of teaching in the university must necessarily be of a higher order than that obtaining in the ordinary high school. To return to our subject, this universal senior matriculation requirement practically amounts to one year in arts, as the majority of the students who remain in school the extra year, necessary to obtain the prescribed standing in English and mathematics, will take work in other departments, and so will secure the equivalent of one year in a college of liberal arts.

The Influence of advances in Sciences on College Courses

Coming to the college course proper, it seems fitting to remark that it was originally founded on the plan of the existing classical course, which had its beginning under a set of conditions very different from those existing in the world to-day. This classical course was considerably modified, naturally, in developing the original engineering course and the resulting course has been in a state of change and transition ever since. With the enormous advances made in science within the last century it is only reasonable to expect that applied science would change greatly also, and that engineering education is always to be found in a more or less frantic attempt to catch up. We are not then, surprsed to find it subject to periodical attacks, from one quarter or another, on the ground of its unsuitability for meeting the demands of the time.

Under the influence of these criticisms the colleges have moulded their curricula in accord with what seemed,

at the time, the plan likely to give the best results. These criticisms have, within the past few years, taken the line that the course provides too much specialization, and too little training in citizenship. The result has been that an era in despecialization has set in until to-day we find that standardization in the first year is almost universal. The work of this year consists of mathematics, English one foreign language, physics and drawing of various kinds.

Despecialization and Return to Standardization

In many colleges, including Penn. State, Iowa State, Purdue, Pittsburg, Pennsylvania, Mass. Inst. of Technology, Stevens Institute, Syracuse and others, some of these so called cultural subjects are carried into the second year, while Cincinnati teaches English for five years. Further, new and rather unusual subjects, according to the old engineering programme, are commencing to be found in the curriculum. Among these are history and economics at Penn. State, public speaking and business law at Cornell, advanced courses in economics at Purdue, history at Cincinnati and psychology at Pittsburg. Business law and engineering economics under various names are required for at least one year at practically all colleges to-day and a few are teaching the elements of accounting.

The more advanced American institutions are also including in the latter years of their courses, a certain number of electives, which must be taken from the college of liberal arts. To briefly summarize the work of some forty of the leading American engineering schools to-day, it might be said that the first year is alike for all branches, but that specialization begins with the second year. Moreover there is a decided tendency to eliminate some of the more technical and highly specialized courses, and substitute for them an equal amount of humanistic work as given in the faculty of arts. There are, however, a few rather startling variations from this general average and these will be dealt with, more fully, later. Our practice in Canada is fairly uniform. Nova Scotia Technical College with its five affiliated schools, McGill with its affiliates, Manitoba, Saskatchewan, Alberta and British Columbia have a standardized course for the first two years in all branches; Queen's has a standardized freshman year, and divides the second year into two broad branches, chemical and non-chemical, with standard courses for each branch these courses differing from one another chiefly in the relative amounts of chemistry, surveying and drawing given; Toronto begins its specialization in the first year. Thus, with the exception of Toronto, our Canadian colleges depart from the American average in the direction of a greater standardization.

The two year uniform course is also adopted in the States by the University of Cincinnati, but the University of Iowa State has made the greatest advance in this line, as for three and a half years the students of all branches work together. It may be interesting to see what the Iowa faculty consider the essentials of engineering, for that is what such a programme really amounts to. In the first year is given instruction in English, mathematics, general drawing, surveying and general shopwork; in the second year in calculus, general physics, mineralogy and geology, descriptive geometry and machine drawing; in the third year in mechanics, hydraulics, materials of engineering, stresses in framed structures, accounting or economics, elementary electrical engineering and an introductory course in power plant engineering. Common to the fourth year in all branches are English, economics or accounting, contracts and business law and metallurgy.

It is interesting to remark that in every American college of which the writer has any information, at least two years military training in an officers training corps is given, and that in many this is continued throughout the whole course. At Iowa the first two years are in such a corps and the last two are devoted to physical training.

Present Extent of Standardization

Iowa State furnishes an example of the most extreme type of standardization found anywhere in America. Some of the other colleges, however, have attacked the problem along a different line and have in a way, departed from precedent even further than Iowa. At Yale there is only one freshman class to which all first year men belong. Consequently the student at Yale is not called upon to decide whether he wishes to be an engineer or not until after he has been one year in attendance, and has received a year of general training including, English, European history, chemistry, mathematics, physics and drawing. If he elects to enter engineering he takes surveying in the summer camp following his first year. In this way Yale makes compulsory the equivalent of one year in the college of arts for all its students.

Pittsburgh has recently gone one step further in this direction, as the first two years of its engineering course are given in the college of arts, suitable options being provided for the engineer. Both these institutions, though, graduate their men at the end of four years. Coming a step further along the same road, we find at Dartmouth, the Thayer School of Civil Engineering, which has required, since its founding in 1871, three years of liberal arts, including English, mathematics, modern languages, physics, chemistry, political economy, sociology, history, and some options. To the student completing this course, with suitable options, and one year in engineering, is given the degree of B.S., followed by the degree of C.E., on the completion of another year in engineering.

The college of engineering at Northwestern University also has always followed the same policy, of a five year course, three years of which are in the college of liberal arts, and two years in the college of engineering. At the end of the fourth year a B.S., is given and a professional degree at the end of the fifth year. Moreover of the seventy-two week-hours of the fourth and fifth years, eight must be chosen from the work of the college of liberal arts. At Cornell such a regulation is not as yet compulsory, but students are so strongly advised to take three years in arts before entering engineering, that it would seem to be a future possibility. For students following such a plan an A.B., is awarded at the completion of the first year in engineering and a professional degree at the end of the third.

Columbia, however, is the red radical in the educational field, as it has departed widely from tradition in two ways. In the first place, in lieu of the regular college entrance examination, a student from an approved high school, furnishing a certificate from the principal of such school, certifying to the satisfactory completion of the prescribed work, and having satisfied the college authorities of his personal fitness, may submit to a set of psychological or intelligence tests, and if satisfactorily graded by such tests, may enter without the formality of an examination. The examination is still given for those who prefer it. But Columbia's chief interest to the engineer lies in its method of handling engineering education. Since 1914 it has demanded for entrance into the professional engineering school, three full years of arts, including chemistry, qualitative analysis, English, history,

economics, mathematics, two modern languages, physics, mechanics, drawing and descriptive geometry. At the end of the first year in engineering an A.B., is awarded and a professional degree at the end of the third.

Origin of the Four-year Course

The standard course to-day, nevertheless, remains a four year course, although these wide variations are interesting as showing the trend of the times. They become still more interesting when we begin to look for the origin of the four year period. About seventy years ago Rensselaer Polytechnic Institute, at Troy, N.Y., was reorganizing its curriculum and its director, a man many years ahead of his time, considered that an engineer should be first of all an able and well educated citizen and secondarily an engineer. With this idea in mind he adopted, as the standard of entrance to the engineering school, a college course, on which was superimposed three years of pure engineering training. This system naturally proved a failure, owing to the limited college facilities of that period, and he was forced to abandon it, but Columbia's standards to-day are his vindication.

To provide a suitable training for the man unable to attend college for the required three years, he established in connection with his engineering school a preengineering course of one year. This, with the three years spent in engineering proper, formed the original four year course. Even this course was at that time more than was demanded by the other professions, both in preparation and subsequent training, but in the years following they have increased both, while engineering, in spite of the many changes and developments of the last half century has retained in essence the time and much of the work of this early course. That this course is far from acceptable to the greater number of the members of the profession at the present time must have long ago become evident to even the most casual reader of our technical press, or to the most indifferent member of our national engineering organizations, all of whom have appointed committees to investigate the situation, and to report remedies for its too highly specialized and technical condition, which state seems to be the chief defect found.

Improvement of Present System Necessary

The teachers of engineering, themselves, are aware of defects in the present system and have been trying to improve it for several years. They have invited criticisms from all sides, from such engineering organizations as the American Society of Civil Engineers, The American Society of Mechanical Engineers, etc., from employers of engineers and from prominent members of the profession. Some of the arrangements have been startlingly violent, that given by W. H. Burr before the Society for the Promotion of Engineering Education, at Yale, in the summer of 1921, being perhaps the most severe, and also the best known, owing to the wide publicity given it.

Although we may not be in sympathy with all the criticisms made by Mr. Burr yet we must admit there is much food for thought in his remarks. He draws attention to the fact that heretofore enginers have not been accorded that professional status, they apparently so ardently desire, and which they are now attempting to obtain by legislation, advertising, etc. He argues that these attempts must surely fail, as the fault lies, not with the general public, but with the engineers themselves; that engineers, owing to the highly specialized training they receive, have become merely high class mechanics; that they differ from members of the other professions in the fact that they receive no training at all designed to fit them for contact with their fellow men, or to give them that proper perspective on world and community conditions, which a man enjoying the confidence and esteem of his neighbours, as a leader, must have.

Mr. Burr presents a very strong plea for the introduction of an arts course, previous to engineering, or for, at least, a modified course which shall be less specifically technical and more fundamental. F. C. Pratt, vice-president of the General Electric Company, makes a somewhat similar criticism, though in a calmer manner. He also contends that our system is too highly specialized and that owing to the large numbers taught the more brilliant men are held back by the average of the class. This latter criticism, I believe, is well founded. Mr. Pratt, however, concludes his discussion of the situation with the statement that, in his estimation, the engineers of to-day are as well prepared as at any time in the past.

The eminent English physicist and engineer, Sir J. J. Thompson, speaking of the successful engineer, says, "A large part of the success of the engineer depends on his power of improving and influencing the men with whom he is brought in contact. The education of the engineer ought then to be framed so as to develop those qualities which makes him, in the highest sense of the word, a man of the world, a man of wide sympathies and interests".

J. H. Dunlap, secretary of the American Society of Civil Engineers, and lately professor of sanitary engineering at Iowa State University, in an able article entitled, "Preparing the Engineer for the New Era," calls attention to the extent to which the modern world has become dependent on the engineer for its ordinary and most commonplace requirements, and the place he is beginning to occupy, both in public affairs and as an executive in corporation management. In commenting on the preparation given to-day and its suitability for the field opening up, he draws comparisons with the requirements of the other professions and engineering, both twenty-five years ago and now. At the earlier date engineering required a higher standard of admission and a longer course, on the whole. To-day the condition is reversed and where two generations ago engineering led and medicine was at the bottom of the list, to-day we find just the opposite condition prevailing.

(This paper will be continued in the August issue of The Engineering Journal.)

Transportation Routes in Canada

Their Relation to Enduring Production

Frederick William Cowie, B.A.Sc., M.E.I.C.

Consulting Engineer, Harbour Commissioners of Montreal.

Paper read before the Montreal Branch, The Engineering Institute of Canada, April 19th, 1923.

At the annual meeting of *The Engineering Institute of Canada*, held in Montreal, January 1923, the committee on By-Laws proposed an amplification to the clause under the heading "Objects of *The Institute*", and as adopted, this clause now reads: — "to encourage original research, and the study, development and conservation of the resources of the Dominion."

There are few subjects, at the present time, of more acute public interest, and none more vital in connection with enduring production in Canada, than transportation routes, and the urgent demand for a reduction in the price of transportation. Tax payers look with distrust at any suggestion of a new transportation route. On the other hand ugly facts regarding production stare us in the face.

Agricultural production, in Western Canada, which otherwise offers such limitless exportable resources, is reported to be in danger of enduring, on account of profitless returns, as compared with competing countries where transportation to markets, pays a lower price.

"The merchant whose desk overlooks the great harbour, and whose visitors smack of the sea, is no more concerned with international trade, than the farmer a thousand miles from the seaboard."—WHEPLEY.—"*The Trade of the World.*"

This paper has been prepared, with a view to promoting a practical study of a most important phase in the development of Canadian resources, viz., successful production.

In such a country of immense distances, with such valuable natural resources, and with success plainly visioned and almost established, what is the most vital present necessity? The answer to this question has been given, by Canada's greatest men, and it is: "immigration".

Well, what has Canada to offer to the would be emigrant? Without hesitation the following twelve reasons may be given as to what Canada offers:—

1. A healthy, if a hardy, climate.
2. An admirable Constitution.
3. Excellent educational facilities.
4. Religious freedom.
5. Splendid sport.
6. Comparatively low taxation.
7. Undeveloped natural resources, almost without limit.
8. A splendid future for children.
9. Western spirit, where a man feels like doing things.
10. An agricultural country where, with four times the present population, 1,000,000,000 bushels of the finest wheat in the world, may be produced for export.
11. A rural district where no one goes hungry.
12. A country where many a poor immigrant has in a few years become rich.

How does Canada's offer compare with that of the middle and western United States? Does it better the offer of Australia and New Zealand? Does it out-bid South Africa? Is it more attractive than the Argentine? Finally, is it more certain than the plains of central Europe?

Some of these wheat growing countries offer a better transportation price on products, from the point of production to the best market. In other respects, the offer of Canada, is probably the most attractive. Is Canada taking, or promising any steps to equalize the price of transportation with such competitors as the United States, Europe, India, and the Argentine? Constructive discussion of this subject is desired.

How can the producer in the West, be assured of the sympathy and the generous unprejudiced co-operation of the dominant forces of the East better than by giving him, what he most needs, competitive transportation rates, to result in Enduring Production?

Production in Canada

While it may be stated, almost without proof, that central and western Canada offers an area for production, almost illimitable, at the same time it must be admitted that it is an area of immense distances to markets. The three western provinces, Manitoba, Saskatchewan and Alberta, have a total land area of 466,000,000 acres; land suitable for agriculture 180,000,000 acres, and land under cultivation 30,000,000 acres.

With one-sixth agriculturally developed at present, what are the results, and what the progress? "In 1898, the population of these three provinces was approximately 400,000; in 1922 approximately 2,000,000. In 1898, the production of wheat was 32,000,000 bushels; in 1922, 375,000,000. In other words, while the population increased five times, the wheat production increased over eleven times. In 1898, the total field crops amounted to 62,000,000 bushels; in 1922, 800,000,000 bushels, increased over thirteen times. What, if the other five-sixths is successfully settled and profitably developed agriculturally? What, when mixed farming is more universal? But what as to distances?

By rail, the distances between the centres of production and projected or existing ocean ports, is approximately: — *Canada*, to Port Nelson, on Hudson's Bay, 700 miles; to Vancouver, on the Pacific, 800 miles; to Montreal on the St. Lawrence, 1,700 miles.

What of Canada's competitors?

Australia, approximately 400 miles;
Southern Russia, approximately 400 miles;
Northern Russia and Poland, approximately 400 miles;
India, approximately 500 miles;
South Africa, approximately 500 miles.

From the ocean ports to United Kingdom ports, the actual distances are approximately as follows:—

Canada, from Montreal	2,763	miles
" " Port Nelson	2,926	"
" " Vancouver	8,639	"
Australia, from Freemantle	9,506	"
Southern Russia, from Odessa	3,426	"
Northern Russia and Poland, Danzig	867	"
India, from Karachi	6,043	"
South Africa, from Durban	7,000	"

During the war, and high prices, and since, with production in many areas at a stand still, the Canadian farmer could meet the high price of transportation. What of the future?

Points-of-View

There are many points-of-view, in connection with transportation and transportation routes, in Canada. Can a citizen be loyal to his own city and be equally loyal to his country? What may be the attitude of a legislator in connection with legislation in the general interest of the country, rather than in favour of his own constituency?

Can it be remembered, that Confederation in Canada was bought at a price, and forgotten, that railways comprised in that price can not, and were not expected to pay?

Here are some of the points-of-view:

Professor Rowland Biffen, professor of Agricultural Botany, Cambridge University: — "Canada may increase its wheat growing area, but the average return per acre was only £ 4 10s., and the Canadian grower was dissatisfied with this. One could not help wondering how the men who had taken 160-acre holdings were going to live on the small returns they had from their production of wheat."

Hon. Robert Rogers, in the Montreal *Gazette:* — "Why should farmers be expected to continue to produce and sell their wheat, as they are obliged to do this year, for less than it has cost them to produce it? Who can deny that * * * with the abnormal increases in the cost of rail transportation, have placed the farmer between the upper and the nether millstones."

The Montreal *Daily Star*, editorial: — "Why do farmers leave the west? The challenge of the west has got to be met. The immediate solvency of this country can only be preserved by ensuring the agricultural prosperity of the west. We must make farming — grain-growing — pay in the west; and we must do it soon."

The Gazette, Montreal, editorial: — "Who believes that the future of the Canadian west will be less happy or less wonderful than the optimists have predicted. It was only forty years ago that the first transcontinental railway, which the pessimists declared could not earn axle grease for its engines, was completed."

The Gazette, Montreal, "Romance of Trade": — "Canada's 'Big Six' in the production field are field crops, live stock, paper and pulp, lumber, mines and dairy, in the order named. Canada moved from eighth place in export trade in 1913 to fourth place in 1922, being now exceeded only by the United States, Great Britain and France."

The Gazette, Montreal, editorial: — "The greatest wheat crop in the history of the Dominion was produced last year. The wealth of Canada has been increased by this abundant harvest and a stimulus has been given to the revival of business.

With all this, the producers in the western provinces are still dissatisfied. They are still reiterating the complaint that they are being unfairly treated, that they are compelled to buy in a dear market and sell in a cheap one. So far as the east is concerned, there is no disposition to accord to the producers of the west anything less than fair treatment. The interests of the west are the interests of the Dominion."

James A. Richardson, in *The Gazette:* — "If wheat is to be exported, Canada must produce against the world."

The Gazette, "Banks and Banking": — "The case of the farmers." "The fact is indisputable that the farmers of Canada, as well as of the United States, have fared hardly during the last two or three years.

"Many farmers in the western provinces have made no money during the last two years, even from the bountiful crop of 1922. It has cost them in many cases more money to grow a bushel of wheat, than the price received for the product."

Sir Henry Thornton, President, Canadian National Railways: — "Our policy will be to do the maximum amount of good for the maximum number of people. We must have more population. The whole question of the farmers of Alberta and Saskatchewan marketing their grain by way of the western route or any other route hinges on one thing, and that is the ability of the railways to give the farmers a freight rate on their grain that will allow them to compete successfully with the other grain-producing countries of the world."

The Interstate Commerce Commission, U.S.A.: — "Distance is important only in so far as it affects the measure of the cost of transportation. It is quite conceivable that the actual cost of transportation over the longer haul might be less than over the shorter."

W. C. McKinnell, Member for Rockwood: — "Advocates the completion of the Hudson Bay Railway to relieve the farmers of western Canada in the matter of freight rates, and to provide faster shipment of grain to Europe."

The Winnipeg *Free Press* on the Hudson Bay Railway: — "There should be no further occasion for parliament to discuss the question of completing the route or not. That is settled now for good, and the west will expect the government not to make merely a meagre appropriation as a confirmation of its policy but to make as substantial an appropriation as possible in view of the vital importance of transportation to the prosperity of western agriculture."

The Gazette, Montreal, editorial:—"Westerners would have the rest of Canada, believe that the people of the prairie provinces are unanimous in the demand for the completion of the Hudson Bay Railway. ** Still there are some men in the west who have not been misled by the propaganda in favour of this absurd undertaking."

W. J. Strain, of Pleasantdale, Sask., ridicules the project. The money necessary to complete the Hudson Bay Railway could be, he thinks, much better employed in improving the existing grain outlets, both east and west, than in adding to the twenty-one millions already lost in "this foolish enterprise".

J. L. Thomas, C.E., in the Montreal *Star:* — "Yes, the railway will be built for a certainty, because the west no longer intends that this important outlet to Europe shall be throttled by the interests of the east."

Prof. B. K. Sandwell, Montreal: — "Condemned the proposed completion of the Hudson Bay Railway as highly impracticable. In addition to the many other

difficulties in the way of such a route, vessels plying up and down the Bay would have to be made of exceptionally powerful construction to resist the ice and could not be employed profitably in any other service during the other ten months of the year. Further than this, the route would only be actually open during five weeks of each year."

Mr. W. A. Bowden, Chief Engineer, Department of Railways and Canals: — "The problem, (the Hudson Bay Railway), is more complex than any other I have had to deal with. * * The distance from the grain centres to Port Nelson was the same as the distance from Winnipeg to Fort William. The distance from Port Nelson to Liverpool was the same as from Montreal to Liverpool. Accordingly there was a saving by the Hudson Bay route equal to that from the head of the lakes to Montreal. The cost of haulage over this distance is from 5 cents to 12 cents a bushel."

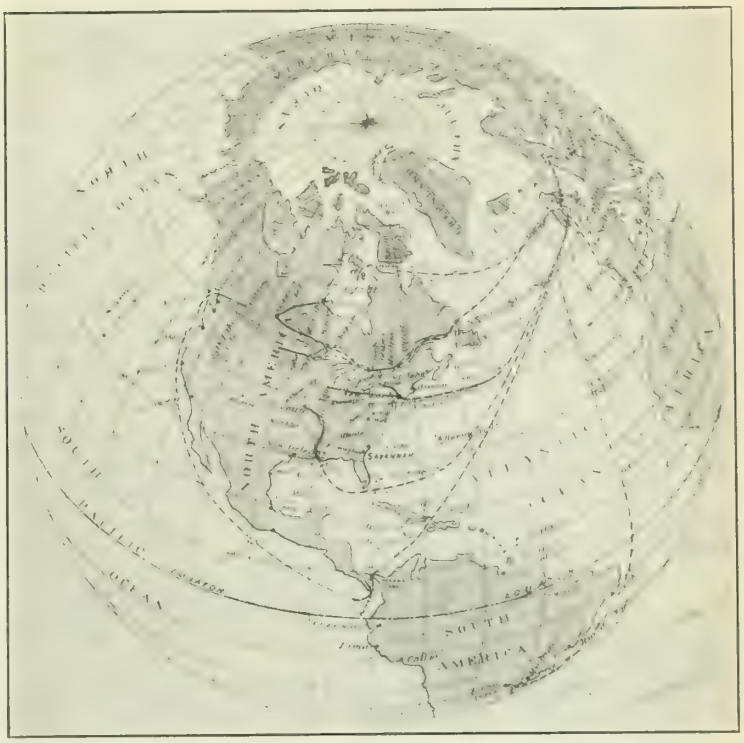
The Gazette, Montreal, editorial: — "If and when the western provinces, through immigration, can be made to produce to their capacity, there will be wheat enough for both eastern and western routes, and for ports in the west as well as in the east. The east is not disposed to take a sectional view of the proposed Vancouver development, but will be content to judge it upon its merits from a national point of view. This, at least, can be said of it now, that it contrasts favourably with the proposal to throw good money after bad in completing the Hudson Bay Railway. The Vancouver project is based upon known geographical data and upon economic conditions which can be determined with measurable certainty, whereas the Hudson Bay folly does not offer even a gambler's chance of success."

The Gazette, Montreal, editorial: — "A spirited campaign is in progress in Alberta and British Columbia looking to the development of the western grain route, that is to say, the route via Vancouver and the Panama Canal. According to a Vancouver estimate, the cost of shipping wheat from Alberta to Liverpool by way of Vancouver is ten cents per bushel cheaper than if the same grain were shipped over the eastern route. The accuracy of this estimate is disputed; an actual test is said to have shown a difference of five cents, but those who are advocating the Vancouver route prefer to put forward the more general claim that a substantial saving can be effected.

These are conditions which require some investigation and consideration. If sacrifices are to be made by the Dominion as a whole for the immediate advantage of the people of Alberta and British Columbia, it will be necessary to show, first of all, that the ultimate gain will be commensurate with the cost and will be shared by those upon whom that cost must fall."

Henry Timmis, in *The Gazette:* — " * * the 'all Canadian' super-patriots who are obstructing the international development of the international section of the St. Lawrence river, which would enable Canada to control her own traffic, as well as the traffic from the mid-west States, with a population as great as the British Isles."

The late Thomas Munro, Past-President: — "We have to consider what the prospects are for an increased trade to the port of Montreal, when the canals, (still incomplete in 1896), shall have been finished through to a draught of 14 feet. The unparalleled reduction in freight rates on the upper lakes bears directly upon this point. Grain is now, (1896), carried from Chicago to Buffalo, (870 miles), at about half the cost of 1886.



A Projection showing Wheat Routes from Production to Markets, 1923

In 1886, the season's average on wheat between these points was 3.6 cents; in 1894, it was 1.2 cents; in 1895 the average was 1.9 cents; but in July last it was carried for 1 cent. The highest Erie Canal rate on wheat, Buffalo to New York, (1894 and 1895), was 3 cents, the lowest 1⅞ cents, and the average 2⅜ cents.

"Taking the average lake rate in the near future on wheat at 1½ cents, and the Erie improved at 2 cents, it is quite clear that 4 cents at the outside will soon carry 60 lbs. of grain from Chicago to New York, a distance of 1,368 miles,—and pay a fair profit at that."

What are the facts of 1922 in view of the above predicted 4 cents rate? H. J. Symington, K.C., in *The Gazette*, — "Rates Contrasted": — "He quoted rates before the war and contrasted these with the rates in 1922; Fort William to Georgian Bay, 1.46 cents in 1914, as high as 11 cents in 1922; Fort William to Montreal, 4.54 cents in 1914 as high as 22 cents in 1922." Evidence given before the Royal Commission investigating lake grain transportation, was to the effect that in May 1922 rates were made at a "conference", as follows:—

Head of the lakes to Georgian Bay ports.....	2½ cents
Head of the lakes to Port Colborne.....	3 "
Head of the lakes to Montreal.....	9¾ "

At a "meeting" in July the rates to Georgian Bay were increased to 3 cents, and the other rates increased, approximately, three-quarters of a cent a bushel, i.e. to Montreal 10½ cents.

From a careful study of these points-of-view, what conclusions must be reached?

Providence has been very liberal towards production in western Canada, and it is assured, if it can be made to yield sufficient returns. Transportation is the one and only serious problem.

The splendid system of water-ways may be made to offset the great distances. As exportable natural products is the hope of the west, so exportable industrial products is the hope of the east.

Navigation improvements and the development of hydro-electric power, may come hand in hand. The latter may pay for the former.

The west is fundamentally sound, and the east is sympathetic.

It has been the policy, in Canada, and thank God, it is so to-day, that the impossible must be tried, and what is possible achieved, to enable Canadians to compete for their own transportation. The river St. Lawrence ship channel, to Montreal, was termed impossible; it has been achieved. A transcontinental railway in Canada, was considered a dream: there are now two. The North-West was a prairie; it is now an agricultural paradise.

It will pay Canada to pay the price to make this agriculture endure. But Heaven forbid, hurried uninvestigated, undemonstrated projects.

The West must be assured, however, so that they may face the day when disorganized Europe is again a competitor. There is distinct hope in the splendid editorials in the eastern dailies.

It is believed that the influence of the new President of the Canadian National Railways will result in unprejudiced action.

In the matter of routes there are absolute differences of honest opinions.

Nothing short of a most thorough investigation will settle these questions with the desired finality.

Unit Transportation Prices

As the bushel of wheat is the established unit of production under consideration, the ton-mile is herein discarded in favour of a more comprehensible unit, viz., the number of miles a bushel of wheat may be transported for one cent.

According to Sanford Evans, the average ocean freight rate, for five years, 1909-13, from New York or Montreal to United Kingdom ports, was 4.83 cents per bushel; or over 600 miles for a bushel of wheat for one cent. According to Thomas Munro, the season's average on wheat from Chicago to Buffalo, all lake, 870 miles, in 1894, was 1.2 cents, or over 700 miles per bushel for one cent. The average rate from Buffalo to New York, 498 miles, via the Erie canal, in the same year, was 2⅜ cents, or over 200 miles per bushel for one cent.

When the farmer was invited to develop the Canadian northwest, he went in and settled on the land, on a basis of unit freight rates as follows:—All lakes, 700 miles per bushel of wheat for one cent; Canal rate, 200 miles per bushel of wheat for one cent; Ocean rate, 600 miles per bushel of wheat for one cent; Railway freights, 66 miles per bushel of wheat for one cent; as compared with figures for 1922 as follows:—

Canadian railroad freights, (actual):

	Miles for one cent
Winnipeg to head of lakes, 415 miles for 8.4 cents	50
Medicine Hat to head of lakes, 1075 miles for 14.4 cents	70
Georgian Bay to Montreal, 375 miles for 8.6 cents	44
Calgary to Vancouver (Mountain), 635 miles for 15.0 cents	42
All lakes freights:—	
Head of the lakes to Georgian Bay, 540 miles for 2½ cents	216
Head of the lakes to Port Colborne, 850 miles for 3 cents	282
Head of the lakes to Montreal, 1216 miles for 9¾ cents	125
Port Colborne to Montreal, 366 miles for 6¾ cents	55

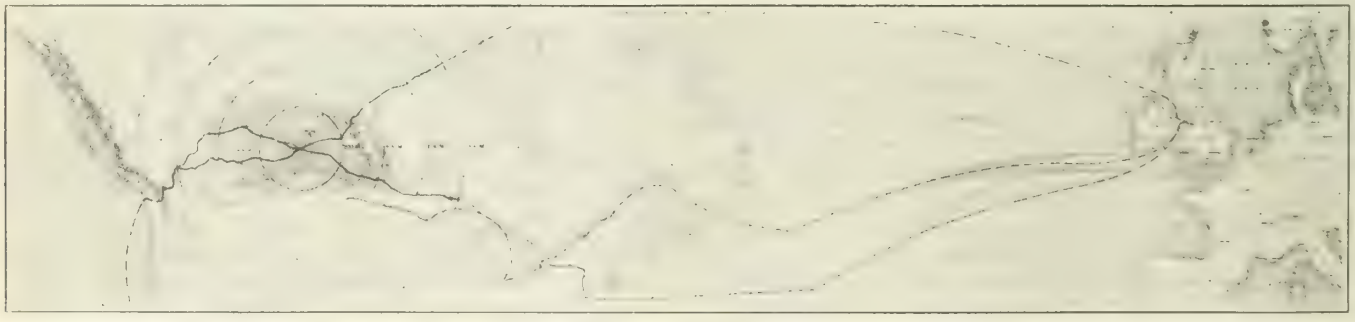
Rail rates, increased about 1⅓ times.
All lakes, increased about 3 times.
Canal rates, increased about 4 times.
Ocean freights, increased about 1¾ times.

Assuming, therefore, that railroad freight rates are the same, in competing grain-growing countries, for comparison, the estimating unit prices are taken as follows: a bushel of wheat being the unit basis:—

		Miles for one cent
1.	Rail freights, long hauls	70
	short hauls	50
	mountain hauls	40
2.	All lakes, 10,000 ton vessels	250
3.	Canals, 2,200 ton vessels	55
4.	Ocean freights, Atlantic	350
	long distances	400

TRANSPORTATION COSTS, FROM CENTRES OF PRODUCTION TO UNITED KINGDOM MARKETS.

(1)	Northern Russia and Poland, (estimated):		
	Rail to Danzig, 400 miles	8	cents
	Extra for port	1	"
	Vessel to Hull, 867 miles (250 mile rate)	4	"
		13	"



Transportation Routes in Canada.

Reprinted with additions from the Proceedings of the Institution of Civil Engineers, Great Britain.

(2)	Southern Russia, Black Sea, (estimated):		
	Rail to Odessa, 400 miles	8	cents
	Extra for port	1	"
	Ocean Vessel, to Liverpool, 3,426 miles	10	"
		19	"
(3)	Argentine, (estimated):		
	Rail to Buenos Aires, 400 miles	8	cents
	Ocean to Liverpool, 400 mile rate, 6,435 miles	16	"
		24	"
(4)	Canada, (projected), via Hudson's Bay (estimated):		
	Rail, Saskatoon to Hudson's Bay, 750 miles	12	cents
	Hudson's Bay port to Liverpool, 3,000 miles	9	"
	Add 25% to ocean rate, 2¼ cents	2¼	
	Add for extra port costs, ¾ cents	¾	"
		24	"
(5)	United States, (actual):		
	Kansas City to St. Louis, rail, 400 miles	8.0	cents
	St. Louis to New Orleans, Warrior Fleet	6.0	"
	New Orleans to Liverpool, 4,561 miles	12.5	"
		26.5	"
(6)	India, (estimated):		
	Rail to Karachi, 500 miles	11.0	cents
	Ocean, via Suez, 6,043 miles and Suez	15.5	"
		26.5	"
(7)	Canada, via all water, (actual):		
	Rail, Moose Jaw to Fort William, 815 miles	12.0	cents
	All water, Fort William to Montreal, 1,216 miles	9.75	"
	Montreal to Liverpool, 2,763 miles	8.5	"
		30.25	"
(8)	Canada via Buffalo-New York, (actual):		
	Rail, to Fort William	12.0	cents
	Lakes, to Buffalo	2.0	"
	Buffalo to New York	9.5	"
	New York to Liverpool	8.5	"
		32.0	"
(9)	Canada, lake and rail, (actual):		
	Rail to Fort William	12.0	cents
	Fort William to Georgian Bay	3.5	"
	Rail to Montreal	8.5	"
	Montreal to Liverpool	8.5	"
		32.5	"
(10)	Australia:		
	Rail to Freemantle, 400 miles	8.0	cents
	Ocean via Suez Canal, 9,506 miles, and Suez	24.5	"
		32.5	"
(11)	Canada, via Vancouver-Panama Canal:		
	Rail, Edmonton or Calgary to Vancouver, (actual)	15.0	cents
	Ocean via Panama Canal to Liverpool, 8,639 miles	21.5	"
		36.5	"
(12)	Canada, winter, all rail, via St. John, N.B.:		
	Moose Jaw to St. John, N.B., 2,292 miles (80 mile rate)	28.5	cents
	St. John, N.B., to Liverpool	8.0	"
		36.5	"

The above relation of the prices on transportation from the producer to the market, are sufficiently accurate for convincing argument. The transportation prices vary from 13 cents to 36.5 cents, the average being about 25 cents. It is a reasonable assertion that under present conditions, at a transportation price of 25 cents a bushel, agricultural production would endure in western Canada, and not only endure, but prosper.

Congestion

It may be given as an opinion, based on experience, that there will be no measure of relief from congestion until the procession of grain shipments can be materially modified or balanced, both from day to day, and from season to season. Congestion, both expected and actual, has been given as the most dominant factor in connection with high and increased, lake freight rates.

This factor does not appear to be recognized in the case of "approved" railway rates, although there does not seem to be any real reason why, in one case and not in the other. Certainly if there is congestion there is demurrage and extra cost.

The factors due to non-uniformity in the procession of wheat, within the province of the engineer to constructively discuss, may be given as:

1. Anxiety of the producers to market and realize, all at once.

2. Lack of sufficient holding storage accommodation at all-the-year-ports, and at consuming centres.

3. In place of only one outlet, there may be two or three.

4. The reluctance of the United Kingdom buyer to contract ahead.

(1) Immediate realization by the producers spells trouble both ways, sales at a sacrifice and increased transportation prices due to congestion. Any remedy for this must be left to the legislator, (if he has any time) to the banker and to co-operation.

Wheat Routes from Production to Markets.

(2) Where shall the grain be stored? Frankly the writer has an open mind on that question. Shall it be at Georgian Bay ports, from whence it may be shipped, in winter, through St. John, Halifax, or Portland? Shall it be at Buffalo, for shipment through American ports? Shall it be at Montreal, for shipment, on call, via Canadian winter ports? Or, shall it be at United Kingdom ports convenient to final marketing and consumption?

The procession of wheat through Montreal has now reached 1,500,000 bushels daily; or five fully laden tramps. It is easy to realize how much storage would be required to overcome a lull, in buying for a week. With ample public storage, both at Montreal and at four or five United Kingdom ports, a uniform procession would be independent of brisk or slow buying; as well as reluctance to buying ahead, par. (4).

(3) Regarding possible alternative or additional outlets, that will be suggested for discussion later.

Urgent Undertakings

The St. Lawrence route is proven. But instead of 155,000,000 bushels of grain, in a season, double that quantity must be possible of shipment.

It is well for Canada that public spirit, as well as skill has attended the bringing into being and the welfare of this magnificent port of Montreal.

The Harbour Commissioners and their very able and efficient staff may be depended upon to do what is possible and what is right. To take care of the procession of grain, without undue congestion, may well be left in their hands. They require no urging; they merit the full support of Canada.

In all fairness as well as prudence, however, the port of Quebec would appear to be worthy of careful study, as an additional spout for the flow of St. Lawrence traffic.

The outstanding project offering the most advantageous and profitable results would appear to be the urgent completion of the new Welland canal.

At the rates established by a conference of Canadian lake shipping companies, viz., 3 cents a bushel by the 10,000 ton class of freighters, or 280 miles for a bushel of wheat for 1 cent, as compared with 6¾ cents from Port Colborne to Montreal by the 2,200 ton class of vessels, or 55 miles for one cent; is it reasonable to believe that the former class of vessel will not proceed through this new, most up-to-date canal, to Kingston or Prescott, for a price which the latter class of vessels could not compete with? Just offer them 4 cents a bushel to Kingston or Prescott, instead of 3 cents to Port Colborne.

From Kingston or Prescott, to Montreal, or to Quebec, what a splendid barging prospect at a 2 cent rate; and for competition, there is Ogdensburg for American vessels.

The building of permanent ports, with large storage elevators, in anticipation of the St. Lawrence deep waterway, would not be sound, but a German Dolphin Port, with a battery of floating elevators would be sufficient for the transfer. The possibility of the early completion of the new Welland canal, is open for earnest discussion.

The Hudson's Bay Route

The writer dares greatly, in "risking a fall" with the Editor-in-Chief of *The Gazette*, of Montreal, who so fittingly voices, and even leads commercial opinion in the east.

After no superficial study, however, the writer dares the statement, that the Hudson's Bay Route offers much more than "a gambler's chance of success". He has personally experienced every phase in connection with St. Lawrence river navigation, its failures and its successes.

The late Sir John Kennedy, Past President, of this *Institute*, in no casual school, taught the writer that while one can not force the mighty St. Lawrence one may make terms with it. And where in the world such prodigious difficulties, where such successes, as in the making of the artificial harbour at Montreal.

There is only one St. Lawrence, and Canada may thank God for it. It can have no enduring rival, but is it wise and sufficient that it be relied upon, alone? Those who know, will accept, that no one may be more, or even equally loyal to the St. Lawrence route, than the writer, who has given his best towards its success, in the last thirty-seven continuous years, and based on mature experience, he is of the opinion that the Hudson's Bay route, under accepted limitations, offers a prize, in favour of production, worthy of fuller investigation and a better attempt to demonstrate it.

Henry Hudson sailed from London in the little ship "Discovery" of 55 tons, on the 17th of April 1610. The strait which now bears his name was entered about the middle of June, and the bay on August 3rd; and on November 1st he went into winter quarters in James Bay.

It was however, two French explorers, Radison and deGrosseillier, who first demonstrated the route for commerce. It is recorded that in 1666, they started from Lake Winnipeg and proceeded to Hudson's Bay, via the Nelson river, (probably the Hayes), and out through the strait, to the markets of the world. Failing to interest Canada, or France, they took their project to England, and after a successful trial expedition the Hudson's Bay Company was founded in 1670.

The Hudson's Bay route is now over three hundred years old, and for over two hundred and fifty years a company of hard headed merchants, operating for gain, with distinct success; year after year, sent one or more ships to Hudson's Bay, and the records of loss are very few.

In the history of Hudson's Bay by Lord Strathcona, we find such statements:

"Most of the company's exports to Europe, were then carried in its own vessels by way of Hudson's Bay.

"Moose Factory * * * is a place of much importance, a vessel going there every year in June and returning in October or November.

"York Factory (on the Hayes River, near Port Nelson) was the depot and port-of-entry for the whole northern department, * * a vessel proceeds there yearly from London.

"Forts, founded by the company, covered a vast extent of country over which they traded and ruled, (a list of fifty-two, being given covering territory from Hudson's Bay to the Pacific, and from Oregon to Alaska)."

Is it any wonder that the people of the northwest still look to the Hudson's Bay as a route for their trade to the outside world; almost every landmark in the territory connecting record and tradition with its former success.

What are the possibilities, and what the limitations of navigation. The possibilities are recorded in the annals of the Hudson's Bay company. The limitations may be gathered from the records and reports of the officers of the Canadian Government Expeditions, themselves navigators, hydrographers, geological survey, and other scientific experts; and from practical skilful sailors as Captain Bernier and Captain Bartlett.

According to information contained in the above mentioned reports, Hudson's Strait, from Button Island at the Atlantic entrance, to the open bay at Mansel

Island, is 480 miles long. The width varies from 30 to 40 miles at the Ocean entrance, to 70 to 84 miles at other points. Across Hudson's Bay the distance is about 500 miles.

A serious attempt to investigate Hudson's Bay navigation and to obtain scientific and practical information, was made by the government of Canada in 1884, 1885, and 1886, under Commander A. R. Gordon.

Commander Gordon, gave as his conclusion respecting the season of navigation, the main question of the object of his expedition, that practical commercial navigation in the straits can be kept up during July, August, September and October.

Captain Bernier in command of the "Arctic", accompanied by Major Moodie, of the Royal Northwest Mounted Police, made a voyage in 1904. They left Quebec as late as September 17th, and passed through Hudson's Strait without encountering any ice until within a few miles of Fullerton harbour, which is over 400 miles north of Port Nelson.

Owing to the proposal to build a railway to Hudson's Bay, the hydrographic survey branch of the Naval Service of Canada, commenced, in 1910, to make examinations of Ports Nelson and Churchill.

Commander I. B. Miles, who had with him Captain S. W. Bartlett, one of the best known pilots of Hudson's Strait, made an interesting report, of continuous ice fields, compass troubles, and northers even in August.

Captain Frederick Anderson, with distinct success headed several expeditions to Hudson's Bay, commencing in 1911.

Of the report of the expedition in 1911, Wm. J. Stewart, chief hydrographer, makes the following observations:

"It shows the dangers and trials which ordinary well found vessels may expect in navigating Hudson Strait. All our vessels had been strengthened, yet all were seriously damaged."

Capt. Frederick Anderson continued the good work in 1912. Chief hydrographer Stewart's observations on the reports of this year are much more favourable:

"Port Nelson was reached on the 6th of August, after an uneventful trip. Benefiting from last year's experience, care was taken in selecting the track followed, to avoid the ice, with the result that the "Minto" encountered less ice than any vessel entering Hudson Bay during the past season. The latter part of the season was occupied in making investigations concerning navigation in Hudson Strait. The straits were finally cleared on the 6th of November, no ice being in sight." In Captain Anderson's own words: "The period during which vessels could enter Hudson Strait with comparative safety may be taken to extend from July 15th until November 15th, with an extension of a week at either end, according to season."

Captain Anderson's reports for 1913, were not so favourable, and heavy ice was encountered on October 23rd. A large hydraulic dredge, built at Toronto, anything but an arctic navigation craft, was safely towed to Port Nelson, in September. In Captain Anderson's report on ice conditions for 1914, he suggests — "hydroplanes operated in conjunction with wireless stations might be used with good results, to inform captains concerning the disposition of the ice."

The above may be taken as a very fair résumé of official information. Now what may be deducted from such a maze of complex reports.

If the St. Lawrence, under similar conditions of isolation, safeguards, local protection, and experience were being investigated to-day, what would be the accepted duration of the season of navigation? During May there is, on occasion, ice in the Gulf, and in November there are snow storms as well as ice, a full month before the last vessel clears from Montreal. May we not expect, with the establishment of safety depots, wireless stations, air patrols, aids to navigation and an ice-breaking service; that better results, than now experienced, would be recorded on the Hudson's Bay route?

The dread hauntings of danger and shipwreck which now pertain to the isolated Hudson Bay, pertained to the river St. Lawrence, within the memory of living men, who have, however, seen success won from "the seemingly impossible".

As to ports, the writer is disposed to argue that the Port Nelson venture was entered upon before sufficient information had been obtained and that the location of the termal works was a distinct mistake. The reports of the railway engineers as to the location to Nelson, being much more favourable than to Churchill, may be accepted. The best that can be said of it, is that the terminal works at Nelson, were located before the excellent charts, now available, had been completed.

A shipping master might have enough doubt as to the route, without having to dread the entrance, and the safety of his ship in the port; and the Port Nelson venture would certainly involve a dangerous entrance to an unsafe port. An artificial harbour, constructed after the experience of the Montreal harbour guard pier, would appear to offer a solution to the port difficulty. A sketch of such a port is shown on the chart. Such a port would be easily approached, safely entered and offer secure accommodation. Vessels could safely winter there, if unexpectedly caught by early winter. The earthwork embankment, flanked by large boulders, has been found to offer the best resistance to ice conditions.

What trade would benefit, and to what extent? Captain Anderson is a safe and prudent hydrographer. He had in Captain Bartlett an experienced adviser. After thirty years he almost confirms Commander Gordon's conclusions. We may for argument, accept Captain Anderson's season, July 15th to November 15th, without counting on the extra week, earlier or later.

An elevator of only two million bushels capacity, filled with "last year's" crop, would provide crago for the unbroken first month. The new crop, August 20th to November 15th, would, at 500,000 bushels per day, and a steady procession, result in a port handling output of two million bushels of old, and forty-three of new crop. Allowing one-third for limitations, there would be 30,000,000 bushels, marketed early, at a saving of 6 cents per bushel, a fair prize in itself, as well as an assurance of enduring production.

What about the argument that "the relatively short period of safe navigation does not coincide with the period of crop movement"?

The writer has seen, time and again, new crop from the Canadian West, at Montreal elevators, from August 20th to 25th. This grain could be at Nelson a full week earlier.

Neither the Hudson's Bay route nor the St. Lawrence route, provides an ideal season of navigation, but there is a great similarity, the critical period of each being September, October, and part of November.

For live cattle, for cold storage products, and for fish, a port on Hudson's Bay offers local advantages.

Fully appreciating the difficulties, and freely admitting that there is justification for differences of opinion, the writer believes that the suggestion of Sir Henry Thornton, recommending investigation, is the only one

which may settle the question, finally, one way or the other.

The Vancouver-Panama Canal Route

There are, and there may be more, three distinct phases in favour of the Pacific port route, viz:—

1. The growing trade to the Orient and South America.
2. Grain shipments in the winter season.
3. The actual producing area of economic transportation by that route.

(1) The grain and grain products, trade to the Orient and to South America, is growing, and in itself would justify the proposed Vancouver facilities.

(2) To equalize and make uniform the transportation procession, in case a co-operative marketing with credits to producers where shipments are deferred, it would appear reasonable that transportation to Atlantic outlets should be concentrated upon, until the close of the season, and that the transportation equipment be then transferred, for five months, to the Pacific port.

(3) There is an area which is relatively tributary to the Pacific port, at all seasons of the year.

The Vancouver Harbour Commissioners are alive to the possibilities of their port. They hope for, and expect a reduction of rail haul rates. With a proper uniformity in the grain procession, it would appear to be possible.

It must be remembered, however, that the possibilities of cheapening transportation by the eastern outlets is real, and according to the measure of to-day, to a 24 cent rate, and no possible public improvement or lowering of rates could make the Vancouver route equally economic.

The St. Lawrence Deep Waterway

Why is the St. Lawrence deep waterway more acutely before the public, to-day, than it was ten years ago?

Ten years ago steam coal was available in Ontario and Quebec at $3.00 per ton, and the supply was ample. To-day, the price is three times higher, and the supply unreliable. Ten years ago, the price of transportation of a bushel of wheat from the farm to the United Kingdom market was fifteen cents. To-day, it is thirty cents. Ten years ago, the price of hydro-electric power in Montreal harbour, was one cent per horse power hour. To-day, it has only advanced 8 per cent.

Before the war, Canada was not the equal of other countries as regards engineering works and industrial variety of out-put. To-day, Canada can build any and all parts of hydraulic and electric development, and much that was not known, ten years ago, about ice control and low head power, is now known and made practically successful.

What equal project in the world, therefore, now offers an equal return to man, from the generous resources of nature.

There are three distinct and important factors: navigation; regulation; power development.

In connection with one or two power development projects, a great deal of investigation and economic planning has been done. The Wooten-Bowden investigation and report, of 1920-21, was a step in the right direction, but only a step. All honour to those engineers for what they accomplished. It has been argued that the Wooten-Bowden proposed installation "fails to produce the best efficiency either in navigation or power". Whatever elsewhere, the proposals in the vicinity of Montreal harbour, were not designed with a view to co-operation with the plans for the future development of Montreal harbour, and the record of the Montreal Harbour Commissioners would go to prove that their views, may not be disregarded.

The lecture given by a distinguished member of this *Institute* before the St. James Literary Society of Montreal, gave food for sober thought. Mr. Henry Holgate, by "chapter and verse" demonstrated that St. Lawrence navigation is international.

Under the Treaty of 1871, the navigation of the St. Lawrence, below St. Regis, shall forever remain free and open for the purpose of commerce to the citizens of the United States, subject to laws and regulations of Great Britain and Canada, not incosistent with such privileges of free navigation. The treaty of 1909, provides in effect, that the navigation of all navigable boundary waters, lake Michigan and all canals connecting boundary waters, shall continue free and open for the purposes of commerce to the inhabitants, and to vessels of the United States and Canada.

It is not imagined that if the United States desired to construct navigation works, they could enter upon Canadian territory without permission. But there are precedents to one country constructing, with permission, navigation improvements in the other.

What is the international point-of-view?

The Suez canal was constructed by an international company.

The Scheldt River was improved and is being maintained for deep navigation, for several miles of its flow through Holland, by Belgium. Navigation improvements have been made and are maintained on the River Danube, by an international commission. Where does Canada stand among nations?

And it is the St. Lawrence route that offers the most hopeful and fullest field for statesmen, economists, engineers and transportation experts. The possibilities are almost illimitable, the future beyond dream.

Let us concede one-sixth of the producing Canadian northwest to the Pacific, another sixth to Hudson Bay, and we have left an export commerce, from Canadian territory, of extraordinary proportions. And with it, American commerce which will surely tax it to its fullest limit. Montreal has nothing to fear.

For navigation purposes, alone, the St. Lawrence deep waterway may be admitted as of doubtful economy. It has been argued that the interest, on the cost, amounting to say $300,000,000., for navigation alone, together with the annual cost of operation and upkeep, would amount to twenty-five million dollars annually, which sum would pay for the present lake and rail transportation, of 250,000,000 bushels of wheat from Fort William to Montreal, at the present high rates annually, for ever; and that western farmers would readily accept a bonus equal to the reduced transportation price; and we must not forget that neither the New York state barge canal, nor the St. Lawrence system, have realized the expected reduction in rates.

The Harbour Commissioners of Montreal, representing not merely the interests of Montreal, but of Canada, have taken an eminently fair attitude upon the question. In their excellent annual reports they have stated that they do not believe that ocean vessels, except specials, are either fitted for inland navigation, nor can they compete with the Great Lakes type of vessel, including a transfer at Montreal.

They would welcome and have reserved harbour accommodation for the 10,000 ton lake vessel, but they specifically state that, in their view, public money at the present time, if available, will yield better returns, if applied to improving proper port terminals.

The question of Coastal Laws, now being Considered by Royal Commission, may not be discussed, but, in connection with the St-Lawrence Deepwaterway, the Free Port area, at Montreal as advocated by Dr. McDougald, would appear to offer, the advantage of America competition in transportation to Montreal.

For navigation alone, therefore, the St. Lawrence deep waterway, may not be Canada's immediate concern, but connected with the development of hydro-electric power for industrial production, and with regulation for navigation improvements below Montreal, the question resolves itself into one requiring immediate serious concern, if a way of safely financing it, is open. We have Ontario and Quebec, without coal, but blessed with a three-quarter interest in 5,000,000 h.p. of hydro-electric energy within a short distance of one of the best manufacturing areas in Canada, if not in America, viz., Kingston to Quebec, with its centre at Montreal harbour.

The writer does not propose to venture a debate with Mr. Thomas Robb, the very able manager of the Shipping Federation of Canada, who is so conscientiously loyal to Montreal's interests.

Canada may — or may not — be able to finance the gigantic scheme, or her share of it. Canada is well able however, to safeguard her own interests. Assuming that both Canada and the United States are interested in improved navigation. Assuming that Canada is vitally interested in the regulation of levels, What may be the best disposition? It is not only a survey that is necessary. It is the greatest economic question Canada has ever faced, as well internationally, financially and practically, as from an engineering stand point. The best that can be made of it, is none too good, for it will last for a long time, impossible of change.

It has been variously stated that American capital is available for the financing of the whole project, subject to the dictates of an International Commission; that American power would be generated on American soil, and the Canadian share on Canadian soil, subject to their laws, and that regulation works and navigation canals would be handed over free for operation and maintenance, as the price; that power would be developed as required and sold at prices fixed by the International Commission, and that a percentage of the income would be reserved to redeem the whole development in a certain number of years.

But before such a scheme may be considered, it should have, and it is worthy of the most profound consideration and the most careful investigation.

In the interests of production what may such a project offer? It would ensure enduring agricultural production in the west, it would promote industrial production in Ontario and Quebec, and it would improve navigation below Montreal.

The St. Lawrence project will not down. It is backed by widespread interests, both from the United States and Canada. The west would obtain their desires in facilitated navigation, and Ontario and Quebec would compete with the world industrially, if successful achievement were accomplished.

A Word as to Transportation Tolls

It has been argued that as a necessity towards enduring production, that either by genius and effort in cheapening routes, or by actual contribution from Canadians east and west, a cheaper price for transportation must be found. When measured only by making production in the west, successful, eastern Canada may, wisely or otherwise, refuse to pay for the loss on operation or to contribute towards cheapening other routes, but with an appreciation of transportation tolls, paid all along the line, or not paid, a different view may be realized.

The integral units of transportation routes, may be considered from the point-of-view of construction, operation, maintenance, and trading.

Canadians, with their money, or their credit, may develop routes, so as to develop productive areas, but almost all the money so spent is paid out at one time or another, to Canadians, all along the line-of-route.

It has been said that the cost of transportation varies inversely with the volume of traffic. Whether that be true or not, it is reasonable to expect that increased production and increased traffic will go hand in hand.

Conclusions

Production is amply possible, in Canada, both agriculturally and industrially, and that in competition with the world. Cheaper transportation prices and hydro-electric power, are possible, and will result. Rail rates in Canada, on grain, have not advanced abnormally. They are reasonable when compared with costs of labour, coal and supplies. The outlook for the future is in favour of a greatly increased volume of traffic, and therefore lower rates. Freight rates on the Canadian lake and canal routes are now being investigated by a Royal Commission.

As to ocean rates, the improved facilities at Canadian ports, which are now attracting the most splendid liner and tramp service, and the resulting competition gives reasonable hope for fair ocean rates, in the near future.

Holding and storage accommodations, to result in a more uniform procession of grain, relief of congestion and favourable marketing is most important.

The best hopes, however, are inevitably linked up with:

(1) The possibilities of the Hudson's Bay route, as an additional and cheap outlet, for a portion of the western wheat.

(2) The Vancouver route for the extreme northwest.

(3) The 10,000 ton type of navigation on the Great Lakes being extended to Montreal and Quebec.

(4) Increase in the volume of traffic, by hydro-electric St. Lawrence development, and industrial expansion in Ontario and Quebec.

(5) With cheaper transportation rates, the development and increased use of Canada's winter ports.

It has been the object of this paper, to promote constructive discussion on a most vital subject.

Who are the interested parties?

(1) The producers of the west in particular, and industrial producers, generally.

(2) The Canadian people, to whom the success of agriculture in the Canadian west, and industrial production in the east, are vital.

Who may remedy matters?

(1) Canadian statesmen, by a careful investigation of the complex problems, and by legislative action.

(2) The Canadian National Railways, under whose executive has been confided most of the railways and port terminals built as a price of Confederation and having in view to the development of Canada, rather than dividends.

(3) Public commercial organizations, supporting what is in the public interest.

(4) The unbounded influence of the splendid Canadian press.

(5) This *Engineering Institute* and its members may do much.

"And what must be done, shall be done."

Maximum Age For Resurfacing Concrete Roads

A digest of a Report on the Inspection of three hundred and fifty miles of Concrete Highway.

R. DeL. French, M.E.I.C.,

Professor of Highway and Municipal Engineering, McGill University, Montreal.

Paper to be presented before the Peterborough Branch, The Engineering Institute of Canada.

During the months of June, July and August, 1922, the writer inspected upwards of three hundred and fifty miles of concrete highway for the Asphalt Association. This work was undertaken primarily for determining, if possible, the age at which such a pavement would cease to serve satisfactorily as a foundation for an asphalt surface. Since the effects of age and deterioration could hardly be expected to be very apparent in the case of concrete roads of recent construction, most of those examined had seen some years' service. Furthermore, city streets were considered only incidentally, as reference to table No. II, a general summary of the data collected, will show.

As a starting point, a list of all counties in Canada and the United States which had ten miles or over of concrete road in 1915 was prepared. Each of these counties was visited by the writer, the tour taking him through seven states of the union and the provinces of Ontario and Quebec. It was not possible in all cases to gather the data desired, for a variety of reasons. Once the severe illness of the county engineer prevented, in more than one instance essential data was entirely lacking, so that in reality a considerably more extensive investigation was undertaken than that represented by table No. II.

Naturally, a foot-by-foot examination of three hundred and fifty miles of highway was impracticable, nor was it considered necessary. A careful noting of all defects, such as could be made from an automobile driven at low speed, enabled an estimate of condition to be made which it is thought was fairly accurate. Very likely a minute examination of any one road might change its classification somewhat, but it is believed that in the aggregate the results are close to the truth.

Classes of Concrete Surfaces

All concrete surfaces were divided into six classes, based on those used by the engineers of the United States Bureau of Public Roads in examining the California road system, as follows:—

Class A. Road with perfect surface or having transverse cracks no closer together than might normally be expected in a road without expansion joints. There must be no visible longitudinal nor corner cracks nor signs of surface disintegration.

Class B. The road may have more frequent transverse cracks, extending either completely or partially across its width, than are allowable under class A. There must be no visible longitudinal nor corner cracks, and the surface must be generally undisintegrated, but slight surface scaling, not over 1-16 inch in depth nor in patches of over three square feet in area, are permissible in not over 10 per cent of the road surface.

Class C. The road may have one or more visible longitudinal cracks, either with or without transverse cracks, but the latter must be not less than an average of 50 feet apart. High joints are permissible, but not over 10 per cent of the total number may be thus affected. Surface disintegration not over ¼ inch deep nor in patches over three square feet in area is permissible in not over 10 per cent of the road surface. Not over 10 per cent of the total number of slabs may have corner cracks, but there must be no visible evidence of settlement of the portion cracked off.

Class D. The road may be cracked in any manner so long as no slabs less than about 50 square feet in area are formed. Patches of an area of less than 15 square feet, and not closer together than 200 feet, on the average, are permissible. Corner cracks may be twice as frequent as in class C, and the portion cracked off may have settled not over ¼ inch below the general level of the road. Three times as much surface disintegration of the same character as allowable in class C may exist.

Class E. This class includes all sections of road not falling into any other class, i.e., all those worse than class D and better than class F.

Class F. Into this class fall all completely disintegrated roads which are passable for automobiles only at very low speeds and with careful driving.

It may be admitted at once that this classification is a rough one. However, it would seem to make little difference what basis of classification is adopted, so long as the standard is the same in all cases, and the complete inspection is made by the same individual, so as to eliminate as far as possible, the personal equation.

To compare roads having varying percentages of different classes of surface, they may be reduced to equivalent roads having a different percentage of some one class. Class A was adopted as the basis of comparison. The relation between a class A surface and that of any other class is mainly a matter of conjecture. Here again, it makes little difference what relationship is adopted so long as it is applied consistently. For the purposes of this investigation, the following were chosen, not entirely arbitrarily, but after a rather careful consideration of all the factors affecting the matter:—

Table I: — Relation between class A surfaces and those of lower classification.

Class	*Value in percent of class A*	*Class*	*Value in percent of class A*
A	100.00	D	20.00
B	50.00	E	16.67
C	25.00	F	0.00

Applying these factors to the figures of columns 15 to 20 inclusive, of table No. II, the results of column 21 are obtained.

Attempts have been made to protect the surface of new concrete roads by coating them with a bituminous carpet. The general experience with such methods seems to have been unsatisfactory. The writer saw a few sections in Maryland which had been thus treated, although this procedure has long been a thing of the past there. In only one case was there any considerable area

of the carpet remaining, and in that case not more than 50 per cent of it was still left. On the other roads it had practically disappeared, there being only an occasional patch along the extreme edge of the pavement, where there is practically no traffic. The failure of such coatings on this continent is notable, in contrast with their reported success in England, where a tar-and-chips carpet appears to be almost standard practice.

Resurfacing Roads

It should be pointed out, of course, that "resurfacing", as defined by the writer means far more than applying a thin coating of some bituminous materials to a worn road surface. To him it means the construction of a high type of bituminous pavement — be it sheet asphalt, Topeaka mix or what not — using the old road as a foundation.

It is recognized that the precise moment at which it becomes good business to resurface any road is largely dependent upon economic factors, which are constantly changing and which vary from place to place at the same time. Some help may be given the highway engineer, however, if an upper limit of age beyond which resurfacing is not technically practicable can be established.

In a resurfaced concrete road, the original concrete acts as a foundation for the new top. The function of a foundation is to distribute the loads imposed upon it over the sub-grade. Thus it should act as a unit, i.e., the ideal foundation should be free from cracks. Such a condition probably never exists in practice, some slight cracking of the foundation being relatively unimportant with bituminous wearing surfaces on account of their flexibility and elasticity. There is, however, a limit beyond which it is certainly not good practice and perhaps unsafe to go.

A class A or class B concrete road will probably make an excellent foundation for any type of resurfacing, monolithic or otherwise. A class C concrete road would probably give quite satisfactory results with an elastic and flexible wearing surface, but would hardly be considered satisfactory for a more rigid surfacing, such as brick with grout filler. A class D road or either of one of the poorer classes *might* be satisfactory if resurfaced with a bituminous coating, but in all probability in the majority of cases trouble would be experienced sooner or later with such construction. It is the writer's opinion, therefore, that if resurfacing is contemplated, a road should not be allowed to deteriorate beyond the point where it may fairly be placed in class C before this repair is undertaken.

It is now pretty generally conceded that any very extensive cracking of a concrete foundation will tend to produce corresponding cracks in a bituminous top. If this is due to the mere presence of the crack in the foundation, and not to accompanying settlement, it constitutes an argument against resurfacing any concrete road showing much cracking. On the other hand, if settlement, of which cracks are the evidence, is the disturbing factor, a concrete road of some years' standing, the cracks in which are largely due to expansion and contraction, should not be entirely unacceptable as a foundation.

Reference to figure No. I will show that the heavy traffic concrete roads inspected reached class C in about nine years, while those carrying light traffic reached the same condition in about thirteen years. These, then, would seem to be conservative figures to adopt as the ages beyond which it is not technically desirable to try to resurface concrete with a bituminous material.

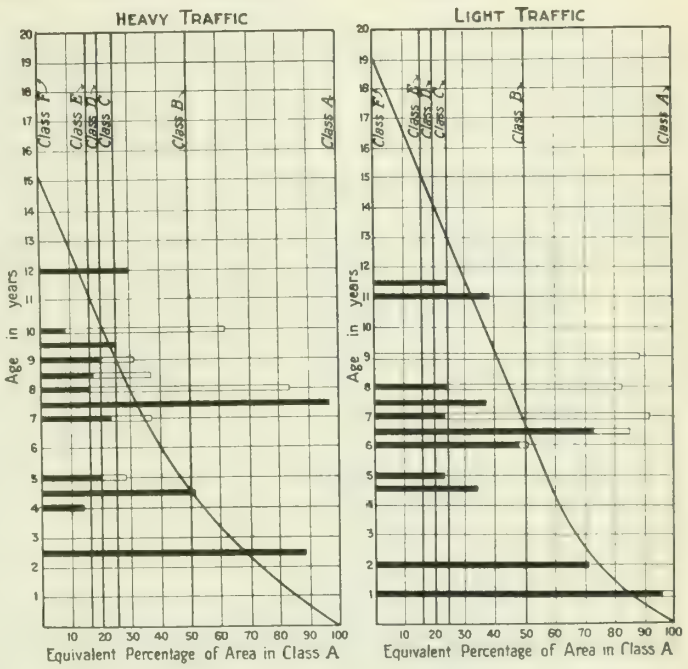


Figure No. 1.

It may be objected by some that the roads inspected do not represent modern practice and that therefore the ages given are unduly conservative, and will not hold good for the newer ones. There may be some ground for this contention, but it is the writer's opinion, based on observation of present practice as exemplified in many construction jobs visited during the past summer, that unless some very radical improvements in the design and construction of concrete roads are introduced, of which there seem to be few indications, the conclusions presented above will be substantially correct for the newer roads. Some progress is being made in the art of designing and building concrete roads, but it appears to be slow and most of the steps in advance so far have been in connection with the less important features which can hardly be presumed to affect durability in a great degree.

It would be manifestly unfair to offer a paper of this nature to the members of *The Engineering Institute of Canada* without emphasizing the fact that while the work it describes was done at the request of an organization vitally interested in promoting the use of a particular paving material, no restrictions of any sort were imposed on the writer, either as to the data he should collect or the conclusions he should draw from this data when available. In effect The Asphalt Association asked merely for the truth as the writer saw it, without regard as to the manner in which it might affect their interests.

In conclusion, asknowledgement is due the Association for permission to present this brief digest of the complete report, and to the many road authorities which furnished much of the data, often at considerable cost and inconvenience to themselves.

Table II——Digest of Data Relating to Concrete Roads Inspected.

Traffic: H = heavy, L = light. Aggregate: S = stone, G = gravel. Sub-grade: C = clay, G = gravel, L = loam, S = sand. Drainage: E = excellent, G = good, F = fair, P = poor. *Estimated immediately after inspection, but no memo. † Plus or minus.

Number.	State or Province and County	Road	Date built	Traffic	Length, ft.	Width, ft.	Av. thick. ins	Length of sections, ft.	Area, sq. yds.	Mix.	Aggregate	Sub-grade	Drainage	Per cent Area of Class						Equiv. % Class A area
														A	B	C	D	E	F	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Illinois																			
1	Cook,	Dixie Highway	1914	H	19,443	18	7	100	38,886	1–2–3½	S	C&L	F			35.2	64.8			21.76
2	Cook,	Halsted St.,	1915	H	2,623	18	7	100	5,246	1–2–3½	S	C&L	F		*50.0	*50.0				37.50
3	Cook,	Milwaukee Ave.,	1911-15-16	H	24,000	18	7	100	48,000	1–2–3½	G	C&L	F		*50.0	*50.0				37.50
4	Cook,	South Park Ave.,	1915	H	7,111	18	7	33⅓	14,222	1–2–3½	S	C&L	F		*15.0	*35.0	*50.0			26.25
5	Cook,	Twelfth St.,	1912-15	H	9.926	18	7	33⅓	19,852	1–2–3½	S	C&L	F			48.7	19.8	6.7	24.8	17.26
6	Madison,	Alton,	1914	L	4,500	15	6¾	30†	7,500	1–2–3½	S	C	G		*85.0	*15.0				46.25
7	Madison,	Fairgrounds,	1913	L	3,960	15	6	33⅓	6,600	1–2–3½	S	C	F	23.3		76.7				42.48
8	Madison,	Hillsboro,	1915	H	7,400	15	6¾	33⅓	12,333	1–2–3½	S	S. C.	E			79.5	19.5	1.0		23.94
9	Madison,	Marine,	1915	L	1,768	15	6¾	33⅓	2,947	1–2–3½	S	S.C.	G			64.8	35.2			23.24
10	Madison,	Troy,	1913	L	6,350	15	6	33⅓	10,583	1–2–3½	S	S.C.	F			89.1	10.9			24.46
	Indiana.																			
11	St. Joseph,	Lincoln Highway,	1914-16	H	58,080†	18	7½	25	116,160†	1–1½–2½	G	S	F	*7.0		*55.0	*15.0	*23.0		27.58
12	St. Joseph,	Prairie Ave., South Bend,	1912	H	3,170†	18	6	25	6,340†	1–1½–2½	G	S	E	*50.0		*50.0				62.50
	Maryland.																			
13	Baltimore,	Reisterstown,	1917	H	40,603	17	7	30	76,695	1–2–4	S	S. L.	G	0.9	17.8	65.7	1.5	12.9	1.2	28.68
14	Caroline,	Fowling Creek-Preston,	1914-20-21	L	48,629	15	7	50	81,048	1–2–4	G	S	F	10.4	12.6	61.5	1.2	13.7	0.6	34.60
15	Carroll,	Westminster-Emmittsburg,	1914-15-18-20	H	79,464	14½	6-7	30-100	127,937	1–2–4	S	S. L.	G				100.0			20.00
16	Cecil,	Chesapeake City-Galena,	1914-15-16	L	90,499	13	6-7	30-50	130,721	1–2–4	G	S	F	3.2	9.2	56.2	31.0	0.2	0.2	28.08
17	Cecil,	Northeast-Elkton,	1913-17-19-20	L	34,161	14	6	30	53,140	1–2–4	G	S	F	30.0	25.4	17.2	1.8	22.5	3.1	51.11
18	Cecil,	Perrysville-Charlestown,	1914	L	18,427	14	6	30	28,665	1–2–4	G	S	F	3.3	40.9	5.7	50.1			35.20
19	Dorchester,	Brookview-Sharptown,	1914	L	29,515	14	6	30	45,913	1–2–4	S	S	P	Tar co	ated—	cannot	be esti	mated.		
20	Dorchester,	Hurlock-Shiloh Church,	1911	L	7,550	14	6	30	11,745	1–2–4	S	S	P	17.1	8.0	67.1	3.9	3.9		39.31
21	Queen Anne,	Roberts Sta.-Goldsboro,	1915	L	53,011	14	6	30	82,461	1–2–4	G	S	F	33.7	4.9	46.9	1.2	12.3	1.0	50.17
22	Wicomico,	Salisbury-Ocean City,	1914-15	H	144,196	14	6	30	224,306	1–2–4	S	S	F	95.9	0.9	1.3	1.9			97.06
	Michigan.																			
23	Wayne,	Eureka,	1914-15	L	63,360†	12	7	25	84,480†	1–1½–3	G	S	F		*50.0	*50.0				37.50
24	Wayne,	Fort,	1912-13	H	26,400†	12	7	25	35,200†	1–1½–3	G	S	F			*100.0				25.00
25	Wayne,	Grand River,	1909-12	L	36,960†	18	7	25	73,920†	1–1½–3	S	S	F			*100.0				25.00
26	Wayne,	Huron River Drive,	1913-15	H	18,480†	16	7	25	32,853†	1–1½–3	S	S	E			*75.0	*20.0	*5.0		23.58
27	Wayne,	Seven Mile,	1913-14-15	L	54,120†	15	7½	25	90,200†	1–1½–3	S	S	F	*20.0	*10.0	*70.0				42.50
28	Wayne,	Sumpter,	1921	L	34,320†	20	9	—	76,267†	1–1½–3	S	S.C.	F	*95.0		*5.0				96.25
29	Wayne,	Warren,	1919-20	H	118,800†	18	9	50	237,600†	1–1½–3	S	S	F	*85.0			*10.0	*5.0		87.83
30	Wayne,	Willow,	1920-21-22	L	31,680†	20	9	—	70,400†	1–1½–3	S	S.C.	G	*100.0						100.00
	New York.																			
31	Erie,	Grand Island,	1913 or pre.	L	23,760	16	6	33⅓	42,240	1–2–4 ?	S	G	G						*100.	0.00
32	Erie,	Holland-Protection,	1920	L	27,403	16	6	33⅓	48,717	1–1½–3	S	C&G	E	*50.0	*35.0	*15.0				71.25
33	Erie,	Niagara River,	1918	H	18,160	16	6	33⅓	32,280	1–1½–3	G	G	G				*50.0	*25.0	*25.0	14.17
34	Erie,	Orchard Pk.-E. Aurora,	1917	L	34,637	16	6	33⅓	61,577	1–1½–3	S	C&G	G			*90.0	*5.0	*5.0		24.33
35	Erie,	S. Wales-Holland,	1915	L	23,866	16	6	33⅓	42,428	1–1½–3	S	C&G	E		*9.0	*83.0	*5.0	*3.0		26.75
	Ohio.																			
36	Huron,	Bellevue-Norwalk,	1914	H	8,630	16	6	30	15,342	1–1½–3	S	S	G	63.2	0.5	35.4	0.4	0.5		72.46
37	Huron,	Monroeville-Chicago Jct.,	1914	L	9,700	10	6	30	10,777	1–1½–3	S	S	E	70.4	23.2	6.1	0.1	0.2		83.48
38	Huron,	Oberlin-Norwalk–Sec. G	1913-14	H	13,910	14	6	30	21,437	1–1½–3	S	C&G	G			37.7	27.8	23.7	10.8	18.94
39	Huron,	" " Sec. H	1914	H	13,602	16	6	30	24,181	1–1½–3	S	C&G	G	14.2	30.9	40.8	7.0	7.1		42.43
40	Huron,	" " Sec. I	1914	H	5,640	16	6	30	10,027	1–1½–3	S	C	E	78.6	3.2	2.2	16.0			83.95
41	Huron,	Plymouth-Norwalk,	1915	L	5,630	10&20	6	30	7,023	1–1½–3	S	C	G	81.8	4.3	11.2	2.7			87.29
42	Lake,	Chardon-Madison,	1913	L	7,445	12	6	30	9,927	1–1½–3½	S	C	F	79.5	3.6	15.3		0.8	0.8	85.26
43	Lake,	Painesville-Warren,	1914	L	7,075	12	4 + 2	30	9,434	1–2½–5 1–1–2	G	C	G		44.6	54.9	0.3	0.2		36.09
44	Licking,	Columbus-Newark,	1914	H	20,698	16	7	30	36,796	1–2–4 ?	G	G	G					*100.0		16.67
45	Licking,	National Pike,	1914	H	77,774	16	7	30-70	138,266	1–1½–3	S	C	E			*100.0				25.00
46	Medina,	Hinckley-Medina,	1914	H	7,286	10	5 + 2	30	8,096	1–1½–3	G&S	C	E	22.2	22.5	9.4	0.8	32.8	12.3	41.43
47	Medina,	Medina-Norwalk–Sec. G	1915	L	4,800	10	6	30	5,333	1–1½–3	S	C	G	88.0	6.0	6.0				92.50
48	Medina,	" " Sec. M	1915-16	L	8,882	10	6	30	9,867	1–1½–3	S	C	G	78.1	12.5	5.4		4.0		86.37
49	Medina,	" " Sec. L	1915-16	L	5,302	10	6	30	5,891	1–1½–3	S	C	G	54.0	31.2	12.0	2.3	0.5		73.14
50	Mercer,	Addy,	1916	L	31,680†	14	6	35	49,280†	1–1½–3	G&S	C	G		93.0	5.0	2.0			48.15
51	Mercer,	Celina-Greenville,	1910	H	10,560†	14	6	30	16,427†	1–2–4	G	C	E		32.5	31.0	32.5	4.0		31.17
52	Mercer,	Dyzert,	1916	L	21,120†	14	6	35	32,853†	1–1½–3	G&S	C	G		95.0	5.0				48.75
53	Mercer,	St. Marys-Fort Wayne,	1914	H	31,680†	16	6	35	66,320	1–1½–3	G	C	G		90.0	9.0	1.0			47.45
	Ontario.																			
54	Wentworth, Halton, Peel & York,	Toronto-Hamilton,	1915-20	H	186,278	18-24	8	50	390,000†	1–1½–3	S	S	E	4.0		96.0				28.00
	Quebec.																			
55	D. Montreal,	Notre Dame St. East,	1912	H	3,960†	44	10+2	?	19,360†	1–2½–5 1–1½	S	C	E					*50.0	*50.0	8.33
56	D. Montreal,	St. Catherine St. East,	1912	H	3,960†	44	10+2	?	19,360†	1–2½–5 1–1½	S	C	E				*35.0	*65.0		17.83
57	Napierville,	Napierville Village,	1913	H	2,600†	16	7	50	4,622†	?	S	C	E			*90.0	*10.0			24.50
	Wisconsin.																			
58	Milwaukee,	Blue Mound No. 1,	1913	H	22,682	18	6½	50	45,692	1–2–3½	G	C	G			*100.0				25.00
59	Milwaukee,	Cedarburg Ave. No. 1,	1914	L	8,395	18	6½	50	16,772	1–2–3½	G	G	G			*100.0				25.00
60	Milwaukee,	Green Bay No. 1,	1913	H	7,814	18	6½	50	15,709	1–2–3½	G	C	G	14.7			85.3			31.76
61	Milwaukee,	Green Bay Nos. 2 & 3,	1914	H	25,344	18	6½	50	46,187	1–2–3½	G	G	E			*50.0	*50.0			22.50
62	Milwaukee,	Lovers' Lane No. 1,	1915	L	3,802	18	6½	50	8,014	1–2–3½	G	C	F			*100.0				25.00
63	Milwaukee,	North Fond du Lac No. 1,	1913	H	26,611	18	6½	50	50,579	1–2–3½	G	G	E				*100.0			20.00
64	Milwaukee,	Wallace Ave.,	1915	L	4,171	18	6½	50	8,398	1–2–3½	G	C	G			*100.0				25.00
					1,793,363				3,181,432											
					340 mi.†															

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VOL. VI July 1923 No. 7

Institute Fuel Committee

Several branches of *The Institute* have been doing magnificent work in connection with the fuel problem of Canada in a manner calculated to show the public that in the solution of this problem *The Institute* must play a prominent part.

At a recent meeting of the Council a Fuel Committee of *The Institute* was established, the first meeting of which was held at headquarters on Thursday, May thirty-first, at which time the committee was organized, and a conference held with a delegation of five members of the Dominion Fuel Board, including the chairman and secretary.

There were present of the committee, F. A. Combe, chairman, who occupied the chair; John T. Farmer, B. F. Haanel, C. V. Corless, E. V. Moore, George C. Mackenzie and Fraser S. Keith, who acted as secretary in the absence of Lesslie R. Thomson. There were also present Doctor Charles Camsell and J. B. Challies, John McLeish and C. P. Hotchkiss, of the Dominion Fuel Board, together with B. F. Haanel, a member of the board and also a member of the committee. Doctor Allen of Saskatoon, and Doctor Alfred Stansfield were also present as representatives of the Canadian Institute of Mining and Metallurgy, the majority of the members of the committee being also members of that body.

Chairman Combe asked for a general discussion as to the scope and activity of *The Institute's* committee, the general opinion being that, inasmuch as several branches were discussing the problem from the local viewpoint, this committee should consider the problem in its broadest aspect, and, as far as possible, from the national viewpoint. General appreciation was expressed of the desire of the Dominion Fuel Board for co-operation, there being a unanimity of opinion that the closest co-operation should be maintained, both with the Dominion Fuel Board and with the committee of the Canadian Institute of Mining and Metallurgy.

Doctor Camsell, B. F. Haanel, John McLeish and J. B. Challies, told of the work of the Dominion Fuel Board, of the problems that confronted it, of the line upon which they were directing their effort, and in general indicating clearly what the Dominion Fuel Board had done, and was proposing to do. Doctor Camsell explained the efforts being made to establish the use of coke for domestic purposes by the installation of coking plants at Hamilton, Ottawa, Montreal and Quebec more particularly with a view to using Nova Scotia coal for that purpose. Considerable discussion followed on the use of coke and its desirability for use in the ordinary domestic furnace.

Mr. McLeish advised that a study was being made of the use of central heating plants and asked for suggestions. It was suggested that a bibliography be secured from which could be chosen articles giving the most information on the extent of the use of central heating plants — their economy, and cost of operation.

Doctor Corless, in stating that the problem of the moment was essentially one of transportation, declared that the ultimate aim of the committee should be to work for a solution that would make Canada entirely independent of any other country for its fuel, indicating that such a situation would be one of the greatest factors possible in building up the Dominion, now spending enormous sums for foreign fuels.

Following the discussion on the importance of the transportation phase of the problem it was unanimously resolved that the following memorandum be submitted by *The Engineering Institute of Canada* and the Canadian Institute of Mining and Metallurgy to the Fuel Committees of the Senate and House of Commons, upon proper authority being secured from the councils of these bodies.

WHEREAS it is the opinion of the Fuel Committee of *The Engineering Institute of Canada*, co-operating with the Canadian Institute of Mining and Metallurgy, at a regular meeting held at Montreal on Thursday, May thirty-first, nineteen twenty-three, that the most important element in the fuel problem of Canada is the question of transportation, and

WHEREAS the Fuel Committees of the Senate and the House of Commons are at present studying the fuel problem of Canada,

Be it resolved —

THAT the Fuel Committee of the Canadian Senate and the House of Commons of Canada be requested to consider the importance of this phase of the fuel problem to the end that they recommend provision of funds and that they appoint a committee of coal transportation and equipment engineering experts to act in consultation with the engineering departments of the transcontinental railways, to determine, both scientifically and experimentally, the greatest extent to which the cost of the transportation of coal from Alberta to Ontario can be reduced.

It was noted that the secretaries of the Canadian Institute of Mining and Metallurgy and *The Engineering Institute of Canada* had been coopted by the Dominion Fuel Board.

The Fuel Situation — an Opportunity for Service.

To the Membership of The Institute:—

The first number of The Engineering Journal was devoted to the Fuel Situation in Canada, and President Vaughan on that occasion emphasized strongly the importance of the subject to the Dominion. To-day the Fuel Situation is even more important, and the conditions that now confront us in Canada present an opportunity for service to our country such as has never before been given to the profession.

Linked as it is with the great problem of transportation, in which for its own sake, every Canadian has a personal interest and duty, the fuel problem becomes more important every day. Our principal fuel deposits are generally far distant from the consumers.

The knowledge of our available fuel, of many kinds and every kind having many exellencies, is inseparable from the correct understanding of its proper use, the most suitable method of burning and the best furnaces and heating appliances, efficient ventilation and insulated walls of houses, not to mention the broader and even more comprehensive principles of coking and by-products, briquetting, and central heating systems. All these points and many others, in their direct and in their indirect application, are appreciated by the members of the Institute.

The Fuel Committee of the Council is actively studying the whole question, and the members are invited to co-operate with them. Communicate with General Secretary Keith. The Fuel Board of Canada has already met our representatives.

But in taking up the matter in its broad aspect, please do not overlook the importance of the quesiton *LOCALLY*. The problem differs widely in its application from ocean to ocean. In Sydney it is one thing, in Montreal another, in Toronto still another, in Regina another, and so on right across the continent. The proper fuel may be wood, peat, lignite, bituminous coal or anthracite. Haulage may be or may not be a serious factor.

I am firmly impressed that the greatest single service The Institute can render the Dominion to-day is by every branch forming an active fuel committee to study the local problems in particular, and to publicly advise the people of the district as to the best fuel and its proper use. This work should be commenced now, and the local information should be given out from time to time, having regard to the seasons and the needs.

Walter J. Francis,

Montreal, June 2, 1923. President.

Maritime Professional Meeting

Arrangements are under way for a maritime professional meeting, the exact date of which has not yet been established, to be held in St. John, New Brunswick, towards the end of September. This meeting promises to be one of the most interesting professional meetings held, and it is expected that a large number from the central provinces will be present to supplement the gathering from the maritime provinces.

Saguenay Branch Approved

As a further indication of the engineering development of the Dominion, and a growing desire on the part of members in unorganized districts to be more closely identified with the affairs of *The Institute*, an application for the establishment of a branch to be known as the Saguenay Branch was received by Council at the meeting held on Tuesday, May twenty-ninth, nineteen twenty-three, and hearty approval given for the early establishment of the branch in that district. The secretary was instructed to make arrangements for an organization meeting to be held during the summer. The Saguenay valley has become an important engineering centre and reflects the strong position occupied by the engineering profession in the development of the pulp and paper industry.

The application reads as follows:

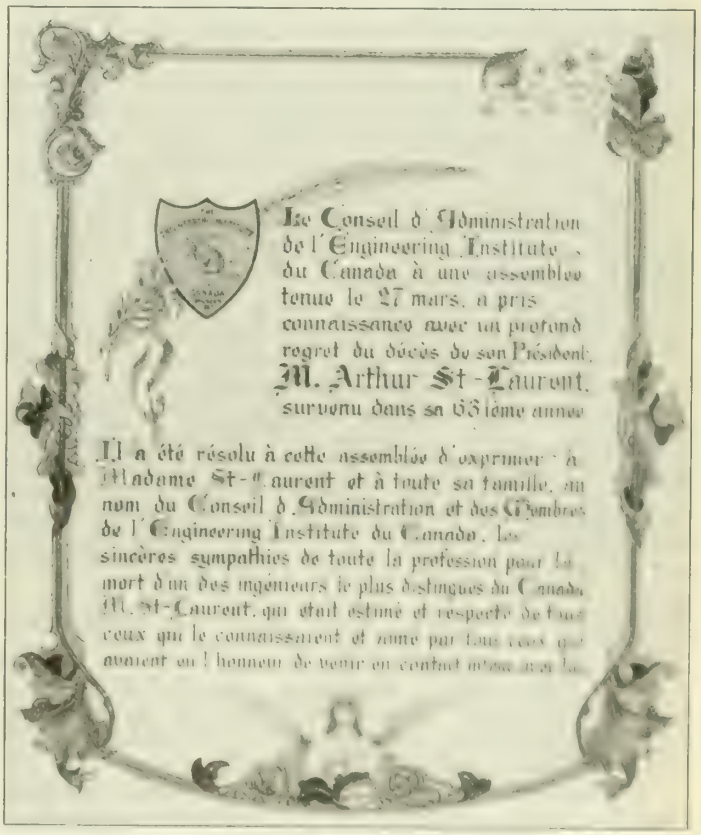
Chicoutimi West, Que., May 14th, 1923.

To the Council —
The Engineering Institute of Canada,
Montreal, Que.

Gentlemen:—

We, the undersigned corporate members of *The Engineering Institute of Canada*, hereby make formal application for the establishment of a branch of *The Institute* to be known as the "Saguenay Branch":

C. N. Shanly, A.M.E.I.C., Price Bros. & Co. Ltd., Chicoutimi West.
C. Ben Bate, A.M.E.I.C., Price Bros. & Co. Ltd., Chicoutimi West.
H. V. Bignell, A.M.E.I.C., Price Bros., & Co. Ltd., Kenogami, Que.
F. L. Darrell, A.M.E.I.C., Price Bros. & Co. Ltd., Kenogami, Que.
W. G. Mitchell, M.E.I.C., Price Bros. & Co. Ltd., Kenogami, Que.
C. Roy McCort, A.M.E.I.C., Price Bros. & Co. Ltd., Kenogami, Que.
A. A. MacDiarmid, A.M.E.I.C., Price Bros. & Co. Ltd., Kenogami, Que.
G. F. Layne, A.M.E.I.C., Price Bros. & Co. Ltd., Kenogami, Que.
G. E. LaMothe, A.M.E.I.C., Price Bros. & Co. Ltd., Chicoutimi West.
P. E. Rosenorn, A.M.E.I.C., Price Bros. & Co. Ltd., Chicoutimi West.
J. F. Grenon, A.M.E.I.C., Chicoutimi, Que.
G. B. Snow, A.M.E.I.C., Chicoutimi, Que.


Le Conseil d'Administration
de l'Engineering Institute
du Canada à une assemblée
tenue le 27 mars, a pris
connaissance avec un profond
regret du décès de son Président:
M. Arthur St-Laurent,
survenu dans sa 63ième année
Il a été résolu à cette assemblée d'exprimer à
Madame St-Laurent et à toute sa famille, au
nom du Conseil d'Administration et des Membres
de l'Engineering Institute du Canada, les
sincères sympathies de toute la profession pour la
mort d'un des ingénieurs le plus distingués du Canada,
M. St-Laurent, qui était estimé et respecté de tous
ceux qui le connaissaient et aimé par tous ceux qui
avaient eu l'honneur de venir en contact même avec lui.

Engrossed Letter of Condolence presented by Council to the Wife and Family of late President St. Laurent.

THIS MONTH'S CONTRIBUTORS

Modern Tendencies in Engineering Education

A subject deserving of even greater attention than it is at present receiving has been comprehensively treated in a paper by Professor H. W. McKiel, A.M.E.I.C., entitled "Modern Tendencies in Engineering Education"; presented before the Moncton Branch on February 19th, 1923.

Professor McKiel has devoted a great deal of time and study to the changing requirements of the engineering courses in the universities and has presented in his paper an analysis of the curricula of the engineering faculties of many of the principal universities on this continent. A large number of the members of *The Institute* have given much thought to the present needs of the profession and to these members particularly Professor McKiel's paper will provide new food for thought.

Professor McKiel received his primary education in the public schools in Gananoque, Ontario, in which town he was born in 1888. In 1903 he matriculated from Alexandria (Glengarry) high school and entered the arts course at Queen's University in 1904; graduated four years later with the degree of Bachelor of Arts with honours in experimental physics and chemistry. He then pursued a course of graduate study for one year following which, he entered the school of mining or as it is now known, the faculty of applied science at Queen's University and again graduated with honours in 1912 with the degree of Bachelor of Science, in chemical and metallurgical engineering. For one year he was director of the collegiate department and teacher of science at Mount Royal College, Calgary and was for six and a half years professor of mechanical engineering and for three and a half years senior professor of engineering at Mount Allison University, Sackville, N.B.

During vacation periods, Professor McKiel was at various times with the Canada Cement Company as chemist at their Lakefield, Ontario mill; research associate with the department of electro-metallurgical research at Queen's University, engaged on the production and use of cobalt; research chemical engineer with the British Chemical Company at Trenton, Ontario. Professor McKiel has also been secretary and registrar of the faculty of applied science of Mount Allison University for nine years and been a member of the Canadian Universities Conference committee on engineering education, representing the university at two of these meetings.

He was admitted into *The Engineering Institute of Canada* as Associate Member on October 28th, 1919 and is also Member of the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the Society for the Promotion of Engineering Education, Fellow Canadian Institute of Chemistry and vice-president of the Maritime Chemists' Association.

Maximum Age for Re-Surfacing Concrete Roads

In a short paper appearing in this issue of *The Journal*, Professor R. deL. French, M.E.I.C., has presented the principal features of his report on the Maximum Age for Re-Surfacing Concrete Roads.

Professor French is of United States birth and education, but has been naturalized in Canada for many years. A graduate of 1905 of the Worcester Polytechnic Institute, he at once became assistant to Professor M. A. Howe, engaged in the revision of the latter's well-known texts on masonry arches, and then returned to his alma mater for further work, for which he was granted the C.E. degree in 1908. Then followed two years with the commissioners of sewerage of Louisville, Ky., as assistant engineer on the design and construction of about $5,000,000 worth of storm and sanitary sewers, including some very large ones, and a year as assistant chief engineer of the National Concrete Construction Company, also of Louisville, in general contracting.

In 1911, he joined the staff of Messrs. R. S. and W. S. Lea, consulting sanitary and municipal engineers of Montreal, as principal assistant engineer, leaving this position in 1918 to become associated with Arthur Surveyer, M.E.I.C. From 1919 until the completion of its plant at Bienfait, Sask., he served the Lignite Utilization Board of Canada as its engineer.

In addition to his professional work, he has been in charge of the highway and municipal engineering instruction at McGill University since 1911, and was finally appointed to the new chair in these subjects in 1921.

Professor French is a member of both *The Engineering Institute of Canada* and the American Society of Civil Engineers. He has written a number of papers for the technical press, and will be remembered as the author of "The Design and Construction of Reinforced Concrete Covered Reservoirs", awarded the Gzowski Medal in 1920. He was admitted to *The Institute* as Associate Member on March 11th, 1913, and elected Member on October 22nd, 1918. He has served *The Institute* in various capacities since 1913, and at the moment is a member of three of its committees.

Transportation Routes in Canada

F. W. COWIE, M.E.I.C.

Of more than usual interest is the paper on Transportation Routes in Canada, by F. W. Cowie, M.E.I.C., read before the Montreal Branch on April 19th, 1923. While treating the subject generally, Mr. Cowie refers particularly to the "Hudson's Bay Route" and devotes the greater portion of his paper to detailing the features of this project.

Mr. Cowie was born in 1863 at Caledonia, Haldimand county, Ontario, where he attended the public and high schools. He later spent one year at Woodstock College, Woodstock, Ont., taking a special course in mathematics and practical astronomy, and in September 1883 entered the second year civil engineering course at McGill University, graduating with the degree of Bachelor of Applied Science in 1886. He was then appointed assistant engineer under the late Sir John Kennedy then chief engineer, Montreal Harbour Commissioners. Since that date Mr. Cowie has continuously devoted his service to this very important branch of engineering work, having been for a number of years chief engineer for the Harbour Commission of Montreal. In 1922 he resigned from the position of chief engineer and was appointed to the position made vacant by the death of the late Sir John Kennedy — that of consulting engineer to the Board.

Admitted to *The Institute* as Associate Member on November 11th, 1887, Mr. Cowie was transferred to the grade of Member on May 19th, 1898, and has always taken an interest in Institute affairs.

PERSONALS

Geo. W. Craig, M.E.I.C., formerly city engineer, Calgary, is now district engineer with The Asphalt Association, Chicago, Ill.

H. W. Perkins, A.M.E.I.C., is engaged in highway work with the State Highway Department at Two Harbors, Minn.

Trevor C. Thompson, Jr.E.I.C., has accepted a position with the Crosby Steam Gauge and Valve Company, at Charlestown, Mass.

T. C. Main, A.M.E.I.C., has been transferred by the Canadian National Railways from Paskwegin, Sask., to Winnipeg, Man.

George H. C. Norman, S.E.I.C., has completed his third year in electrical engineering at the University of British Columbia, and is with the Canadian Mining and Smelting Company at Trail, B.C., for the summer.

Boyd Candlish, A.M.E.I.C., has resigned from the staff of the Herbert Morris Crane and Hoist Company, Niagara Falls, Ontario, and has accepted a position with a firm of industrial engineers in Detroit, Michigan.

John S. Hall, A.M.E.I.C., is locomotive foreman with the Canadian Pacific Railway at Havelock, Ont., having been transferred from London, Ont. Mr. Hall graduated with the class of '14 from McGill University.

F. A. Ellis, S.E.I.C., of Toronto, Ont., is with the Canadian Westinghouse Company, Limited, at Hamilton, Ont., having accepted an appointment under the company's two-year apprenticeship course.

L. Wilfred Lockett, S.E.I.C., who graduated from Queen's University this spring, has accepted a position with the Riordon Company Limited, at their Temiskaming plant, in combustion engineering work.

B. M. Hill, M.E.I.C., and C. McN. Steeves, M.E.I.C., were selected on May 16th as the representatives of the Alumni Society on the Senate of the University of New Brunswick.

H. J. Cooper, A.M.E.I.C., has been transferred from the Drainage Branch, Reclamation Service, Department of the Interior at Ottawa, to the office engineering staff of the Irrigation Division at Calgary.

James Ewing, M.E.I.C., town planning engineer of Montreal, together with Beaugrand Champagne and M. Cormier, architects, have been appointed technical advisors to a committee appointed by the council of the city of Montreal to study the question of town planning.

J. V. Buttlerworth, S.E.I.C., graduated this year from Nova Scotia Technical College with the degree of S.B. and is with the Geological Survey of Canada as first assistant on a topographical survey party at Springfield, N.S.

O. C. E. Fournier, A.M.E.I.C., has been transferred from Ottawa by the Dominion Water Power Branch, with headquarters at Montreal, Que., and is now on the staff of engaged in hydrometric studies in the province of Quebec, of which Leo. G. Denis, A.M.E.I.C., is in charge.

C. P. Mills, S.E.I.C., of Ottawa, has been appointed to the staff of the management division of Stone and Webster, Inc., at Boston, Mass. Mr. Mills was with this company on summer work during his vacation last year and returned to complete his course at McGill University last fall.

L. T. Rutledge, M.E.I.C., secretary-treasurer of the Kingston Branch, has been appointed architectural superintendent and resident engineer on the construction of the new library for Queen's University. Mr. Rutledge represents both the architects, Messrs. Shepard and Calvin, of Toronto, and the University.

A.E.Stewart, A.M.E.I.C., has been appointed roadmaster by the Canadian Pacific Railway, covering the subdivisions of Coutts, Cardston and Sterling, in Alberta, having been transferred from Glacier, B.C. Mr. Stewart received the degree of B.Sc. in civil engineering from the University of Saskatchewan in 1922.

B. C. Rochester, S.E.I.C., has joined the engineering staff of the English Electric Company, at St. Catharines, Ont., where he is receiving a course of training with a view to entering the sales department of the company. Mr. Rochester graduated in electrical engineering this year from McGill University.

H. G. Thompson, S.E.I.C., has resigned from the position of sales engineer for the Canadian Sirocco Company, Limited, of Montreal, to accept a position on the engineering staff of the Riordon Company Limited, at their Temiskaming mill. Mr. Thompson graduated from the University of Toronto in 1922.

Harold J. Acton, B.Sc. (McGill '21), S.E.I.C., received the degree of Master of Science, in electrical engineering at the graduation exercises of the Massachusetts Institute of Technology, on June twelfth. His research, under the direction of Doctor A. E. Kennelly, was on inductive interference, on which subject a thesis was presented.

W. J. Dick, M.E.I.C., has moved from Calgary to Edmonton, and has opened an office in the Macleod Building. Mr. Dick is general manager of the Cadomin Mines, Limited. He graduated from McGill University with the degree of B.Sc., in mining in 1908 and received his M.Sc. three years later.

I. R. Strome, A.M.E.I.C., is now with the department of the Interior at Ottawa in connection with the International Waterways Treaty. Until recently he has been on the surveying staff of the department at Calgary, having been employed there since 1914. Mr. Strome graduated from the University of Toronto with the class of '14.

Albert Auger, A.M.E.I.C., formerly assistant engineer in charge of construction work for the Grand Trunk Pacific Railway at Prince Rupert, B.C., has been transferred by the Canadian National Railways to headquarters at Winnipeg, Man. Mr. Auger received his degrees of B.A., and B.C.E., from the University of Manitoba in 1908 and 1913 respectively.

F. W. Townsend, A.M.E.I.C., is on a four months' leave from Peru, South America, where he has been for the past three years with the London and Pacific Petroleum Company. Mr. Townsend is spending his vacation at his home in Wyoming, Ill., and will later return to Peru for a further period of three years. For a number of years, he was located at Regina, Sask., as engineer for the Imperial Oil Company.

R. Harrison, Jr.E.I.C., was recently appointed engineer and superintendent for the Scarboro water works system, Scarboro, Ont. Mr. Harrison received the degree of

B.A.Sc. from the University of Toronto in 1920 and was, for a time, draughtsman with the Hydro-Electric Power Commission of Ontario, in the hydraulic department and with the firm of James, Proctor and Redfern of Toronto, Ont.

Horace L. Seymour, M.E.I.C., C.E. (Tor.) with offices in Toronto and Weston, has been appointed engineer to the Weston Water, Power and Light Commission. He is also engaged in general municipal engineering work for the town, and is acting as resident engineer for the town on the sewerage system to be installed in unsewered districts of Weston, for which work W. B. Redfern, A.M.E.I.C. is the consulting engineer.

G. S. Stairs, A.M.E.I.C., has been appointed to the position of town manager of Wolfville, N.S. After graduation from the University of Dalhousie with the degree of B.Sc. in 1911, he was connected with the Western Canada Power Company at Slave Lake, and later was appointed assistant to the construction engineer on topographical surveys and construction. Prior to his present appointment, Mr. Stairs was with the city engineer's office of Halifax, N.S.

Frank N. Speller, M.E.I.C., received the degree of D.Sc. at the recent convocation of the University of Toronto. Mr. Speller graduated in 1893 from the University of Toronto in civil engineering and a year later graduated with honours in mining and metallurgy. In 1898 he was appointed lecturer in applied mechanics, and later was connected with general mining work in Canada until 1901, when he left Canada to join the staff of the National Tube Company at McKeesport, Pa., and in 1905 was appointed metallurgical engineer with offices at Pittsburgh, Pa., which position he still holds.

Noel Ogilvie, M.E.I.C., director of the Geodetic Survey of Canada, Ottawa, Dr. W. Bell Dawson, M.E.I.C. superintendent of the Tidal Surveys, Ottawa, and J. Patterson, Meteorological Service, Toronto, represented the National Committee of Canada of the International Union of Geodesy and Geophysics at the annual meeting of the American Geophysical Union, held at Washington, D.C. from April 17th to 19th inclusive. Mr. Ogilvie had the honour of presenting an address on "The Organization and Aims of the National Geodetic and Geophysical Committee of Canada."

XIIIth International Congress of Navigation

C. E. W. Dodwell, Hon. M.E.I.C., is in Europe to attend the XIIIth International Congress of Navigation opening in London on July second, nineteen twenty-three. Mr. Dodwell is the official representative of *The Institute* at this congress, and also represents the Federal government.

Appointments to Canadian Engineering Standards Comm.

The Council of *The Institute* has nominated Professor C. J. MacKenzie, M.C., M.E.I.C., dean of the faculty of civil engineering of the University of Saskatchewan, as a member of the Main Committee of the Canadian Engineering Standards Association, to replace W. H. Winterrowd, M.E.I.C., whose resignation was necessary owing to the fact that he removed to the United States. W. H. Sutherland, M.E.I.C., assistant engineer, Montreal Water and Power Company, Montreal, was nominated as *The Institute's* representative on the sub-committee on Cast Iron Pipe, and J. W. Orrock, M.E.I.C., assistant engineer, Canadian Pacific Railway, was nominated to represent *The Institute* on the C.E.S.A., sub-committee on Railway Fences and Gates.

Recent Graduates in Engineering

The following lists of students who have recently received degrees and honours have been received from the University of New Brunswick, University of Manitoba, McGill University, Queen's University, and the University of Toronto.

University of New Brunswick

Degree of B.Sc.

Akerley, Edward Cecil, B.Sc., (Civ.), St. John, N.B.
Burgess, Francis Hubert, B.Sc., (Elec.), Grand Falls, N.B.
Burtt, James Henry, B.Sc., (Elec.), Fredericton, N.B.
Burpee, Charles Miles, B.Sc., (Civ.), Edmundston, N.B.
Carson, Claude Roy Hunter, B.Sc., (Elec.), Grand Manan, N.B.
Creed, George Edward, B.Sc., (Elec.), Sussex, N.B.
Dummer, Ronald Alfred, B.Sc., (Elec.), St. John, N.B.
Ferris, Laurance Holden, B.Sc., (Civ.), St. John, N.B.
Gilmore, Lawrence Edgar, B.Sc., (Forestry), Stanley, N.B.
Gunter, Ernest Herbert, B.Sc., (Forestry), Fredericton, N.B.
Hagerman, Bernard Harrison, B.Sc., (Civ.), Fredericton, N.B.
Hagerman, Edward Wendell, B.Sc., (Forestry), Fredericton, N.B.
Haines, Benjamin Willard, B.Sc., (Elec.), North Devon, N.B.
Jamer, Daniel Watson, B.Sc., (Forestry), North Devon, N.B.
Jewett, Clarence Glenwood, B.Sc., (Elec.), Fredericton, N.B.
Lawlor, Walter Francis, B.Sc., (Civ.), Fredericton, N.B.
Lister, Leland Stratton, B.Sc., (Forestry), Fredericton, N.B.
Lounsbury, William Lawrence, B.Sc., (Elec.), Fredericton, N.B.
MacDonald, William Dollard, B.Sc., (Elec.), Sussex, N.B.
MacKenzie, Kenneth Perley, B.Sc., (Elec.), Portland, Me.
Maxwell, Harold James, B.Sc., (Civ.), St. John, N.B.
MacNeil, William, B.Sc., (Forestry), Dalhousie, N.B.
Phillips, Richard Darrell, B.Sc., (Elec.), Fredericton, N.B.
Scott, Harold Watson, B.Sc., (Civ.), Barker's Point, N.B.
Smith, Henry Eric Connell, B.Sc., (Elec.), Woodstock, N.B.

University of Manitoba

Degree of B.Sc. (with honours)

Abraham, Yehuda, B.Sc., (El.), Winnipeg, Man.
Eyford, Cornell T., B.Sc., (El.), Winnipeg, Man.
LeNeveu, Arthur, B.Sc., (El.), Winnipeg, Man.
Sterritt, W. Robert, B.Sc., (El.), Blackpool, England.
Trueman, James C., B.Sc., (Ci.), Winnipeg, Man.
Trueman, Mark C., B.Sc., (El.), Winnipeg, Man.

Degree of B.Sc.

Allen, John M., B.Sc., (Ci.), Winnipeg, Man.
Battershill, Charles A., B.Sc., (Ci.), Winnipeg, Man.
Cheshire, W. V., B.Sc., (El.), Winnipeg, Man.
Creighton, James M., B.Sc., (Ci.), Winnipeg, Man.
Duncan, J. E., B.Sc., (El.), Edmonton, Alta.
Halland, H. M., B.Sc., (Ci.), Starbuck, Man.
Lechtzier, Saul, B.Sc., (El.), Winnipeg, Man.
MacLean, Vincent, B.Sc., (Ci.), Winnipeg, Man.
McCuaig, Donald A., B.Sc., (El.), Minto, Man.
McKay, James E., B.Sc., (El.), Winnipeg, Man.
Mitchell, James I., B.Sc., (Ci.), Selkirk, Man.
Muir, J. Fred, B.Sc., (Ci.), Winnipeg, Man.
O'Neille, Patrick, B.Sc., (El.), Winnipeg, Man.
Steenberg, Neil, B.Sc., (Ci.), Winnipeg, Man.
Tempest, William F., B.Sc., (Ci.), Winnipeg, Man.
Walden, J. G. Loftin, B.Sc., (El.), Bagot, Man.
Watson, Stewart C., B.Sc., (El.), Winnipeg, Man.
Worthington, Robert E., B.Sc., (Ci.), Winnipeg, Man.

McGill University

Honour Graduates with Degree of B.Sc.

Buffam, Basil Scott Whyte, B.Sc., (Mi.), Perth, Ont. — Honours in Geology.
Buller, Francis Hamilton, B.Sc., (El.), Montreal, Que. — British Association Medal; Honours in Electrical Engineering.
Cregeen, Kenneth Thomas, B.Sc., (El.), Montreal, Que. — Undergraduates Society's First Prize for Summer Essay; Honours in Electrical Engineering.
Culpeper, Bernard Armel, B.Sc., (Ci.), Montreal, Que. — British Association Medal; Honours in Civil Engineering
Gegg, Richard Conrad, B.Sc., (Mi.), Hong Kong, China. — Honours in Mining Engineering.
Lawrence, Frederick Sylvester, B.Sc., (Ci.), Montreal, Que. — Departmental Prize for Summer Essay.
Layne, John Graham, B.Sc., (Met.), Barbados, B.W.I. — British Association Medal; Milton Hersey Prize for Summer Essay: Honours in Metallurgical Engineering.
McLagan, Thomas Rodgie, B.Sc., (Me.), Westmount, Que. — Crosby Steam Gauge Co.'s Prize for Summer Essay.
Moore, Reginald Arthur, B.Sc., (El.), New Westminster, B.C. — British Association Medal; Honours in Electrical Engineering.

Sherwood, Thomas Kilgore, B.Sc., (Chem.), Montreal West, Que. — Honours in Chemical Engineering.

Steacie, Edgar William Richard, B.Sc., (Chem.), Westmount, Que. — British Association Medal; Honours in Chemical Engineering.

Whittemore, Carl Raymond, B.Sc., (Met.), Trail, B.C. — Research Fellowship in Metallurgical Engineering.

Woods, Walter Hamilton, B.Sc., (Mi.), Victoria, B.C. — Honours in Mining Engineering.

Degree of M.Sc.

Bain, George William, M.Sc., Lachute, Que.
Bickell, William Albert, M.Sc., Vancouver, B.C.
Bissell, Harold Rudolph, M.Sc., Toronto, Ont.
Humes, Harold Louis, M.Sc., Westmount, Que.
McClelland, William Raymond, M.Sc., Halifax, N.S.

Degree of B.Sc.

Abbott-Smith, Henry Bancroft, B.Sc., (El.), Westmount, Que.
Ahern, Philip Charles Byrne, B.Sc., (El.), Ottawa, Ont.
Allan, John Maynes, B.Sc., (Chem.), Halifax, N.S.
Anderson, Dan, B.Sc., (El.), Charlottetown, P.E.I.
Armstrong, Arnold Victor, B.Sc., (El.), Montreal, Que.
Benett, Charles Morgan, B.Sc., (El.), Brantford, Ont.
Binns, George Frederick, B.Sc., (Me.), Montreal, Que.
Blackall, John Fenwick Walker, B.Sc., (Me.), St. John's, Nfld.
Bleau, Alphonse, B.Sc., (Met.), Belœil, Que.
Bloomsfield, Jacob, B.Sc., (Me.), Montreal, Que.
Bown, Charles Roy, B.Sc., (Me.), Sydney, N.S.
Bradshaw, Gordon Rothwell, B.Sc., (Mi.), Nelson, B.C.
Brisbane, William Gordon, B.Sc., (Ci.), Westmount, Que.
Brodeur, Jean Charles, B.Sc., (Mi.), Ottawa, Ont.
Budden, Arthur Napier, B.Sc., (Me.), Montreal, Que.
Chisholm, Joseph Donald, B.Sc., (El.), Antigonish, N.S.
Craik, Oliver Stanley, B.Sc., (El.), Melbourne, Que.
Crain, George Edwin, B.Sc., (Ci.), Ottawa, Ont.
Cross, George Esplin, B.Sc., (Me.), Westmount, Que.
Desloover, Jean Albert R., B.Sc., (El.), Montreal, Que.
Dewis, Edwin Harold, B.Sc., (Me.), Shubenacadie, N.S.
Dickinson, Albert Godfret, B.Sc., (El.), Vancouver, B.C.
Dormer, William John Smillie, B.Sc., (El.), Lennoxville, Que.
Eadie, Thomas Wardrope, B.Sc., (Ci.), Ottawa, Ont.
Elkington, Gerald Erlam, B.Sc., (El.), Duncan, B.C.
Fagan, James Wilfred, B.Sc., (Me.), Montreal, Que.
Farnsworth, Arthur Leslie, B.Sc., (Me.), Cookshire, Que.
Finlayson, Harold Musgrave, B.Sc., (Ci.), Montreal, Que.
Foss, Donald Burrowes, B.Sc., (Me.), Sherbrooke, Que.
Gilbert, Edgar Valentine, B.Sc., (Ci.), Montreal, Que.
Goldberg, Harry Julius, B.Sc., (El.), Montreal, Que.
Grant, Alexander James, B.Sc., (El.), Moncton, N.B.
Griffith, Thomas Raymond, B.Sc., (Chem.), Outremont, Que.
Hague, Edward Cousins, B.Sc., (El.), Montreal, Que.
Harbert, Edward Thomas, B.Sc., (Me.), Montreal, Que.
Harling, Frank Norman, B.Sc., (Ci.), Westmount, Que.
Jackson, Lawrence Wright, B.Sc., (El.), Ottawa, Ont.
Johnson, William James, B.Sc., (Ci.), Lachine, Que.
Jordan, John Nealon, B.Sc., (Me.), St. John, N.B.
Laidley, Wendell Howard, B.Sc., (Ci.), Montreal, Que.
MacInnes, Donald Alexander, B.Sc., (Me.), Montreal, Que.
McKindsey, Gordon, B.Sc., (Ci.), Lennoxville, Que.
MacLaren, Albert Roy, B.Sc., (Me.), Buckingham, Que.
McLennan, Gordon Roderick, B.Sc., (El.), Ottawa, Ont.
Matheson, Arthur Marshall, B.Sc., (Chem.), Ottawa, Ont.
Moran, Taylor Matthew, B.Sc., (Me.), Ottawa, Ont.
Munro, David John Best, B.Sc., (El.), Montreal, Que.
O'Heir, Hugh Bingham, B.Sc., (Mi.), Hamilton, Ont.
Oliver, Cuthbert Jack, B.Sc., (El.), New York, N.Y.
Oliver, James Harold, B.Sc., (El.), Rockburn, Que.
Peters, Arthur Wright, B.Sc., (El.), Montreal, Que.
Rainnie, Ronald James, B.Sc., (Me.), Sackville, N.B.
Renouf, Edward T., B.Sc., (Me.), Montreal, Que.
Rochester, Bertram Cole, B.Sc., (El.), Ottawa, Ont.
Roquet, Leo Laurent, B.Sc., (Me.), Ottawa, Ont.
Ross, Malcolm Vaughan, B.Sc., (El.), Quebec, Que.
Scott, James McDonald, B.Sc., (Me.), Valleyfield, Que.
Scott, Lewis John, B.Sc., (Me.), Grand Falls, Nfld.
Simpson, Richard Landon, B.Sc., (Ci.), Montreal, Que.
Smallhorn, Edward Robert, B.Sc., (Ci.), Montreal, Que.
Smith, Adam Wyndham Simpson, B.Sc., (El.), London, Ont.
Smith, David Whitney, B.Sc., (Me.), Montreal, Que.
Timmis, Harold Gordon, B.Sc., (Me.), Passiac, N.J.
Toole, Francis James, B.Sc., (Chem.), London, England.
Vrooman, Harold William, B.Sc., (Chem.), Walkerville, Ont.
Webster, Robert Chilion Peter, B.Sc., (Me.), Ottawa, Ont.
Wetmore, Douglas Stevenson, B.Sc., (Chem.), Truro, N.S.
Wylde, Charles Napier, B.Sc., (Me.), Montreal, Que.

Queen's University*

Degree of B.Sc. (with honours)

James, Victor Arnold, B.Sc., (Mi.), Toronto, Ont.

Degree of B.Sc.

Baker, Ackland James, B.Sc., (El.), Lakeside, Ont.
Bastedo, Thomas Franklin, B.Sc., (Ci.), Woodstock, Ont.
Foster, Arthur Richards, B.Sc., (Ci.), Sault Ste. Marie, Ont.
Kennedy, Thurlow William, B.Sc., (Me.), Ottawa, Ont.
Koen, James Doyle, B.Sc., (Ci.), Sydenham, Ont.
MacDonald, Neil Thomas, B.Sc., (Ci.), Kingston, Ont.
McClure, John Burns, B.Sc., (El.), Thamesford, Ont.
Read, George Wilbert, B.Sc., (Me.), Dunrobin, Ont.
Tomkins, John, B.Sc., (Ci.), Kingston, Ont.

Governor-General's Medal

Monteith, A. C., B.Sc., Powassan, Ont., Governor-General's Medal to the graduate receiving the highest standing in the third and fourth years.

University of Toronto*

Degree of M.A.Sc.

Culliton, P. J., B.A.Sc., M.A.Sc., (Ci.), Stratford, Ont.
Wynne-Roberts, R. L., B.A.Sc., M.A.Sc., (Chem.), Elizabeth, N.J.

*Lists for the University of Toronto and Queen's University were published in the June 1923 Journal.

ELECTIONS AND TRANSFERS

At the meeting of Council held on May 29th, 1923, the following elections and transfers were effected:—

Member.

McDIARMID, Fergus Archie, B.A. (Univ. of Tor.), supervisor of standards, Geodetic Survey of Canada, Ottawa, Ont.

Associate Members.

BARRINGTON, Yorke C., town engr., Sydney Mines, N.S.

BARWICK, Oliver Archibald, B.Arch. (McGill Univ.), dftsman., for D. J. Spence, architect, Montreal, Que.

EDWARDS, Thomas Appleby, dftsman., Hydro-Electric Power Commission of Ontario, Chippawa, Ont.

GRAHAM, John Henry, junior engr., Dept. P.W. Canada, London, Ont.

HOLE, John, private practice, Toronto, Ont.

McLEAN, Charles Luther, transport officer, James Bay extension, Temiskaming and Northern Ontario Rly., Chute, Ont.

MORRISON, David Montrose, engr. in charge, design and constrn. terminals, grading, tracklaying, etc., London and Port Stanley Rly., London, Ont.

POUNDER, John Allan, B.A. (Univ. of Tor.), engr., International Boundary Commission, Ottawa, Ont.

ROBB, Roland Wentworth Tupper, district manager, Prov. of Quebec, Robb Engineering Works, Limited, Montreal, Que.

ROBERTSON, Randal Killaly, B.Sc. (McGill Univ.), works manager, Cooksville Shale Brick Company of Canada, Ltd., Cooksville, Ont.

Juniors.

EDWARDS, Samuel Michael, gen. engrg. work, technical service dept., City of Montreal, Que.

KNAPP, Edward Winslow, B.Sc. (McGill Univ.), Montreal, Que.

MUMMERY, Charles Rutherford, B.A.Sc. (Univ. of Tor.), demonstrator in elec. and mech. laboratories, Univ. of Manitoba, Winnipeg, Man.

VINEBERG, Samuel Sulim, B.Sc. (McGill Univ.), City of Winnipeg Hydro-Electric System, Winnipeg, Man.

Transferred from the class of Associate Member to that of Member.

DENNIS, William Melburn, B.Sc. (McGill Univ.), geodetic engr., Geodetic Survey of Canada, Ottawa, Ont.

FORBES-MITCHELL, William Joseph, Major, D.S.O., senior asst. engr., Dept. P.W. Canada, London, Ont.

GRANT, Alexander Macdonald, B.Sc. (Queen's Univ.), geodetic engr., Geodetic Survey of Canada, Ottawa, Ont.

HARVIE, Thomas White, chief engr. of the Port of Montreal, Montreal, Que.

McCALLUM, George Hugh, B.Sc. (McGill Univ.), in full charge operations of survey on Pacific coast, Geodetic survey of Canada, Ottawa, Ont.

SCHLEMM, Leonard E., (Mass. Inst. Tech.), private practice, Montreal, Que.

SEYMOUR, Horace Llewellyn, B.A.Sc. (Univ. of Tor.), consulting municipal and town planning engr., Toronto, Ont.

TAIT, Isaac Joseph, (Heriot Watt Coll.), supt. engr., Canadian Government Merchant Marine, Limited, Montreal, Que.

YOUNG, Roderick Bearce, B.A.Sc. (Univ. of Tor.), senior asst. laboratory engr., Hydro-Electric Power Commission of Ontario, Toronto, Ont.

Transferred from the class of Junior to that of Associate Member.

BARNES, Charles Thomas, struct'l. designer, City of Winnipeg Hydro-Electric System, Winnipeg, Man.

BOOKER, Harvey D., service dept. engr., Canadian Westinghouse Company, Fort William, Ont.

BOWMAN, Frederick, (Grad. Univ. of Tor.), checker and squad leader, struct'l. drawing office, and engr. on erection of steel bridges, Dominion Bridge Company, Lachine, Que.

KANE, Charles Stanislaus, engr. in charge, local contracting office, Dominion Bridge Company, Montreal, Que.

OULTON, Aubrey Ernest, asst. engr., bridge dept., C.N.R., Moncton, N.B.

PLAMONDON, J. Adrien, (Grad. Ecole Poly.), consltg. engr. for Roberts Filter Mfg. Co., of Darby, Pa., Montreal, Que.

WALCOT, John Bevan, (Heriot Watt Coll.), field and office work, Walter J. Francis & Co., Montreal, Que.

Transferred from the class of Student to that of Junior.

CLARKE, Terence, B.A.Sc. (Univ. of Tor.), struct'l. dftsman, Canadian Bridge Company, Walkerville, Ont.

FORD, Robert, B.Sc. (McGill Univ.), constrn. engr. under W. L. Ketchen, M.E.I.C., Riordon Company, Limited, Temiskaming, Que.

McCONVILLE, Cecil A., B.Sc. (Honours), (Queen's Univ.), recording instrument engr., Abitibi Power & Paper Co., Iroquois Falls, Ont.

The following Students were admitted:—

ANTLIFF, James Cooper, B.Sc., (McGill Univ.), Club House, Cedars, Que.

BROUGH, Frank Sheldon, B.Sc. (McGill Univ.), 48 Windsor Avenue, Westmount, Que.

WELLS, Curtis MacIvor, B.A.Sc. (Univ. of Tor.), 68 Alexandra Boulevard, Toronto, Ont.

EMPLOYMENT BUREAU

Situations Wanted

Sales Engineer

Sales Engineer, B.Sc., McGill University, electrical engineering, P.E.Q., A.M.E.I.C., A.M.A.I.E.E. Two years test experience, C.G.E., Peterborough. Ten years experience in design, manufacture, sales and installation of all kinds of cable with large cable manufacturing company. Apply Box 105-W.

Civil Engineers

Graduate of McGill University, age 30, several years experienced on railway location and construction in Jamaica and Guatemala, forest reconnaissance and land surveys; one year hydro-electric power plant construction, desires work with firm of engineers or contractors, location immaterial. Apply Box 106-W.

Civil engineer, age 29, seeks engagement with contracting or engineering firm preferably, or with railway or government. Irrigation, railway canal and lock construction, and building experience. Good French and a smattering of Spanish and have worked in Canada, England, Belgium. Four years war service. Willing to go anywhere. Leaving present firm because of their lack of work. Apply Box 107-W.

Electrical Engineer

Electrical engineer, Assoc.A.I.E.E., age 27, married. Employed during the last year by a large public utility corporation, on meter testing and records, distribution mapping, switchboard operation and maintenance, desires a change in position. Would especially appreciate a position with opportunity for advancement. C.E.F. experience includes construction of Nissen steel huts and installation and erection of small electric plant. Available early in August. Apply Box 108-W.

Situations Vacant

Electrical Engineer

Man to take charge of transformer assembly department. Must thoroughly understand high voltage apparatus and the assembly of such apparatus in large units. Apply Box 40-V.

(For additional "Situations Vacant" see page 346).

BRANCH NEWS

Toronto Branch

J. A. Knight, A.M.E.I.C., Secretary-Treasurer.
L. W. Wynne-Roberts, A.M.E.I.C., Branch News Editor.

A. C. Oxley, A.M.E.I.C., has been re-appointed chairman of the Library Committee for the present year. Arrangements have been made for a series of luncheons this summer at which engineers prominent in the various branches of the profession will speak, and it is hoped to announce the first of these to take place shortly.

For several winter sessions the members of the Toronto Branch have held their meetings in the Engineers' Club where the lecture hall has been taxed to overflowing at almost every meeting. The Attendence Committee are investigating alternative meeting places, which will be central and suitable to the needs of the increasing membership of the branch.

Hamilton Branch

W. F. McLaren, M.E.I.C, Secretary-Treasurer.

The annual meeting of the branch was held at 8 p.m. Thursday, May 10th 1923, at the Royal Connaught hotel. The secretary-treasurer read his report, as follows:—

Secretary's Report

During the year eight branch meetings have been held. All these are reported in the branch news of *The Engineering Journal.* The following were the speakers, with their subjects and attendance:—

		Attendance
Sept. 15	Annual dinner — Hon. F. C. Biggs, Minister of Public Works and Highways	81
Nov. 1	C. H. Mitchell, M.E.I.C. — "Italy in War"	120
Dec. 14	F. A. Gaby, M.E.I.C. — "Hydro Radials"	150
Jan. 23	J. B. Carswell, A.M.E.I.C. — "Re-Rolled Steel"	50
Mar. 12	Debate — Tye-Cauchon Report	50
Apr. 6	S. Q. Hayes — "Japanese Developments"	150
Apr. 27	Messrs Adams, Black and Marston — "Roads"	35
May 10	H. C. Boyden — "Cement"	100

Total — eight meetings — Average attendance — 92.

Your executive committee held nine meetings, with an average attendance of five out of ten members on the executive. The following table shows the changes of membership during the year:—

Class	June 1st 1922	Resigned or transfered	New joined	Members transfered	Total May 31st 1923
Members	20	2	–	3	21
Associate Members	60	8	1	4	57
Juniors	10	4	1	2	9
Students	27	9	1	7	26
Affiliates	54	12	1	–	43
Total	171	35	4	16	156

In spite of slight reduction in membership during the year, our finances are in good shape. The accompanying statement shows:—

Receipts	$420.97
Expenses	385.32
Excess receipts	35.65
Last year's balance	202.38
Cash in bank	$238.03

FINANCIAL STATEMENT, year ending May 31st, 1923.

Receipts

Forward		$202.38
Rebates:—		
Apr. to June	$ 26.75	
July to Oct	40.50	
Nov. and Dec	9.00	
Jan. to Mar	84.25	
	160.50	
Less discount	.40	160.10

Branch News:—		
May	$ 2.09	
June	5.14	
July	5.83	
August	1.11	
October	6.53	
December	2.09	
January	6.67	
February	10.00	
March	3.06	
April	10.00	
		52.52
Affiliate fees 1922-23 — 36 at $3.00, less disc. one chq. 15c.		107.85
Journal subscriptions — 5 at $2.00		10.00
Annual dinner		90.50
		$623.35
Expenses		
Expenses of meetings:—		
Sept. 15—Annual dinner		$147.00
Nov. 1—C. H. Mitchell		7.84
Dec. 14—F. A. Gaby		11.53
Jan. 23—J. B. Carswell		6.53
Mar. 12—N. Cauchon		58.23
Apr. 6—S. Q. Hayes		11.53
Apr. 27—U. of T. Members		28.21
May 10—H. C. Boyden and annual meeting		38.21
		309.08
Postage and telegrams		11.01
5 Journal subscriptions		10.00
500 statements		5.23
Stenographer		50.00
		385.32
Balance		238.03
		$623.35

The scrutineers, W. Hollingworth, M.E.I.C., and F. W. Hubbard, A.M.E.I.C., reported results of the ballot, which showed the following as the new executive:—

Hon. Chairman — H. U. Hart, M.E.I.C.
Chairman — J. W. Tyrrell, M.E.I.C.
Vice-Chairman — W. G. Milne, A.M.E.I.C.
Past Chairman — F. W. Paulin, M.E.I.C.
Secty.-Treas. — W. F. McLaren, M.E.I.C.
Committee: — J. J. Mackay, M.E.I.C. — 1 year.
C. H. Marrs, M.E.I.C., — 1 year
F. P. Adams, A.M.E.I.C., — 2 years
C. J. Nicholson, A.M.E.I.C., — 2 years.

The chairman then called upon Lt.-Col. H. C. Boyden, of the Portland Cement Association of Chicago, for his address on "Recent Developments in Concrete". He spoke in part as follows:—

Concrete

Concrete is usually said to contain three ingredients, cement, fine aggregate and coarse aggregate, but the fourth ingredient, water, is also most important. The fine aggregate, sand, must be clean and hard but not "sharp". Its cleanness can be easily determined by a colour test. Take a twelve ounze prescrpition bottle and fill up with sand to four and one-half ounzes; then add three per cent solution of caustic soda up to seven-ounze mark; shake well and leave for 24 hours. If liquid on top is clear, the sand is good, if a dark brown colour, reject it. The coarse aggregate need not necessarily be very hard to get good results provided proper principles are followed.

Water is as important as cement and yet it is the most carelessly used ingredient. Strongly alkaline water should not be used. Marsh waters should be tried before being trusted. The temperature of the water has very little effect on the concrete. The most important consideration is the water ratio, or the ratio of the volume of water to cement, one cubic foot water to one sack cement is called a water ratio of one. The less the water the stronger the concrete, providing it is plastic. To determine the proper consistency in the field, the slump test is used. A frustum of a cone 4 inches at top, 8 inches at bottom and 12 inches high is used. The settlement or "slump" of the mixture when turned out of the form, indicates its quality. For road work a slump of ½ inch to 1 inch is used; while reinforced concrete requires 2 to 2½ inches slump. If water is increased, cement must also be increased to maintain strength under greater plasticity. The mixing of the ingredients is most important. Mixing must be carried on for at least one minute in a mixer after all four ingredients have been put in. Finally, during the "curing" of the concrete, it is essential to keep it wet for at least two weeks and three weeks is better. This will double the compressive strength and increase imperviousness to moisture five times.

In the discussion it was brought out that adding hydrated lime to concrete would increase the imperviousness, with very little effect on strength. Results from use of Super Cement were said to be uncertain. To colour concrete, any mineral colour may be used. The meeting closed with a hearty vote of thanks to the speaker. The chair was occupied by F. W. Paulin, M.E.I.C. The attendance was about one hundred.

Winnipeg Branch

Geo. L. Guy, M.E.I.C., Secretary-Treasurer.

At the meeting of April the 19th, a report was presented by the Committee on Roads. At the Western Professional meeting held in Saskatoon two years ago, a committee was appointed to standardize road practice in the west and to evolve a road policy. The committee consisted of three members, one from each of the prairie provinces; it was found, however, that it was impossible to work effectively at long range, and furthermore, that conditions were so different in each province that no agreement on any phase was possible. Each branch then appointed its own committee, charging it with similar functions.

The committee in reporting presented an outline of the history of road building in the province, tracing its development from individual enterprise, through local improvement, municipal supervision to provincial aid and federal assistance as exists to-day. The conclusion drawn from this portion of the report would appear to be that there is a close analogy between the history of the growth of civilization and that of road building in any particular locality. The evolution from the nomad to the tribe, from the tribe to the state, from the state to the nation is characteristically the same process of centralization of authority as manifests itself in all places and ages in road building. So that in evolving a road policy, it would appear that the first consideration ought to be a determination of the stage to which civilization as evolved in the particular locality under consideration. This opens up the question as to whether here in Manitoba our civilization is not very advanced, notwithstanding the adornments which have been hung on it, whether we are not impeding our real progress by clothing ourselves with the spurious habilments of carriage folk when we should really be plodding behind the plough.

The committee was reticent about touching these questions just now, and confined itself to establishing that it was the function of the engineers as a body to analyze such subjects and as a result of their findings to instruct and lead the profanum vulgus. This proposition gave rise to discussion. Some thought that the engineers had no right to pretend to instruct those charged with the final authority in matters of policy. The general concensus of opinion however, seemed to be that in matters essentially of an engineering character, they not only had the right but that it was a duty to express a definite opinion before such matters were initiated. This would appear to be the broad view of the functions of *The Institute*, and the meeting charged the committee to bring down a draft policy that would be supported by the branch.

The annual meeting of the Winnipeg Branch was held on Thursday, May third. While the scrutineers were counting the ballots for the election of new officers, the chairman called upon Professor E. P. Fetherstonhaugh, M.E.I.C., to present the Plummer medals to Dr. Shipley and W. Nelson Smith, M.E.I.C.

Dr. Shipley, in his acknowledgment, explained that a great handicap existed for research work in Manitoba University on account of the lack of adequate library facilities as well as laboratory equipment. Further, he was able to give only his leisure time to this work. On account of the vast amount of hydro-electric power available here, he believed that electro chemical industries should be established here. As the location of these, however, is an economic question, it was impossible for him to state definitely which particular industries might be placed here to advantage. The university appreciated highly the sympathetic support rendered it by the engineers and medical men in this city. He concluded by thanking the members and *The Institute* for the honour given him in the presentation.

Mr. Smith also expressed his appreciation of *The Institute* in awarding him the medal. He eulogized the work of Dr. Shipley, with whom he co-operated on the investigation which was the subject of his paper. He mentioned, however, that European scientists had investigated this action, but that their records of this fact was not known to them in their investigation. He gave in detail the family history back as far as five or six generations. Following, he indicated the intimacy existing between chemistry and engineering, and cited the experience of Andrew Carnegie in this connection, showing what real value was placed upon the engineering chemist. He was of the opinion that for the proper consideration of combustion engineering problems, that the co-operation of chemists would be advisable. He outlined in detail the methods adopted by them in their investigation of this problem, and stated that Dr. Shipley was at present continuing the research and prophesied that further knowledge would be obtained as the result of his endeavour.

Dr. Frank Allen then addressed the members on modern consideration of energy. He followed the gradual change in ideas with reference to this subject, from Sir Isaac Newton's theory of light, the corpuscular theory, the electro magnetic theory, to Einstein's present suggestion that light has mass and weight. The speaker estimated that at a rate of twenty cents per kilowatt-hour for power, we would be paying 2.4 billion dollars per pound for light, while a study of the fire fly

brings the cost down to a very small amount. Eddington estimated that 160 tons of light falls on the earth from the sun per day. He enlarged, through the application of Einstein's theory, on the amount of energy contained in all matter. The problem before the scientist to-day was some method of being able to make use of the immense amount of energy contained in matter.

A report was read from P. Burke-Gaffney, A.M.E.I.C., giving the names of a committee to arrange the details for a golf competition among the members of the branch during the coming summer. He recommended that return cards be issued in an endeavour to find out the number and names of those who would participate. After a short discussion, the chairman announced that these cards would be issued.

The retiring chairman gave a short address, thanking the officers and members of committees and others for their active support during the year, and for the honour bestowed upon him in electing him chairman of the branch. The new officers elected were as follows:—

Chairman: A. McGillivray, A.M.E.I.C.
Secretary-Treasurer: Geo. L. Guy, M.E.I.C.
Executive: M. A. Lyons, A.M.E.I.C., A. A. Young, A.M.E.I.C., Wm. Walkden, A.M.E.I.C.
Nomination Committee: E. V. Caton, M.E.I.C., W. P. Brereton, M.E.I.C., H. W. McLeod, A.M.E.I.C., T. L. Roberts, M.E.I.C., T. H. Kirby, A.M.E.I.C.
Programme: P. Burke-Gaffney, A.M.E.I.C., D. A. Ross, M.E.I.C., C. H. Attwood, A.M.E.I.C., E. V. Caton, M.E.I.C., N. M. Hall, M.E.I.C.
Research and Investigation: J. N. Finlayson, M.E.I.C., J. W Dorsey, A.M.E.I.C., W. N. Smith, M.E.I.C., J. W. Sanger, A.M.E.I.C., W. Walkden, A.M.E.I.C.
Auditors: A. H. O'Rielly, A.M.E.I.C., Thos. Lees, A.M.E.I.C.
Library and Publications: E. P. Fetherstonhaugh, M.E.I.C., C. A. Clendening, A.M.E.I.C., G. R. Pratt, A.M.E.I.C., B. A. Johnston, A.M.E.I.C., G. B. McColl, A.M.E.I.C.
Legislation and Public Affairs: Frank Lee, M.E.I.C., J. D. Ruttan, A.M.E.I.C., M. A. Lyons, A.M.E.I.C., H. A. Dixon, A.M.E.I.C., C. A. Clendening, A.M.E.I.C.
Advisory: E. P. Fetherstonhaugh, M.E.I.C., J. G. Sullivan, M.E.I.C., T. R. Deacon, M.E.I.C., J. C. Holden, M.E.I.C., Theo. Kipp, M.E.I.C.
Remuneration: E. V. Caton, M.E.I.C., P. Burke-Gaffney, A.M.E.I.C., D. A. Ross, M.E.I.C., J. G. Legrand, M.E.I.C., C. A. Clendening, A.M.E.I.C.
Councillors: Geo. L. Guy, M.E.I.C., E. V. Caton, M.E.I.C.

Statement of Secretary-Treasurer

for period
May 5th, 1922 to May 2nd, 1923.

Receipts

Local dues		$514.00
Rebates from Headquarters:		
May 6, 1922	$ 219.50	
Aug. 24, 1922	87.75	
Dec. 1, 1922	96.25	
Jan. 11, 1923	61.25	464.75
Branch news:		
May 6, 1922	$ 25.69	
Aug. 24, 1922	2.22	
Jan. 3, 1923	9.45	37.36
Advertising:		
Jan. 3, 1923	$ 16.65	16.65
Interest earnings:		
Current interest	$ 13.59	
Bond interest	27.50	41.09
Expenses general professional meeting paid by Headquarters:		
Reporting proceedings	$ 104.00	
Official programmes	78.09	
Badges	61.75	243.84
Special advertising		166.25
Sale of tickets		583.50
Total receipts		$2,067.44
Brought forward, May 1922		471.64
		$2,539.08

Expenditures

Journal	$123.67	
Stationery	119.92	
Printing	418.07	
Stenography and postage	145.50	
Honorarium	180.00	
General	878.80	$1,765.96

Assets and Liabilities

Office furniture and fixture, 10% depreciation	$ 87.64
Library, 10% depreciation	248.40
Victory bonds	500.00
Dues in arrears, 50% of outstanding	428.00
Cash in bank	773.12
Total assets	$2,037.16

Liabilities Nil

Surplus	$2,037.16

Report of the Executive Committee

Gentlemen:—

Your executive begs to report on the activities of the branch for the past fiscal year, as follows:—

The active membership of the branch at this date is 303, being a decrease of 6 against that of last year. The membership is distributed as follows: Members, 49; Associate Members, 174; Juniors, 33; Students, 22; Associates, 5; Branch Affiliates, 20; total 303.

Fourteen regular meetings were held with an average attendance of 47. On June 27th, 1922, a special meeting was held at which the general secretary gave a very interesting address on the report of *The Institute's* Committee on Policy. On September 30th, the members went to Transcona, where an inspection was made of the new electric heat-treating furnaces installed in the shops of the Canadian National Railways, which proved very interesting and instructive. On January 17th, 1923, a special meeting was held, at which a moving picture was presented, showing the processes of manufacture of galvanized iron. D. M. Buck, metallurgical engineer of the American Sheet Metal and Plate Company of Pittsburgh, described the various processes. There were about 180 present at this meeting.

Following is a list of the regular meetings, with appurtenant information, held during the year:—

Date	*Subject*	*Speaker*	*Attendance*
1922			
May 4	Annual Meeting		40
Oct. 3	"Concrete Highway Investigations and Specifications"	Lt.-Col. H. C. Boyden	31
Oct. 19	"Relativity"	Rev. Father Morton, D.Sc.	94
Nov. 2	"Electric Furnaces for Heat Treatment of Steel"	A. W. Lamont, A.M.E.I.C.	37
Nov. 16	"Rate-making for Public Utilities"	F. H. Martin, M.E.I.C.	56
Dec. 7	Progress Report — Committee on Foundations	Harold Edwards, M.E.I.C.	48
Dec. 21	"Operation of a Distribution System"	C.A.Clendening, A.M.E.I.C. H. C. Michell, A.M.E.I.C.	26
1923			
Jan. 4	"Automatic Fire Protection"	J. C. Davis, A.M.E.I.C.	24
Feb. 1	Discussion on Report of Committee on Classification and Remuneration of Engineers. Report of Annual Meeting.	J. G. Sullivan, M.E.I.C.	40
Feb. 15	"Three-wire Trolley Distribution"	W. Nelson Smith, M.E.I.C.	34
Mar. 1	"The Marketing of Grain"	Jas. Stewart	51
Mar. 15	"The Use of Powdered Fuel under Steam Boilers"	Harlow D. Savage	89
Apr. 5	"Lignite Plant at Bienfait"	J. M. Leamy, M.E.I.C.	61
Apr. 19	Progress Report — Committee on Roads	M. A. Lyons, A.M.E.I.C.	29

Nineteen executive meetings were held with an average attendance of seven. At these meetings careful consideration was given to sixteen recommendations to classifications of applications for membership and transfer.

At the regular meeting of the branch held on October 19th, clause 23 of the by-laws was amended to read as follows: "The Nominating Committee shall select names of corporate members of the branch for the offices hereinafter set forth, after having obtained the consent of all nominees for the offices of chairman, secretary-treasurer and executive," etc.

A successful general professional meeting was held under the auspices of this branch, on September 5th to 7th inclusive. Interesting and instructive papers were read and discussed. Visits were arranged to several important engineering projects, and entertainment provided for the delegates.

At the regular meeting of the branch held on November 2nd, R. J. Durley, M.E.I.C., secretary of the Canadian Engineering Standards Association, addressed the meetings on the advisability of getting uniformity of standards on electrical installations and fittings, with a view to the formation of a Canadian National Code. At this meeting, the following resolution was passed:

"MOVED:—WHEREAS the Winnipeg Branch of *The Engineering Institute of Canada* is vitally interested in the work of establishing a Canadian electric code — and — that a com-

mittee composed of Messrs. J. G. Glassco, M.E.I.C., Professor E. P. Fetherstonhaugh, M.E.I.C., E. V. Caton, M.E.I.C., and D. A. Ross, M.E.I.C., be appointed to co-ordinate with the committees appointed by the Manitoba Electrical Association to urge upon our provincial government the advisability of their participating in the proposed conference in Ottawa, to establish a Canadian National Electric Code, and a National Bureau of Inspection."

The chairman of the committee reports that they were unable to convince the members of the government of the advisability of having Manitoba officially represented at the proposed convention.

At the meeting held on March 1st, the branch decided to offer its services to the city in the matter of the revision of the building by-laws, and the city clerk was notified to this effect.

On February 6th, 1923, the Engineering Society of Manitoba University held a dance at the Fort Garry hotel, to which the members of the branch were invited; also to the annual grads' farewell banquet which was held on March 16th.

W. Nelson Smith, M.E.I.C., and Dr. J. W. Shipley were awarded the Plummer Medal for their joint paper "The Self-Corrosion of Cast Iron and Other Metals in Alkaline Soils", and "The Self-Corrosion of Buried Lead Pipes".

The branch was further honoured in having two of its members, W. E. Hobbs, A.M.E.I.C., and D. L. McLean, A.M.E.I.C., appointed to the office of deputy provincial secretary, and deputy minister of public works, respectively.

It is with deep sorrow that we record the death of one of our esteemed members, Colonel J. A. Hesketh, M.E.I.C., who died on January 26th, 1923.

The Committee on Foundations, under the chairmanship of Harold Edwards, M.E.I.C., carried on some valuable research and investigations along the line of the general geology of the district, the best practice as to soil loading, and the design for surface foundations, and on December 7th presented an interesting report to the branch.

The Committee on Legislation and Public Affairs dealt with the matter of the abolition of the Public Utilities Commission, and decided that it was in the best interests of this province that the commission be retained. This matter was presented to the branch and a resolution was forwarded to the provincial government, urging the continuance of the commission.

The Advisory Committee of the branch reports that no meetings were held during last year, as no request for advice was received either from individual members of the branch or from the executive.

The Library Committee reports that in view of the fact that the local requirements in respect to an engineering library are being attended to by the corresponding committee of the Association of Professional Engineers, it was not found necessary to call any meetings of the committee during the year.

The Municipal Committee reports that little can be added to the report presented by the committee during *The Institute* year of 1921-22. The matter of devising ways and means of standardizing connections of fire-fighting apparatus throughout the province has engaged the attention of the members of this committee and it is hoped that further progress may be reported a year hence.

The Committee on Research and Investigation reports that no formal meetings have been held during the year. Several members of this committee, however, have been active on other committees involving research and investigation, notably the Committee on Foundations and the Committee on the Deterioration of Concrete in Alkali Soils.

The Remuneration Committee reports that no matters of salary have been referred to it for action during the year.

At the regular meeting of the branch held on April 19th, the chairman named Messrs. W. M. Scott, M.E.I.C., W. Nelson Smith, M.E.I.C., and M. A. Lyons, A.M.E.I.C., a committee to act with a similar committee of the Association of Professional Engineers, to devise ways and means for the co-ordination of the work of *The Institute* and Association within this province.

Respectfully submitted, *Chairman*, E. V. CATON, M.E.I.C.,
Secretary, Geo. L. GUY, M.E.I.C.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

The Executive Committee held one meeting during the month o May and the purpose of same was to consider matters in connection with the convention of the A.S.M.E.

A.S.M.E. Convention

This convention was a decided success from every point of view and the assistance rendered the sister society by the members of the Montreal branch was highly commented upon and appreciated. The smoker was pre-eminently successful and proved to be entirely out o the ordinary. The touch of provincial and national colour given it by reason of "several of the stunts" was notable — particularly the advanced model of Quebec heaters and coolers.

Papers and Meetings

The chairman has called a meeting of the representatives of the various sections for the 12th instant to consider the question of papers and meetings for next year. It is proposed to adopt a different policy from that of other years in so far as the papers are concerned. What is hoped to make for added interest will be the policy of determining which of all the subjects will prove the most suitable for the time and conditions applying and when this is done speakers, whom it is thought can best deal with these subjects, will be approached. The members of the various committees would be glad if the branch members would make known their views as to special subjects they would like to have dealt with in some of the papers to be given. Any communications in this regard will be highly appreciated and should be directed to the chairman, H. W. Fairlie, The Monarch Electric Company, 205 St. James St., Montreal.

International Mathematical Congress

Word has been received from the chairman of the Canadian committee of the above that it is proposed to hold this congress in Canada in 1924 and it is probable that it will be held in Montreal. Before the war the congress met once in four years, its meetings being held in important centres of culture in Europe, such as Rome, Paris, Cambridge. It has never met in America. Deputations would be expected to be present from most of the European countries, from Japan, the United States and other countries on this continent. European and other governments would be invited to send official representatives. It might be pointed out in this connection that scientists in Europe are more in touch with governments and public affairs than is the case in America.

All phases of mathematics, both pure and applied, would be represented at the congress, and it would accord well with the atmosphere and conditions of America to accentuate the latter. Besides pure mathematics then the congress would cover the mathematics of the physical sciences, the mathematics of the various branches of engineering and actuarial science. We would expect to have in attendance mathematicians like Picard, Painlevé, Hademord, Volterra, mathematical physicists of the grade of Langevin, Lorentz, Bohr, Einstein, Eddington, engineers of the class of Bairstow, Steinmetz, Pupin, and some of the foremost actuaries in the world. A very moderate estimate of the attendance at the congress would place it at 1500.

As the British Association for the Advancement of Science meets in Toronto, it would seem not inappropriate that the other scientific gathering should be held in Montreal. There are other reasons, however, why it would be appropriate to hold the Congress in the province of Quebec. The French people have always been pre-eminent in the mathematical sciences, and the largest and most distinguished deputation to the congress from the continent would be French. Most of the papers presented by continental mathematicians would be in the French language. The congress, too, would present a happy opportunity for co-operation between the French speaking and English Canadians in receiving and entertaining our guests from overseas.

The holding of this congress in Canada would mean a great intellectual stimulus to the country. It would greatly enhance the prestige of Canada in the eyes of intellectual Europe. It would place our country on a higher level in the eyes of the United States as well as of Europe. It would be incomparably the greatest event in the history of the mathematical sciences which has ever taken place in America. It would be one of the historic events in science on this continent, and would be known as "The Congress of Montreal", as the preceding congresses are known as those of Rome, Paris, Cambridge, etc.

Ottawa Branch

F. C. C. Lynch, Affiliate E.I.C., Secretary-Treasurer.

The paramount necessity of adequate and uniform salaries being paid to civil servants, who must be picked men, was voiced by Col. E. Lester Jones, director of United States Coast and Geodetic Survey, and International Boundary Commissioner, United States, Alaska and Canada, who was the guest of honour and speaker at a luncheon held by the Ottawa Branch, on May 16th, in the palm room of the Chateau Laurier.

Col. Jones, who was introduced by O. S. Finnie, M.E.I.C., chairman of the Ottawa Branch, as the man to whom President Harding had given the pen with which he signed the United States Reclassification Bill of the civil service on March 4th, spoke on the question of "Are Adequate Salaries to Technical and Scientific Men vital to efficiency in Government Service?" He featured the importance of encouraging efficiency in engineering services; the difficulty — without adequate salaries being paid to them — in holding technical men, and stressed the point that adequate salaries are a wise investment in the civil service, as shown by past experience in the United States civil service.

Colonel Jones stated that he desired it understood he was not speaking in any official capacity, but had gladly consented to talk in view of the co-operation which existed between the government departments of the two countries.

Speaking on the United States civil service Reclassification Bill, he said that it had been passed so late that many had not yet realized its significance, now how it would do away with many of the great drawbacks to efficiency in the service which had hitherto existed. One of them was that there had been no uniformity in salaries; people doing the same work in different departments had been paid vastly different salaries. This was not the fault of the Civil Service Commission, which in spite of adverse criticism, he believed had functioned well, but because the act had been organically at fault. Its greatest feature in this respect had been that civil servants had not been paid a decent living wage, which resulted in the service being overloaded with men of inferior qualifications. Technical and scientific men, who joined the service, did not stay when they found they had no future before them, which had resulted in the annual employment turnover in the service reaching as high a percentage as 40 to 60 per cent. The new act provides that men in charge of departments may be heard from in necessary appointments and adjustments in the branches. This was a good feature, for they were in the best position to know what was best for their respective departments. In turn, their recommendations were passed upon by the commission. Technical men had always been too quiet in the past, and he understood this was one of the troubles here. He believed they should use some of the applied science which they possessed in their own behalf.

The speaker drew a somewhat pessimistic picture of conditions in the United States Civil Service prior to the passage of the new act, stating that men of experience had been lost to the government who could never be replaced. A pointed disadvantage to the service and country had been, that men of inferior educational qualifications had been taken on who proved to be breeders of inefficiency. Their constant replacement had occupied time of the men higher up, which should have been devoted to their own work. This, in his opinion, constituted an extravagant method of handling the country's finances, and the government had long ago felt the reaction from experienced and good men leaving the service.

He stated that in the United States Civil Service, the old order of things had been replaced by the regrouping of civil servants into fourteen groups, which were graded, each grade according to the especial qualifications of the employees, by which the men doing the same work received the same salaries. The reclassification was being fitted to the service by the departmental heads, and then approved by the Civil Service Commission as a re-allocation of employees. By this means the task of the commission had been considerably clarified. Col. Jones believed there could be no better investment in this economic age than that made by the Reclassification Bill, which would make for better work in the civil service, with a higher standard of men. He felt sure that the salaries would bring an adequate return to the country for the money invested. It was by far better to reduce the number of statutory positions in the service and put picked men in the remainder with adequate remuneration, than to maintain the old huge system. The new act was flexible, and left room for readjustments if they should be required.

Col. Jones is here in his official capacity to confer with N. Ogilvie, M.E.I.C., director of the Canadian Geodetic Survey, J. J. McArthur, M.E.I.C., H.B.M., International Boundary Commissioner, Dr. W. B. Dawson, M.E.I.C., superintendent of Tidal Surveys, and others in connection with geodetic, boundary, tidal and other surveys being carried on by the United States and Canada. He saw service in the great war as a colonel, in France and Italy, and was decorated by the King of Italy for conspicuous civil and military service. He is also one of the pioneer advocates of the use of airplanes for survey work, and is known as the "Father of the American Legion in America". In addition, Col. Jones is an author of note, a member of the Washington Society of Engineers, and a number of other important technical and scientific bodies.

Halifax Branch

K. L. Dawson, A.M.E.I.C., Secretary-Treasurer.

A special meeting of the branch at which the student members had full charge of all details was held in the Nova Scotia Technical College, on Friday, April 13th. The chair was occupied by M. B. Wyman, S.E.I.C., who conducted the meeting in a very fitting manner. In addition to the papers presented the students' orchestra provided a number of musical selections during the evening. The main programme consisted of four short papers prepared and read by the students, as follows:—

"Recent Tests on Concrete" — H. W. Humphrey, S.E.I.C.
"Radio Telephony" — C. J. Burchell.
"Automobile Troubles and their Remedies" — L. A. Gauvin.
"Oil Shale" — J. C. Dawson.

Recent Test in Concrete

Mr. Humphrey, in opening his paper, referred to the important place cement holds in the construction world and to its startling leap into commercial prominence. No other commodity has had such a rapid ascent or has so quickly become an indispensable product in building construction. Of all materials of construction, cement is the one most difficult to test and also the only subject to the greatest variation and therefore the one most in need of testing. The advances continually being made through experiment and research together with actual experience render former tests and rules for proportioning and mixing concrete of little or no value. Progress is still being made in many directions in improving and standardizing tests and practices, all of which will exert an important influence on the quality of work and will in the near future result in a higher average of good concrete.

The speaker then proceeded to describe in detail a number of tests performed at the N.S.T. College during the past year. The first test described was an experiment to determine the effect of the size of grains of sand upon the tensile strength of cement mortars and the results showed conclusively that relatively coarse sand makes the strongest mortar, other materials and conditions being equal.

The second experiment was to design a concrete mixture by the fineness modulus method.

The quantities to be determined were:—

(1) *Plasticity*, which is governed by the type of job.
(2) *Mixture*, which is controlled by the plasticity, strength and size of the aggregates.
(3) *Water-cement ratio*, which is governed by the desired strength. The importance of this quantity was stressed by Colonel Boyden in his paper before the branch in May, 1922.
(4) *The quantities of ingredients* per cubic yard of completed concrete.

The speaker described in detail the method used in determining these quantities. A desired strength of 4,000 lbs. per sq. inch was very closely approximated, the average compressive strength of all specimens being 4,009 lbs. per sq. in. The third experiment described was a test making a comparison of neat cement, and cement containing "Master Mix" — a liquid compound claimed by its makers to quicken the set, increase tensile strength, prevent concrete from freezing and make dust-proof, water-proof surfaces.

Experiment showed that "Master Mix" accelerated the setting of the cement with a consequent higher tensile strength but that as the age of the mortar increased the effect of the "Master Mix" decreased so that at the end of a month the effect was not very pronounced.

Radio Telephony

Introducing the subject of radio telephony, Mr. Burchell said, "In radio communication energy is transmitted from point to point in the form of ether waves. Some forms of radiated energy are familiar to everyone, light being probably the most common. The distance between corresponding points in successive waves is termed the wave length and in radio work is usually expressed in meters. Light consists of waves from 39 to 76 millionths of a centimeter in length while the wave lengths commonly used in radio work lie between 150 and 24,000 meters. The wave length does not depend on the power used but only on the electrical constants of the transmitting circuits."

Signals are received from a radio station by placing a conducting wire in such a position that it will cut the waves emitted by the transmitter. As a general rule the higher the aerial the better, and it should be kept away from surrounding objects which might shield it. In order to eliminate all stations but the one desired, the aerial must be tuned to the frequency of that station. This is done by adjusting the capacity and inductance of the circuit so that their reactances balance out at the desired frequency and the current is opposed by resistance only.

The speaker explained in detail the various forms of receiving sets, amplifiers, etc., adapted to various conditions and uses. The question of range and signal strength, depends on the power of the transmitter, atmospheric conditions, the sensitivity of the receiver and the skill of the receiving operator. For this reason manufacturers do not attempt to state the range of their sets as such a statement would be misleading and meaningless.

In closing his interesting paper Mr. Burchell said, "It requires a little time and patience to learn the operation of even the simplest receiver but it is well worth the trouble, for radio is a most fascinating and instructive hobby".

Automobile Troubles and their Remedies

Describing the automobile from an engineering viewpoint, Mr. Gauvin said "Possibly no other piece of apparatus embodies in a condensed form phases of all branches of engineering such as one found in the modern automobile. The civil engineer will find examples and designs of structural steel in the axles and frames. Upon the electrical engineer the ignition and lighting depend. The high grade and special alloy steels and the non-ferrous metals used in its construction require the ablest skill of our best mining engineers and metallurgists. The mechanical engineer, in whose department the whole mechanism belongs, will find problems to cause considerable minute study as to methods of producing power, and the various links through which it must transmit this power efficiently and noiselessly."

Mr. Gauvin discussed three common troubles: — (1) Engine slows down in speed losing power. (2) Engine misses, firing irregularly. (3) Engine suddenly stops.

In the first case the whole trouble is carburetion and is due to a rich or a lean mixture. The second trouble may depend on carburetor, ignition system or valves, the most common cause being a defective spark-plug. The third trouble can generally be traced to the ignition or electrical devices, such as a broken wire or a loose or corroded connection or trouble with the battery.

The speaker dealt in detail with each of these troubles, their causes, symptoms and remedies and explained fully the carburetor adjustments and said in conclusion, "It is a very satisfactory sign, when an engine, starting cold, has no power for three or four minutes and must even be choked in order to start, providing of course that the engine will develop its maximum power after it has heated up somewhat. An engine developing nearly full power when cold is, to say the least, just throwing gasoline away."

Oil Shale

Mr. Dawson treated the oil shale subject under three headings:— (1) The present oil situation. (2) Shale oil as a substitute for petroleum oil. (3) The oil shale resources of the Maritime Provinces.

Referring to the present oil situation, the speaker called attention to the increasing use and demand for, and the diminishing supply of petroleum. It was shown that the American home consumption is already 20 per cent in excess of the production and that according to estimates by experts the oil wells of the United States will be practically dry in 20 years. It is therefore apparent that long before this time has passed some new industry must offer a substitute for petroleum.

Oil shale was described as a compact lominated rock of sedimentary origin yielding over 33 per cent ash and containing organic matter that yields oil when distilled. In appearance it resembles a hard dark wood and is a light to a very dark brown or black in colour. The products of distillation of oil shale are carbon, oil vapours and gas. By varying the temperature in the retort it is possible to vary the amount of oil and gas produced. The great trouble at present is to get a retort which will operate continuously, have a reasonable first cost, a good output and a good quality of oil.

The speaker explained that ample fuel for heating the retort and running the plant can be obtained from the shale itself and described some oil shale operations which are at present yielding 20 gallons of oil per ton. Deposits of oil shale occur near Moncton, N.B., estimated to be 4,000 to 6,000 feet long, 1,500 feet wide and extending to a depth of 1,400 feet, and the average yield is estimated to be in the vicinity of 40 gallons of oil per ton. Seams of oil shale are also found in Pictou county, N.S., in which are estimated to be 100,000,000 tons of workable shale which will average from 15 to 75 gallons of oil per ton.

Mr. Dawson said, "The price of crude petroleum is now on the increase, and with wells costing up to $100,000 each it will not be long before the market price of petroleum will permit the extraction of oil from shale at a profit in the Maritime Provinces."

An interesting discussion of these papers was participated in by C. E. W. Dodwell, Hon.M.E.I.C., Professor Faulkner, M.E.I.C., F. A. Bowman, M.E.I.C., C. St. J. Wilson, A.M.E.I.C., and others.

Niagara Peninsula

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

At the annual meeting of the Niagara Peninsula Branch Willis Chipman, M.E.I.C., president of the Association of Professional Engineers of Ontario, outlined the history of professional engineering from the eighteenth century to date. He described briefly the effort that had been made to secure legislation which would give the engineering profession the same advantages and protection enjoyed by those of law, and medicine. He described in greater detail the final effort which ended in the formation of the present body.

Reviewing the Ontario Professional Engineers Act of 1922, the speaker admitted that it is not all that had been hoped for, but claimed that at least the profession has now legal standing as an organized unit. As an association brought into being by the government it is in a much better position to secure further legislation. It was pointed out that although the definition of professional engineering, embodied in the Act, has been criticized, its wording is in accordance with advise of council retained in drafting the Bill.

The qualifications required for registration have not been objected to, but the provisions for licensing extra-provincial engineers have come under fire. The younger element were for the most part disposed to exclude outsiders. However the majority of the committee felt that too strict a rule would be unwise and therefore provided for reciprocity with professional bodies in other provinces and states. The mining engineers opposed any residential or reciprocal restrictions on licensing.

The present council feel that examinations are for exceptional cases only. That while an engineering degree is of great value there are many prospective members who were not able to avail themselves of that advantage, but who have years of experience in responsible charge and accomplishments which demonstrate their ability. This is of much more value than examinations.

Passing over the penalty clause the speaker pointed out that more was hoped for in this direction particularly with reference to other acts affecting engineering works. If the membership in the association is large and representative enough, there will be less trouble securing amending legislation.

The speaker paid a glowing tribute to the work of the provisional council. Their duties entailed the performance of much work in a limited time. This was done without friction and the work was passed on to the present council in good shape.

The work of the association in no way interferes with that of *The Institute*. Its function for some time to come will be to work for further legislation. The Association is in good shape financially. The membership is nearing the thousand mark.

The speaker concluded with a brief outline of the efforts being made in the United States to secure legislation. It was pointed out that they are having much more trouble than we had in Canada due to the difficulty of bringing all associations together on common ground.

Mr. Kennedy asked the speaker what arrangements could be made for Ontario engineers temporarily in residence and employed in the States. Mr. Chipman pointed out that if not in residence in Ontario they could not be registered.

Mr. Blanchard asked the speaker first, what was the attitude of the council on qualifications and second, of what value was the association to junior engineers. Mr. Chipman in answering the first question pointed out that much the same procedure is followed as in determining qualifications for Associate Membership in *The Institute*. If an applicant is a corporate member of *The Institute* there is very little question of his qualification. In any case the technical qualifications are first investigated. If these are absent the applicants record is investigated very carefully. It is recognized that technical qualifications are not everything and the lack of them may be outweighed by several years practice in responsible positions. Examinations are considered by the present council to be a last resort. Answering the second question the speaker stated that registration would bring no immediate return to junior engineers in dollars and cents, but pointed out that the association was not for the present engineers but for those of the future. The present generation has laid the foundation for them to build upon and it depends upon those who are now juniors whether engineering shall be a profession or merely a poor trade.

Mr. Blanchard in moving a vote of thanks paid tribute to the work done by Mr. Chipman in bringing about the formation of the association. Mr. Gibson in seconding the motion pointed out that in New York state, the law required one member or employee only of a firm to be registered. Nevertheless in the case of the company for whom most of his work was done, not only were all head of departments registered but juniors, with a view to future advancement were registering in large numbers.

Annual Meeting

The annual meeting was held on May 29th at the Refectory, Queen Victoria, Niagara Falls Park. Members and guests to the number of seventy-two sat down to dinner.

The retiring chairman, F. S. Lazier, M.E.I.C., in his report, outlined the work of the executive throughout the year that was closing. On behalf of the executive he expressed thanks for the hearty co-operation of the members individually and collectively in making the various functions successful.

The secretary reported a net increase in the membership of twelve bringing the present membership to 145.

The auditors reported having audited the books and found all correct.

The scrutineers reported the results of the election to be as follows:

Chairman	S. R. Frost, A.M.E.I.C.
Vice-Chairman	— E. P. Johnson, A.M.E.I.C.
Secretary-Treasurer	— R. W. Downie, A.M.E.I.C.
Executive Committee	J. R. Bond, A.M.E.I.C.
	A. W. L. Butler, A.M.E.I.C.

The entertainment provided by the Welland Ship Canal, Instrumental Trio and the "Hydraulocutioners" in their one shift comedy "The Ditchers" was much appreciated. Their programme follows:—

The management of the E.I.C. Theatre have pleasure in presenting to their numerous and long-suffering patrons, a

Gala Performance

of the celebrated play

"THE DITCHERS"

An Hydraulicing Farce in one shift by the famous Cymric Dramatist Teadw Ard

Scene — Somewhere near a Canal.

TIME — Mean Lundy's Lane Time, corrected for sidereal, curvature, refraction and O.T.A.

"The Gang"

Theo. Dolight — An instrument-man (Alleged)
T. Angent Links — A rodman (But should be in chains)
Buck-hard — One of the main razabos.
Bucyrus Blast — A dirt remover.

Lighting by the Philp Juice Company of Niagara Falls.
Costumes by Les Consumers' Bag Cie of Stamford.
Scenery (Such as it is) by Bond, Bond, Bond and Cie of Chippawa and Paris.
Stage Manager — Jagor Donwite.
NOTICE — The management wish to state that much of the language in this play is symbolic and must not be taken literally, and that the characters are entirely imaginary.
Any of the audience intending to take action for libel are requested to communicate with our solicitors. No personal interviews can be entertained.
The audience are requested to refrain from throwing missiles at the actors during the course of the play. They are doing their best.
The management would consider it a compliment if the audience remained until the end of the play.

GOD SAVE THE KING

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

The members of the Vancouver Branch were the guests of the British Columbia Electric Railway Company, on Saturday, May 19th, when they visited the plant of the company at Stave Falls. The party assembled at 8.30 a.m. at the C.P.R. Station, where a special car had been attached to the Toronto Express. About thirty of the members were present. Ruskin was reached at 10 o'clock, where the party transferred to a special train furnished by the railway company for the seven mile run up the river to the site of the power plant.

Present and projected plan of the Alouette-Stave Development.

The rest of the morning was put in inspecting the plant and the new work which was in progress. The old plant consists of four 13,000 h.p. a.c., units direct connected to low head turbines, and the new work consists in the installation of one more large machine and the raising of the dam an additional 30 feet, approximately, thus carrying out the plans of the Western Canada Power Company who were the original owners of this plant. The work is progressing very expeditiously and is just about half completed; the concrete is heavily reinforced and the old sluice ways will be done away with and the surplus water run-off through the Blind Slough which is about one-quarter of a mile from the main dam. When the new plant is in operation a further development will be carried out on the Alouette river, which empties into Stave lake. The entire development of power at the turbines by the Alouette-Stave scheme will be as follows:

Present plant	52,000 h.p.
Alouette plant	10,000 h.p.
Addition to Stave Falls plant	25,000 h.p.
Ruskin plant	80,000 h.p.
	167,000 h.p.
To this may be added the water wheel capacity of the Lake Burtzen plants.	
Plant No. 1	43,500 h.p.
Plant No. 2	40,500 h.p.
	84,000 h.p.
And the capacity of the Vancouver steam stand-by plant	17,000 h.p.
Grand total	268,000 h.p.

After the inspection had been completed the members were invited to partake of a very enjoyable lunch furnished by the B.C. Electric Railway Company. After lunch the vice-president, G. A. Walkem, M.E.I.C., thanked the company, for their hospitality referring to the fact that this was the second visit of *The Institute* to this plant — once, long ago when the Western Canada Power Company owned it — and expressing the hope that they might be permitted to again visit it when the work was completed. In reply Mr. Glover, representing the B.C. Electric Railway Company, said that it gave the company very much pleasure to be able to have a body of engineers see the work which their engineering staff was carrying out, and extended an invitation to *The Institute*, on behalf of the railway company, to again visit them at any time they saw fit, and particularly when the work had been completed.

After lunch the start was made for Vancouver, stops being made at the gravel washing plants about two and four miles from Ruskin. In the first a monitor was washing the gravel down from a high bank, where, after passing through screens and over grizzlies, thus separating the sand from the gravel and sizing the gravel, it was loaded by means of an electric driven clam-shell into hopper cars for transmission to the site. The other gravel plant was in the nature of a dragline extending across the Stave river, it being operated by an electric hoist. This plant has a capacity to furnish all the gravel in use, but unfortunately, owing to the limited depth of the gravel deposit, it was not possible to work it to capacity. Vancouver was again reached at 7 p.m., after a very fine trip and a most enjoyable day.

Visit to Plant of Britannia Mining and Smelting Company

The Vancouver Branch in conjunction with the Vancouver Board of Trade, on Wednesday, June 20th visited by invitation the plant of the Britannia Mining and Smelting Company at Britannia Beach on Howe Sound. This company, which is the largest copper producer in B.C., (if not in America), has recently completed the installation of a new concentrator, the old one having been destroyed about two years ago.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The annual meeting of Moncton Branch was held on Friday evening June 1st. In the absence of chairman, F. B. Tapley, M.E.I.C. C. S. G. Rogers presided.

Third Annual Report of the Executive Committee

The second annual meeting of Moncton Branch was held in the Mayor's office, City Hall, on May 11, 1922. At this meeting reports were read, and the result of the ballot for officers for the ensuing year was announced.

The attendance at our meetings during the past year has been very good, and the supper-meetings still continue to be most popular. There were three meetings of the branch in 1922 and three in 1923. The executive committee held four meetings during the branch year.

Papers were read, addresses given and important business transacted as follows:—

October 12, 1922, W. C. McMullin of the Department of Land and Mines delivered an address on the Mineral Resources of New Brunswick.

November 8, 1922, Dr. V. A. Clarke addressed the members on "Radio Telephony" and A. E. McNutt gave demonstrations with a radio receiving set.

December 7, 1922, Dr. Bigelow, dean of the Faculty of Science and professor of chemistry at Mount Allison University addressed the branch on the subject of "The Place of Research in the Development of Canadian Industries".

January 5, 1923, a special meeting was called to discuss the "Report of the Committee on Classification and Remuneration", but owing to the few members present the meeting was adjourned by order of the chairman, F. B. Tapley, M.E.I.C.

February 9, 1923, Professor McKiel, A.M.E.I.C., delivered an address on the "Modern Tendencies in Engineering Education".

February 27, 1923, a special meeting was held at Mount Allison University, Sackville, at which W. B. McKenzie delivered an address on "Halifax Harbour".

March 15, 1923, Nominations for officers for the ensuing year were held and a discussion took place on the "Report of the Committee on Classification and Remuneration".

April 3, 1923, a farewell dinner under the auspices of Moncton Branch was held in honour of Mr. Tapley and Mr. Gage. A large number of members were present, also a large representation of the officials of the Atlantic Region of the Canadian National Railways.

In May 1922 the membership was 66 — it is now 86. Our membership is as follows: — Members, 10; Associate Members, 27; Juniors, 8; Students, 38; Affiliates, 3; Total, 86.

The increase consists of one Member and nineteen Students.

The sincere thanks of the members of Moncton Branch are due to Major McKee and the ladies and gentlemen who so kindly provided entertainment at all our supper-meetings.

The Financial Statement which was submitted at this meeting shows a surplus of $40.33.

The thanks of the executive are due to Mr. Rogers, chairman of the Papers Committee, and Messrs. Finnemore and Freeman, of the Entertainment Committee, for their untiring efforts in promoting the

interest and entertainment that has been achieved in the branch during the past year, and if the committees that are to be appointed for the next term will give the service that has been accorded last season, the success of the branch is assured.

Financial Statement For Annual Meeting

Receipts

Balance in bank	$ 14.26
Rebates from Headquarers	145.97
Affiliates dues	6.16
Surplus from supper-meetings	13.75
Bank interest	3.31
Donation from Andrew Wheaton	5.15
Miscellaneous	1.70
	$190.30

Expenditures

War Monument fund	$ 10.00
Christmas presents	7.50
Expenses speakers	4.80
Taxi hire	1.00
Stamps	8.62
Printing	42.61
Bank discount	.30
Fraser Floral Co.	24.80
Telegraph and telephone	3.73
Guests at banquet held April 3rd	7.50
Expenses banquet to Messrs. Tapley and Gage	16.75
Attache case	18.15
Miscellaneous	4.21
Cash in bank	40.33
	$190.30

Assets

Cash on hand	$ 48.90
Balloptican lantern	60.00
Attache case	18.00
Rubber stamp	1.00
Stamps on hand	2.53
	$130.43
Balance in bank	$ 40.33
Rebates due from Headquarters	42.22
	$ 82.55

F. B. FRIPP, A.M.E.I.C., *Vice-Chairman.*
M. J. MURPHY, A.M.E.I.C., *Secretary-Treasurer.*

Election of Officers

The following officers were elected for the ensuing year:

W. B. MacKenzie, M.E.I.C., consulting engineer, chairman.
F. O. Condon, M.E.I.C., engineer of maintenance of way, C.N.R., vice-chairman.
M. J. Murphy, A.M.E.I.C., ass't. engineer, C.N.R., secretary-treasurer.

Executive Committee:—

H. J. Crudge, A.M.E.I.C., building engineer, C.N.R.
E. G. Evans, M.E.I.C., district engineer, C.N.R.
J. D. McBeath, M.E.I.C., assistant city engineer.

The following members of the Executive Committee hold office for another year:

A. F. Stewart, M.E.I.C., chief engineer, C.N.R., Ex-officio Member of Council of *The Institute*.
G. C. Torrens, A.M.E.I.C., division engineer, C.N.R.
C. S. G. Rogers, A.M.E.I.C., bridge engineer, C.N.R.
A. S. Gunn, A.M.E.I.C., ass't. engineer, C.N.R.

St. John Branch

W. S. Johnston, A.M.E.I.C., Secretary-Treasurer.

A special meeting of the St. John Branch was held on May 19th with G. N. Hatfield, A.M.E.I.C., vice-chairman, presiding. An address illustrated by lantern slides was delivered by Col. H. C. Boyden, of the Portland Cement Association, Chicago. The speaker treated of concrete as applied to highway construction.

The increased use of the highway during recent years by both automobile and motor-truck traffic had made necessary a more durable type of road than the earth and macadam roads which generally prevailed a few years ago. In an effort to find the most durable type of road, government departments and private organizations had carried on many investigations in both laboratory and field during recent years in an effort to eliminate those types which failed under modern traffic conditions. Probably the best field test had been sections of highway built with alternate sections of different paving material, where the several types of highway were subject to the same traffic loads and continued in use without repairs to destruction. It has been estimated that over a million dollars has been spent to date in these investigations, while a like amount will be required for completion of tests now being made.

The members of the St. John Branch tendered an informal luncheon to Walter J. Francis, M.E.I.C., president of *The Engineering Institute of Canada*, at the Royal Hotel, on Saturday, June 2nd. In the absence of the chairman and vice-chairman from the city C. C. Kirby, M.E.I.C., presided and included among the guests were U. Valiquet, M.E.I.C., C. R. Coutlee, M.E.I.C., and S. J. Chapleau, M.E.I.C., of Ottawa, and H. G. Acres, M.E.I.C., of Niagara Falls.

At the conclusion of the splendid luncheon, the chairman introduced the guests and Mr. Francis addressed the gathering on the work of *The Institute* in general. He spoke of the splendid work being carried on by the branches and he mentioned several features with which he had been especially pleased during his travels. Mr. Francis spoke of the great need for study of the fuel situation and asked all engineers to help solve the problem. Messrs. Acres, Chapleau, Coutlee and A. G. Tapley spoke of the pleasure of being present to welcome the president to the city.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
W. St.J. Miller, A.M.E.I.C., Branch Editor.

If this was to be an account of the coming Stampede at Calgary it would be an easy matter to fill several columns with news of local interest. Our citizens in particular are steeped to affluence in the big event at which not only Dominion but world championships will be decided.

However, when one endeavours to champion the cause of the engineer these days, or to expound on his spirit of enterprise, one is confronted with a superabundance of inactivity that would seem to make the profession unattractive to the coming generation. But we are going to have "some crop" this year, as a result of which there will doubtless follow in the wake a revival of engineering activity in all parts of the country. Every line has been encountering with trepidity the hard-times orgie, and with the advent of said bumper crop the pessimist will have to take a very far back seat.

East Calgary Oil Refinery

Reference may again be made to the oil refinery of the Imperial Oil, Ltd., in East Calgary. Rapid progress is being made and the site is a busy place. Nearly all of the forty-eight storage tanks are now erected in place, and these contain to date some 26,000 barrels of crude oil, with more on the way from Montana. It is stated that two trainloads will be shipped in weekly for treatment. These tanks are in sizes ranging from ten to forty-two feet in height and ten to one hundred and twenty feet in diameter, the largest having a capacity of 84,000 barrels. Steam duplex pumps deliver the oil to the tanks through a quarter of a mile of pipe line. There are 1,340 men on the pay rolls and C. H. Moore is the manager. In a recent report he stated that he could not tell definitely at what date the plant would be completed, probably in September. It is hoped at a later date to give a first-hand description of this interesting plant in more detail.

In addtion to the production of fuel oil and gas oil it is interesting to know that a by-product will be produced in the form of petroleum coke. This may greatly assist the local fuel situation at critical periods. At Regina this petroleum coke, in the form of cakes, competed successfully with the commercial coal coke.

There are nine stills, each with a capacity of 1,000 barrels, and the refining separators, one of the most important sections of the plant, are practically completed. The construction of a tank-car heating shed (217 feet long by 50 feet wide) is well advanced.

Banff-Windermere Highway

Considerable interest is being evinced locally regarding the official opening of the Banff-Windermere road, which is scheduled to take place on or about July 1st. This interprovincial road must mean an added influx of motor traffic through this city, and will, therefore, prove of value to us in this way as well as affording a delightful round trip for the motoring public. The road crosses the Rocky mountains via the Vermillion Pass, reaching a maximum altitude of 5,660 feet. The total descent travelling westwards is 4,235 feet at a remarkably low average grade of three per cent. The road width provides a wheelway clearance of sixteen feet with an additional four feet through cuts to allow for drainage ditches. Curves throughout have been adequately elevated and at these points the roadbed has been widened. It is claimed that the scenic splendour along this *Blue Trail* is nowhere surpassed in its natural beauty, the pick of which lies in the vicinity of Sinclair canyon, where the road passes through towering walls of rock.

Chartered Accountants—Engineers Golf Match

On May 17th, a golf match was played off between the Chartered Accountants of the city and the members of *The Institute* at Bowness golf course. After a close contest the engineers went down to defeat before their opponents the total scores being 8¼ and 4¾. We would

undoubtedly have been the victors if ——, but it is that little word that has so often, and always will, provoke us at certain times by reversing the order of things from what they might have been! The members lined up as follows: V. A. Newhall, A.M.E.I.C., J. Wilkes, P. J. Jennings, M.E.I.C., W. B. Hutcheson, A.M.E.I.C., D. T. Townsend, L. Stockett, M.E.I.C., H. V. Heathcott, B. Russell, A.M.E.I.C., G. H. Whyte, A.M.E.I.C., C. C. Planche and T. E. Emery, A.M.E.I.C. The arrangements of the match were mainly in the hands of J. A. Spreckley, A.M.E.I.C., the efforts resulting in a most enjoyable outing.

Elbow River Flood

Calgary, like many other towns in the west has experienced the effects of a phenomenal amount of spring precipitation this year, amounting to a flood for two or three days. The Elbow river rose to an alarming extent on June 1st, inundating a large part of the residential section adjacent to the banks. The flood waters exceeded those of 1915 by 0.4 inch and effected considerable damage to lawns, gardens and cellars. The basement of the city power house was flooded with four feet of water and some of the boilers were put out of commission. None of the electrical machinery, however, was damaged. Preparations are under way to have the plant thoroughly protected against any

Bridge over Elbow River, Calgary, Alta.
Flood June 1st 1923 — 7 p.m. — Peak of flood at 2 p.m.

possible recurrence of such damage, and it will be made both flood and storm proof. In general the flooded area appears to have been confined roughly to a triangular section of the country included between the foothills of the eastern slope of the Rockies and the towns of Blairmore, Lethbridge and Calgary. The rise of the Highwood river was abnormal, the capacity being some 23,000 c.f.s., as compared with 13,000 c.f.s., during the 1915 floods, and the level was about five feet higher. Part of the retaining wall at the headworks of the Little Bow Irrigation District was somewhat damaged. Damage was also reported by the Lethbridge Northern Irrigation District engineers, some of the main canal having been washed out, as also a portion of the steel flume at the crossing over the Oldman river. This river behaved badly and rose to a dangerous height in excess of previous flood records.

OTHER SOCIETIES NEWS

Canadian Good Roads Association Convention

The tenth annual convention of the Canadian Good Roads Association, with headquarters at the Royal Connaught hotel, Hamilton, Ont., June 11th to 14th, inclusive, 1923, proved most interesting and enjoyable to the many delegates who attended. Six sessions were provided for the transaction of business and the presentation of papers, the first being opened on Monday, June 11th, at 10.30 a.m., with the Hon. J. L. Perron, president of the association, in the chair. In opening the convention, the Hon. Mr. Perron first welcomed the delegates, and then briefly outlined the activities of the association during the past year.

The programme of technical papers covered a wide range of subjects relative to highways, among which were the following:

Provincial System of Highways and Permanent Construction, by Geo. Hogarth, M.E.I.C.; discussion by H. M. Necker.

Test Road Experiments, by J. A. Duchastel, M.E.I.C.; discussion by Clifford Older.

The Need for Specialty trained Highway Builders, by R. DeL. French, M.E.I.C.; discussion by A. T. Laing.

Lessons of the Past and Problems of the Future in Highway Development, by A. W. Campbell, M.E.I.C.

Who should pay for the Road, by Hon. E. H. Armstrong and Hon. P. J. Veniot; discussion by H. S. Carpenter, M.E.I.C.

Maintenance — (a) Methods and Cost data; (b) Gravel and Earth Roads (Scrapers and Graders), by E. A. James, M.E.I.C.; discussion by B. M. Hill, M.E.I.C.

Patrol Systems, how best conducted, by L. H. Nielsen; discussion by A. McGillivray, A.M.E.I.C.

Methods for reconstructing Old Macadam Roads, by James Pearson; discussion by A. P. Sandles.

Culverts and Small Bridges, by E. L. Miles, M.E.I.C.; discussion by Chas. Talbot, M.E.I.C.

Refined Tar in Construction and Maintenance, by J. S. Crandell; discussion by A. F. Macallum, M.E.I.C.

Cement Concrete (Single track), by A. M. Jackson, A.M.E.I.C.; discussion by J. G. Wilson.

Bituminous Surfaces, by Irving W. Patterson; discussion by T. S. Scott, M.E.I.C.

Functions of a Suburban Area Commission, James J. MacKay, M.E.I.C.; discussion by W. C. Thompson.

The proper use of the Highway — (a) Methods for regulation of traffic and enforcing speed laws. (b) The Autobus. (c) Motor Truck. (d) Uniform hand and danger signals. (e) Headlight regulations. (f) Lights on all vehicles, by J. F. H. Wyse; discussion by Elmer Thompson.

Tourist Traffic, by John F. Pierce; discussion by J. B. Harkin.

The annual general meeting of the association took place at 4.30 p.m., Wednesday, June 13th, and the newly elected officers were announced: Honorary President, Hon. J. L. Perron, Quebec; President, Russell T. Kelley, Hamilton; Vice-President, Hon. F. C. Biggs, Ontario; Second Vice-President, A. McGillivray, A.M.E.I.C., Manitoba; Secretary-Treasurer, George A. McNamee, Quebec; Directors, H. H. Shaw, Prince Edward Island; G. Frederick Pearson, Nova Scotia; A. S. McMillan, Nova Scotia; T. P. Regan, New Brunswick; Joseph Beaubien; Quebec; A. L. Caron, Quebec; Col. F. M. Gaudet, M.E.I.C., Quebec' Wm. Findlay, Ontario; T. J. Mahoney, Ontario; S. R. Henderson. Manitoba; H. S. Carpenter, M.E.I.C., Saskatchewan; J. B. Robertson, Alberta; P. Philip, M.E.I.C., British Columbia; F. R. McD. Russell, British Columbia.

Toronto Branch Engineering Alumni S.P.S.

The annual meeting of the Toronto Branch, Engineering Alumni of the "School", was held at Hart House, May 10th. Reports were received from the president, F. A. Dallyn, M.E.I.C., in which he outlined the work of the year. He drew particular attention to the fact that the obligation of the war scholarship scheme had been successfully retired, and the money borrowed from the alumni fund to meet past payments to the fund, had been returned to the treasury of the Toronto Branch. His statement also reported good progress on the university residence proposal brought before the branch at its last annual meeting.

The elections were then held, — six nominations to fill the three vacancies on the executive were received and the balloting resulted in the election of A. A. Kinghorn, '07, G. D. Maxwell, '21, Jr.E.I.C., H. G. McVean, '01, A.M.E.I.C.

Walter J. Francis, M.E.I.C., past president of the Engineering Alumni, and president of *The Engineering Institute of Canada*, addressed the "School" men on "Alumni Co-operation". Every person who had the good fortune to hear Mr. Francis went home with a new inspiration in business and a better idea of the importance and necessity of co-operation in all matters relative to our Alma Mater.

Special Convocation. — Toronto University

Of special interest to "School" men in all parts of the Dominion was the special convocation held on May 1st, at which degrees were conferred upon the class of 1923. Examinations were concluded about April 21st, and with the co-operation of the professors, arrangements were made whereby results would be published and degrees conferred within the comparatively short period of ten days, thus allowing a very large number of science graduates who would ordinarily be scattered all over Canada to remain in Toronto and receive their degrees.

The Kaelin Electric Steam Generator.— Bulletin 101, is an interesting pamphlet being distributed by the Dominion Engineering Works, Limited, Montreal, outlining the field of application of this new steam generator, and describing its construction, operation and control. The Bulletin is well illustrated with half-tones and sectional views, and contains a very complete chart for comparing the cost of coal-fired and electric steam plants under various conditions.

Einstein's Theory of Relativity and Gravitation

Professor L. T. Rutledge, M.E.I.C.

Abstract of Paper read before the Peterborough Branch, The Engineering Institute of Canada, February 22nd, 1923.
Abstracted by R. C. Flitton, A.M.E.I.C.

The Philosophy of Relativity

Professor Rutledge endeavoured in the space of two hours to advance our ideas of the structure and laws of the universe a step further. It was a real effort to break through the wall which separates men from truth. The speaker first briefly traced the advancement of learning from the time of Socrates, who founded the school of absolutism. A Socratic philosopher could discuss absolute being, absolute space and absolute time. The Greek mode of thought persisted into the late Middle Ages, when Des Cartes and Bacon began to doubt the validity of Greek philosophy.

During the long ages great advances had been made in science by such men as Archimedes, Galileo, Kepler, Leonardi de Vinci, Des Cartes, etc., but no important generalizations had been made until the seventeenth century. The seventeenth century has always been regarded as one of the most eventful periods in the history of positive knowledge. The discoveries and speculations of the preceding ages had prepared the way for some grand generalizations of the phenomena of the material world, and scholars of all ages anticipated the advent of that master mind by which this might be accomplished. A generalization of such vast extent, enabling one to determine the positions and aspects of the planets during thousands of years that are past and for thousands of years to come, cannot but be regarded as an achievement of the highest order and the name of Sir Isaac Newton has, by universal consent, been placed at the head of the list of those great men who have been the ornaments and benefactors of their race. His great work, "The Principles of Natural Philosophy" stands pre-eminently as one of the greatest productions of human genius.

His epitaph, in Latin, in Westminster Abbey, tells the whole story in majestic language. Translated, it reads:—

"Here lies
Isaac Newton, a Knight,
Who with a vigor of mind, almost supernatural,
First demonstrated
The figures and the motions of the planets.
The paths of the comets and the tides of the ocean.
He diligently investigated the different refrangibilities of the rays of light,
And the properties of the colours they give rise to,
An assiduous, sagacious and faithful interpreter,
Of Nature, antiquity and the Holy Scriptures,
He asserted in his philosophy the Majesty of God,
An exhibited in his conduct the simplicity of the Gospel,
Let mortals rejoice
That there has existed such and so great an ornament of the human race
Born December the twenty-fifth, 1642,
Died March twentieth, 1727."

During the Renaissance another type of absolutism equally extreme and equally arbitrary as the Greek came into existence. In the Greek thought, the observer was everything and the external reality of no importance. Socrates looked entirely inside himself for the elusive truth, whereas the classical scientist looked entirely outside himself. The external was the important factor. Our thought at the present day is a mixture of these two systems of thought. Einstein was the first to realize this so fully as to make a determined effort to free human thought of this mixture.

Einstein's viewpoint which is the *viewpoint of relativity* is that all phenomena are joint phenomena of the observer and the externals and the events or phenomena exist only in their joint presence.

The law of nature was next explained as a working hypothesis subject to alteration or even abandonment as man's vision widens. A law of nature is a generalized statement obtained after many observations by different observers. The test of one of these laws is that new phenomena can be predicted. This is the *method of relativity*.

Time and Space and Mechanical Principle of Relativity

Then using this modern method of reasoning, the speaker confined his attention to "time and space". Newton gave his views of time and space in the words: "Absolute, true and mathematical time flows, in virtue of its own nature, uniformly in one direction without reference to any external object and is known in other words as duration, also absolute space, by virtue of its own nature and without reference to any external object always remains the same and is immovable." So Newton regarded "space and time" as forms of existence of the real world. Matter was a real substance. Einstein considers space and time as concepts. However whether space and time may be regarded as real or not, it is obvious that neither can be measured directly.

Rene Des Cartes showed us how to set up for the measurement of space the framework of Cartesian or Galilean co-ordinates, a system which we all use in plotting graphs. When using the system for physical purposes, synchronized clocks must be used to give the times at which events occur. A system of axes with its clock is called a frame of reference, and every observer is equipped with such a reference system partaking of his motion.

Sir Isaac Newton formulated the "Mechanical Principle of Relativity" which states that all systems of Cartesian frames of reference are suitable for the mathematical statement of mechanical laws, provided their motion is rectilinear and uniform and without rotation, that is unaccelerated. This was proved by the equations of momentum. However it was pointed out that there are no co-ordinate frames of reference in nature. They are only introduced for the analytical representation of phenomena.

Special Theory of Relativity

Continuing on the search for absolute motion in space, Einstein cites the case of a passenger on a train, who, before he can decide whether his train is in motion or the adjacent one, he must wait for jolts, that is, accelerations or else he must look at some object he knows to be stationary, or in other words, he has to perform an experiment outside his system. Accordingly Einstein laid down a postulate which states, "By no experiment conducted on his own system can an observer detect the unaccelerated motion of his system".

Many years ago, scientists hoped for absolute motion in space and invented the "ether". Ether was a substance to carry the waves of light. Ether was imagined to be an all pervading, imponderable substance filling all the vast emptiness of space and all the inter-molecular spaces of all matter. Lord Kelvin, in his celebrated Baltimore lectures of 1888, gave the splendid exposition of the conception that the ether is a continuous, homogeneous, non-atomic elastic solid.

The Michelson-Morley experiment of 1887 was carried out to observe the relative velocity of the earth and the ether. It was supposed to be about 18½ miles per second. By a method of light transmission between mirrors it was anticipated that interference of light would demonstrate this velocity. The retardation was to be measured. Knowing the velocity of the light, it would be possible to calculate the velocity of the medium relative to the observer. The experiment gave the results that under all circumstances and conditions the velocity of light past the earth-bound observer was the same. So it was inferred that the earth had no velocity relative to the ether.

Ingenious explanations were offered by many scientists. Lorenz and Fitz-gerald offered an explanation stating that the motion of the earth through the ether was balanced so far as the measuring instruments were concerned and that they suffered a contraction in the direction of their motion. They stated that all matter was electrical in nature and that the dimensions of the magnetic and electric fields which accompany the electrons of which matter is constituted change with the velocity of motion.

Professor Einstein without advancing any opinion as to whether there existed any ether or not conceived the idea that it might be infinitely more valuable to take the more general explanation possible and then try to find out "a priori" its logical consequences. This more general explanation of Professor Einstein is his assumption that it is impossible in any way whatever to measure the absolute motion of a body in space. Einstein asserted that objects may appear shorter to one observer than to another depending, of course, on the relative velocities of their frames of reference. Clocks may appear to go slower for one observer than another. If one moved away from a clock with the speed of light the minute hand would forever appear to stand still whereas the minute hand on his own watch in his hand would appear to be going at its ordinary rate. Thus Einstein does not admit of lengths and time having absolute values, but they are relative. They are relations between the observer and the object and these change as the relative motion changes. Time can no longer be regarded as something independent of position and matter and the question is, "what is the reality?"

A possible answer is one proposed by Professor Minkowski and accepted and enlarged upon by Dr. Einstein. It is that objects must be regarded as existing in four dimensions: length, breadth, thickness and the fourth, time. The term space is applicable by analogy to such a region. It has been called a continuum. A continuum is something that proceeds without any open spaces. A line is a continuum of points. Minkowski expressed the relationship of the four co-ordinates in the time-space continuum by the mathematical equation $\sqrt{(X-x)^2+(Y-y)^2+(Z-z)^2}=(T-t)$ where the capital letters are

co-ordinates in one frame and the small letters in the other frame C is the velocity of light. This quantity has the same value for all observers and is therefore absolute. In a plane it represents absolute distance between two points and in dealing with events it represents the true absolute interval of time and space together between the events It is a combination of space and time.

Taking into account the revised views of lengths and times, the mechanical principle of relativity has been extended to physical laws as follows: "All unaccelerated frames of reference are equivalent for the statement of the general laws of physics using Mankowski's time-space co-ordinate system". This is called the special or restricted theory of relativity, since it is restricted to unaccelerated motion.

The speaker then explained the Lorenz transformation in which an equation was submitted giving a relationship between lengths and times on two systems having a relative velocity. The Lorenz factor is: $\sqrt{1-\frac{v^2}{C^2}}$ where v is the velocity of one frame relative to another and C is the velocity of light, both in the same units.

If an observer on a train 1,000 feet long, as measured by him, passes at 60 miles an hour an observer on the embankment, what is the length of train as observed by the man on the ground if he could measure it at the instant?

General Theory of Relativity

The answer is:

$$L + \sqrt{1-\frac{v^2}{C^2}} = 1{,}000 \times \sqrt{1-\frac{88^2}{(186{,}330 \times 5{,}280)^2}}$$

$$= 999.999999999999996 \text{ feet.}$$

The speaker next proceeded from the special theory of relativity to the general theory. The special theory is limited to unaccelerated motion whereas the general theory is not. This was explained by Einstein's example of an observer on a rotating disc. It was shown that inertia and gravitation were identical and that acceleration was a framework to be discarded when the general theory was developed. It was demonstrated that a more complex mathematics was necessary to give an analytical representation of general phenomena. The cartesian co-ordinates were no longer adequate. The Gaussian co-ordinate system which is a generalization of the Cartesian system furnishes the necessary frame work of mathematics.

The absolute differential calculus of Christoffel and Riemann shaped by Ricci and Levi-Civita, furnishes equations solving problems in nature hitherto unsolved when properly applied according to the general theory. The equations are vector equations and at the same time differential. They are unaffected by a change of origin and do not depend on any reference system. This geometry involves the use of tensors. "A linear form in several series of variables, which is dependent on the co-ordinate system, is a tensor if in every case it assumes a value independent of the co-ordinate system (a) whenever the components of an arbitrary contra-variant vector are substituted for every contra-gredient series of variables or whenever the components of an arbitrary co-variant vector are substituted for a co-gredient series", (Herman Weyl). Using the above mathematics to illustrate the laws of nature the general theory states, "That all Gaussian co-ordinates are equivalent for a statement of the general laws of physics".

Applications of Theory of Relativity

With the help of the general law, Einstein predicted many things, solved many problems and explained certain natural phenomena. He stated that the rays of light should be bent in passing the sun. Light is affected by the gravitational field. This was verified at the last two important eclipses. Stars which were behind the sun were photographed. In one revolution of the planet Mercury, the orbit will advance by a fraction of a revolution equal to three times the square of the ratio of the velocity of the planet to the velocity of light or $\frac{3\ v^2}{c^2}$ The orbit of Mercury advances by 574 seconds of arc in a century. The Newtonian mathematics of gravitation accounted for 532 seconds. The remaining 42 could not be accounted for till Einstein worked it out by the general theory and accounted for 43 seconds which was considered close enough.

The third prediction of Einstein was that of the displacement of light from the sun towards the red end of the spectrum, as compared with light of the same kind on the earth. This prediction is difficult to verify but scientists are working on it.

According to the theory of relativity momentum is no longer mv but is $\frac{mv}{\sqrt{1-\frac{v^2}{c^2}}} = mv + \frac{1}{2}\frac{mv^3}{c^2} + \frac{3}{8}\frac{mv^5}{c^4} + =$ sum total of momenta in the system. The action of a moving body in passing from one position to another may be defined as the space integral of the momentum taken over the path of motion. It is possible to show that this is equation to the summation of $\int mv^2\ dt$. Here the principle of *least action* is involved. It states that the free motion of a conservative system between any two given configurations has the property that the above summation is a minimum. In more simple language this means that nature fulfills its laws with the minimum expenditure of energy.

The principle of *least work* is a very important one from an engineering standpoint. It affords a general solution of all problems involving the static equilibrium of elastic solids. An important example of a tensor field is offered by the stresses occurring in an elastic body. It is indeed, from this example that the name "tensor" has been derived. Its most useful application is, perhaps, to problems which are otherwise statically indeterminate, that is to say, problems in which the number of unknown quantities involved is greater than the number of relations furnished by the ordinary conditions of equilibrium. It has an application in the solution of problems in continuous beams. For stable equilibrium the potential energy of any system is a minimum.

In accordance with the theory of relativity, the kinetic energy of a material point of mass "m" is no longer given by $\frac{mv^2}{2}$, but by the expression, $\frac{m\ c^2}{\sqrt{1-\frac{v^2}{c^2}}} = mc^2 + \frac{m\ v^2}{2} + \frac{3}{8}m\frac{v^4}{c^2} +$ It gives the total kinetic energy stored in a mass from the beginning.

The electromagnetic equations of Maxwell can be derived and expressed in their original form by the general theory. Einstein's conception of the universe is explained by the general theory. Space is curved and finite. The universe is quasi-spherical. Its radius is expressed algebraically by the mathematics of the general theory. If the density were known it would be known exactly.

In conclusion the speaker stated that many things would not be explained without a full mathematical analysis but a few points should be noted. The law of gravitation restricts the curvature of time space. It connects this curvature with the measurable properties of matter such as density, velocity stress, etc. Thus these properties define the curvature. We know that the laws of conservation of energy and momentum can be deduced by a purely mathematical process. It must also be borne in mind that such things as length, velocity, energy, momentum, time are not absolute, but relative. They are not attributes of the physical realty but relations between the realty and the observer. Thus the laws of conservation are not laws of the real world like gravitation, but of the observed phenomena. The law which is of most importance and is most fundamental is the principle of *least work* since all the laws, even that of gravitation can be derived from it.

The great charm of Einstein's Theory lies not so much in the verification of some pretty prediction but in the wonderful heuristic power it possesses, and the broad view of nature which it affords. Sir J. J. Thompson of the Royal Society of England stated that it is the most important result obtained since Newton's time. Einstein's reasoning is the result of one of the highest achievements of human thought.

CORRESPONDENCE

Canada's Fuel Problem

Ottawa, May 10, 1923.

The Editor, *Journal*,

Dear Sir,

Regarding the fuel problem, I consider that the report of Dr. B. F. Haanel's address at a recent meeting of the E.I.C., published in your issue of April, covers the ground in a thorough manner from an expert chemical engineer's point of view. To my mind this question should receive the attention of other branches of engineering also, including electrical and heating engineers.

Having been actively engaged in the line of domestic heating engineering for the past forty years in many countries, the question of combustion of coal has been my constant study. Heating engineers, previous to drawing plans for an installation of a furnace or a battery of furnaces must know the grade of coal that will be burnt in those furnaces, as such has considerable bearing on the design of the combustion chamber. The height of boiler shell from fire bed, also the type of grate bars and per cent of air space between those bars if coal is wished to be burned economically, without black smoke, and the necessary horse power developed.

With some grades of soft coal fired on grates of furnaces that were designed for hard coal, it would be im*possible* to get the desired results, for many reasons. Any grade of soft coal, regardless of its high percentage of volatiles can be burned satisfactorily on grates of rectangular shape furnaces, such as we have in power boilers, providing it is fired on right lines, also providing that the furnaces have been

constructed or remodeled for burning soft coal and are maintained in a condition that will keep out surplus air which, when allowed into the flues or tubes of boilers, causes a reduction of the temperatures of those gases produced from burning coal to a temperature below the ignition point necessary for those gases to burst into flames and so consume the hydro carbons, instead of those by-products escaping from the smoke shaft in the form of black smoke. This should be the constant care of every operating engineer from the Atlantic to the Pacific. *Prevent excess air* if it is wished to prevent the awful waste of coal, also unnecessary polution of the air we breathe.

It is natural for the metal in steam boilers to expand and contract according to the intensity of the fire and pressure of steam. Such results in cracks in the walls of multibular also water tube boilers. These cracks if not plugged will admit, owing to the pull of smoke shaft, a very large volume of cold air to filter through, cases the writer has seen, where more coal was being wasted each day through this cause than would pay the wages of the boiler-room staff for a week. These remarks are applicable to automatic stoker furnaces, as well as hand fired furnaces. The device or equipment for consuming smoke other than the practical carbonization and combustion of the gases, *has not been devised, nor never can be*, except to lower the efficiency, with hand-firing.

There are several types of automatic stokers that will burn any grade of soft coal without black smoke. Indeed, from the stacks of many large plants, burning 100 tons per 24 hours, only a light brown haze is noticed at any time. In other cases there is no indication of smoke of any colour. Such not only burn the coal efficiently but increase the boiler rating 200 to 300 per cent. But such equipment cannot be used in domestic furnaces most of which have deep round fire pots and are designed for slow combustion of fuel, low in percentage of volatiles and fairly high in British thermal units. Such a fuel we have in coke made in ovens for metallurgical purposes. The analysis of this fuel is as follows: — ash 17.4 per cent, volatiles 2 per cent, carbon 79.7 per cent, B.t.u. 12,200. The average of some of our soft coals is as follows: — ash 9.7, volatiles 33.4, carbon 54, B.t.u. 11.970. It is the high percentage of volatile gases that practically forbids soft coal being used in the ordinary domestic furnace or cook stoves. Slow combustion of coal requires that the dampers and the drafts of domestic furnaces be nearly closed, so that a fire-pot filled with fuel will last 8 to 10 hours without attention. It is obvious that with a fire-pot filled with soft coal provision must be made for the escape of the large quantity of volatile gases, otherwise the same would either find their way into the air pipes of a hot air furnace and out of the registers in the room or accumulate to such an extent in the furnace as to ignite and explode. The same provision that is made for the escape of these gases causes the rate of combustion of the coal to be faster. Consequently the replenishing of the fire must be oftener. Further with dampers closed, assuming that considerable volume of the volatiles have been burned or allowed to escape to the chimney, previous to closing off the drafts to last through the night, it would not be possible to get heat units from the fire fast enough to compensate to a reasonable extent for the heat units lost through the weather walls or the glass surface of a building. The fire bed would soon lose its temperature, become sluggish, and would, in course of time die out. Assuming that such fuel remained alight at the rising hour the next morning more coal would have to be burned to restore the lost temperature of the house for the first two hours of a cold morning than would be necessary for the whole day.

Accurate formulas for the heat units lost from the different kinds of building material have been furnished by the engineering colleges and are known and used the world over. Such loss must be counter-balanced by the heat units extracted from the fuel, which must be a hard and slow burning fuel. Looking at the matter from any point of view there is not the least doubt but that 72 hour by-product coke will be found the very best substitute for anthracite coal. This fuel should not be classed with coke from city gas works, but in some cases it can with advantage be mixed with 15 to 20 per cent of the gas works coke. For a quicker fire, it should be passed through a crusher previous to delivery — to sizes similiar to the standard sizes of American anthracite. The coking process should be according to a specification prepared by the government in order that too many by-products are not extracted, also that as much of the carbon as possible is retained in the fuel. There are large reserves of soft coal suitable for such ovens in both our eastern and western mines. As the question of rail transportation seems to prevent such coal being used for such purpose at a reasonable figure, my suggestion is to have a fleet of 3,000 or 4,000 ton freighters actively engaged during the whole of the season of navigation, bringing coal from Nova Scotia and New Brunswick mines by the water route to towns and cities along the shore through the canal and up to Toronto, thereby supplying both the provinces of Quebec and Ontario with our coals for coking purposes. The coke ovens to be erected close to the water landing, the coal handled by mechanical conveyors right into the coking plants, adjacent to such coking plants. I would have a battery of steam boilers, the fire for such furnaces to be the gas extracted from the coal coked in the previously described coke ovens, such gas could also be piped to houses, for heating or cooking purposes, adjacent to these two plants. I would have an electric current generating station, the steam for which would be furnished by the previously described boiler plant. After this steam had done duty in those engines, I would turn it into mains laid under the streets of the towns or cities in the vicinity of the coke ovens, for heating purposes, the electric current to be used for hauling coal trucks or coke to the quenchers or sold for lighting or power purposes or to heat houses. During the summer months when the demand for heating and lighting is low the surplus electric current could be used for working the pumps of an artificial ice plant. Apart from the valuable by-products extracted from each pound of coal coked, the revenue from the other sources suggested should be such as to make the whole scheme a logical proposition. The question would be asked: "What about these freighters returning empty?" My answer is that by efficient management they could after the first trip load up with coke for distribution to the cities and towns right up to the mining towns, and including Prince Edward Island, thereby supplying the people with cheap fuel which in my humble opinion will be the salvation of Canada, for the hight cost of living depend not only directly, but indirectly on the cost of our fuel for artificial heat and many factory purposes. If joint stock companies were formed, no doubt there are very few householders in the provinces of Ontario and Quebec, who would not buy at $10 or $20 bond similar to the Victory bonds, redeemable in a stated number of years without interest for the sake of getting a good domestic fuel at say $5 or perhaps less per ton. Another point in favour of such fuel is that if a man had a ton of the fuel, I suggest, in his cellar, he could burn every pound of it. Another point in favour of such fuel is that there would be no soot choked furnaces or chimney fires. It may not be generally known that in 1922 the haulage of incombustible fuel that passed over the American railroads in the form of extra high percentage of ash, slate, shale, bone, and dirt amounted to five million tons of useless haulage, allowing 25 cars to a train, each of 25 tons represents 200,000 cars or 8,000 trains, plus the coal burned on those 8,000 locomotives or wages for 8,000 train crews. No wonder that we were constantly reminded by the press of the country during the past few winters of the coal shortage that cars were not available. Should not the 200,000 cars previously mentioned have been more usefully employed?

It is obivous that I cannot furnish any data of the number of cars of coal that have gone into the atmosphere in the form of smoke that should have been avoided and most certainly would be if no coal were used in its raw state, which is unscientific, wasteful, dirty, and assisting to prolong the white plague in our country. It may not be during our time on earth, but the day will surely dawn when the people will be better informed of the harmful influences of carbon monoxide gas from coal. Legislation will no doubt be enacted that no coal shall be burned in its raw state not only for health sake, but for economic reasons. The hundreds of millions of tons of coal taken from the bowels of the earth each year is gone forever. It is not an article that can be manufactured. Fuel combustion engineers of England and America are warning their governments of future coal resources and advocating conservation of coal in every way possible.

Another factor in favour of by-product coke is that a man can get in his winter supply during the months of summer without fears of spontaneous combustion of that fuel, and perhaps the burning down of his house. The same cannot be said of many of our soft coals which the writer has seen heated and become a huge furnace inside of one day after storage in the bunkers. There is no doubt but that many of our western coals are suitable for coking process. When one realizes the large volume of useful gas, motor liquids, oils, and other valuable by-products that can be got from coking the coal previous to use, it causes one to think that we are marching backwards regarding the conservation of our natural resources. Now these by-products are passing from the smoke shafts in our cities from millions of tons of coal, never to be regained.

In conclusion, I think that you will agree that by deriving the heat value and energy from each ton of coal that is coked as explained that the price of that coke as a domestic fuel would be so low as to be a real blessing to the people of our provinces. Not only the poorer class would benefit but the capitalists and manufacturers also, directly and indirectly, for does not coal enter into every man's business either for artificial heat or power purpose? High priced fuel is reflected in the tax rate on his property, owing to the fact that city councils must fix their rate according to the upkeep of municipal buildings and schools. Fuel plays no small part of such expenses. By the scheme suggested millions of dollars will be kept in our country to be circulated and used for other purposes. By this scheme employment would be available for thousands of our men to erect and equipt such plants, for I am confident that the first plant erected would show such results as to be the index to hundreds of such plants. It is also obvious that such plants would furnish steady employment for hundreds of our men the year round. As a matter of fact I see such a bright future for such an enterprise that were I a millionaire or a Henry Ford, I would not hesitate one moment to erect such plants. There would be no danger of the products not being required. The people must have fuel, artificial heat and light. No one can say that such fuel is only an experiment, it has been used for many years in Europe. Only a few days ago we read in our newspapers of the French troops seizing 500 by-product coke ovens from the Germans. The writer has inspected such ovens and fuel at Sault Ste. Marie, Ont., and has the written testimony of a reliable citizen who has used it under all conditions for domestic purposes for the past eight years, and found it eminently satisfactory. What more could we wish for?

Yours very truly,

J. S. Kingston, A.M.E.I.

Report of Fuel Committee of the Montreal Branch

For the benefit of householders who are wisely considering getting in their coal supply for next winter's use, the Fuel Investigating Committee of *The Engineering Institute of Canada* (Montreal Branch) has prepared the adjoining table, which should be a useful guide in giving reliable information regarding the different coals and other fuels which can be bought in Montreal during the summer months.

It is strongly recommended that as far as possible orders be placed early as owing to the fact that the present working agreement of the American anthracite miners terminate next August, and for other reasons, the prices after that date are uncertain.

The table shows the relative economy of burning different fuels for domestic heating as compared with American anthracite, with brief notes regarding the particular characteristics, advantages and disadvantages of each. In addition to coals, coke and oil, peat and wood are included as auxiliary or supplementary fuels, but it is doubtful whether any peat will be procurable this year. Gas and electricity are mentioned merely as a matter of interest since questions regarding them are occasionally brought up, and not because their use is advocated. The figures given should be taken with reserve; in the case of gas particularly, if close attention is paid to regulating the consumption as actually required, the figures given can be materially reduced, but on the other hand, the very convenience of the supply often leads to costly waste.

It will be seen that the true Welsh anthracite is really the most economical fuel to burn although the price per ton is the highest, since, as it gives more heat, a considerably less quantity is required. The ashes to be handled are also extremely small compared with American anthracite.

Distinction must be made between the true Welsh anthracite, which has been screened and the Welsh semi-anthracites, or 'dry' steam coals, which are also on the market and which were sold in some quantity unscreened during last winter. These latter also are good fuels but they require somewhat more attention. It is very advisable that any coal be screened for use in domestic furnaces.

There is a certain amount of high grade American semi-bituminous coal available, sold in picked lump form, which is economical to burn. The common bituminous or 'soft' coals unscreened are the lowest in price per ton, but have certain disadvantages as noted, and a larger quantity is required to give the same heat is is given by other coals when burned in the ordinary house furnace unless special attention is given and the furnace and flues cleaned daily. It also requires that the furnace fire pot be of ample size and the flues and chimney large.

Metallurgical coke gives excellent satisfaction and usually is greatly preferred to American anthracite by those who are accustomed to it. It is expected that by the latter part of this year a considerable extra supply of this high grade coke, produced by a plant now being built in Canada will be available.

In connection with oil, the majority of the appliances on the market burn the lighter grades of oil, as given in the table, but some types are designed to use the heavy 'fuel' oil, the cost of which runs about 10 per cent less per gallon. Anyone contemplating using oil should obtain full information from the suppliers of the different equipment and obtain a copy of the regulations governing oil installations, issued by the Canadian Fire Underwriters' Association.

American anthracite must be regarded to-day as a 'luxury' fuel in that a high price is paid for acquired habits of use. Welsh anthracite and metallurgical coke, particularly are much better fuels in that they give more heat for less money, are easy to handle and have very little ash.

It must be understood that different fuels have different heating values, and also that, when burned in the ordinary domestic stoves and furnaces it is possible to utilize a greater amount of the heat contained in some fuels than in others, so that the value or economy of any coal is not proportionate to the actual price per ton.

Each kind of fuel requires a particular treatment or method of burning to give the best results, but all those given are easy to handle although it may take one a few days to become thoroughly accustomed to their use. For the benefit of those desiring such information, the Fuel Investigation Committee propose to publish before next heating season simple directions for the proper methods of firing the various fuels mentioned.

In the table the amounts given are very liberal and can be reduced by any one who takes a special interest or care with his furnace.

Heating with Quebec heaters takes considerably less fuel but the house will of course not be so evenly heated throughout as with a furnace and radiators.

For warm air furnaces the remarks and relative values of the different fuels can be taken as applicable, but it is strongly recommended, if bituminous coal is used, that the radiator of the furnace be of cast iron.

It cannot be stated with any accuracy that a house of a certain size should require a definite amount of coal per season to heat it, since it will depend upon the exposure, number of windows and details of building construction. The number and size of radiators should be put in to suit these conditions but roughly speaking it may be said that an average flat will have between 200 and 300 square feet radiator surface, a small semi-detached house 400 to 500, and so on.

A given amount of radiator surface, if properly proportioned and installed, will require a certain amount of fuel per year, so that if one knows, or cares to find out, how much radiator surface there is installed in a particular house, an idea can be got from the table of the amount of fuel that should be burned. It it takes considerably more fuel, then either the radiator surface or furnace capacity is insufficient or badly put in, or the fuel is not being used with reasonable care, and one can see the extra price being paid yearly on account of such reasons.

Cost and Relative Economy of Heating with Different Fuels

This table is made up according to prices prevailing in Montreal in May, 1923, and is referred to in the accompanying article:

Kind of Fuel.	Price Per ton	Fuel req'd per season to heat 100 sq.ft. water radiator surface. Amt. lbs.	Cost of
Welsh Anthracite (screened)	$17.00	2820	$24.00
Remarks: Easy to burn, hot fire; very little ash; not sized but should be screened; breaks rather easily.			
Semi-Bituminous (1st quality picked lump)	$13.00	3700	$24.00
Remarks: Gassy, slightly smoky; coal not sized; preferable for furnace to have large fire pot and flues; sections should be kept cleaned from soot.			
Bituminous (good run-of-mine)	$10.00	4950	$24.80
Remarks: Smoky, dirty; coal not sized, preferable if not much fine screenings; furnace and flues should be of ample size; necessary to clean furnace sections daily.			
Welsh Semi-Anthr. (screened)	$16.00	3220	$25.80
Remarks: Free burning, gassy; small amount of ash; coal not sized but should be screened; breaks easily.			
Coke (Metallurgical)	$16.50	3150	$26.00
Remarks: Clean, ash easy to handle; very little draft required; heats up quickly; light weight (2 tons coke takes same space as 3 tons coal); requires more frequent firing than coal.			
Coke (gas house)	$14.00	4550	$31.90
Remarks: Similar to metallurgical coke, but more friable and not so clean; requires more attention, some clinkers; burns quickly unless draft kept very low.			
American Anthracite	$16.25	4000	$32.50
Remarks: Clean, easy to burn; familiar to general householder; large quantity of slate and ash. making ash sifting advisable.			
Oil (light)	12.8 cents per gal.	205 gal.	$26.20
Remarks: Cleanly, heat raised and dropped quickly; no shovelling or ash handling; some burners more or less noisy; if not burned properly may smell and deposit tar on furnace sections; requires intelligent operation; special regulations and precautions against fire; preferable with automatic control. Extra cost of auxiliary gas, electricity or water, also interest on investment and depreciation must be added for yearly cost.			

Supplementary Fuels

Peat $10.00 per ton.
Remarks: Good for open fireplace or kitchen range, and as auxiliary fuel for fires in fall or spring; burns quickly and easily, very light ash; distinctive but not unpleasant odor when burning; bulky, requiring large storage space.

Wood $18.00 per cord.
Remarks: Clean, good for fireplace and as supplementary fuel to get quick heat; burns quickly, difficult to regulate; maple and birch best.

Other Sources of Heating

Gas — $1.15 per 1,000 cu. ft. — 62,000 cu. ft. — $72.40 — Clean, easy to control; convenient; high price.

Electricity — 1½c. per Kva — 6750 Kva — $101.00 — Clean, easy to control; dependence on electric current supply; high price.

Preliminary Notice

of Applications for Admission and for Transfer

June 19th, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in July, 1923.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation, or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BLAKE—JAMES HEWAT, of 1111 Haultain Street, Victoria, B.C. Born at Temple, Midlothian, Scotland; Educ., 1898-1902, engr. classes, Leith Technical College, 12 mos., and Edinburgh University, 22 mos.; 1898-1903, engr. ap'tice, Hawthorne & Co., Leith, Scotland; 1903 (6 mos.), asst. instructor, Leith Tech. Coll., in evenings; 1903-05, chargeman erector, Armstrong Whitworth & Co., Newcastle, installing gunmountings and boat hoists on battleships; 1905-07, installing and erecting engr., Fraser & Chalmers; 1907-11, supervising machinist and plant engr., C.P.R. at Kenora, Ont., and Field, B.C.; 1911-12, installing and sales engr., Maysmith & Lowe Ltd., Victoria, B.C.; 1912-14, station engineer and plant engr., Canadian North Pacific Fisheries, Victoria, B.C.; 1914-18, examiner of ammunition for Imperial Munitions board, western branch; 1918-21, chief engr. in charge of operations for the International Dredging and Exploration Co. Ltd., Victoria, B.C.; 1921 to date, mechanical inspector, Dept. of Lands, B.C. Prov. Govt.

References: D. W. Hodsdon, G. T. [illegible], L. G. Marriott, K. M. Chadwick, F. P. Girdwood, H. M. Bigwood, T. W. Fairhurst, L. W. Toms.

BOWER—JOSEPH HENRY WINTERINGHAM, of 36 King St. E., Toronto. Born at Toronto, Ont., May 14th, 1891; Educ., B.A.Sc., C.E., (Honours) Toronto Univ., '14; 1908-13, about 2 yrs. full time and college vacations, constrn. work, rodman, instrumentman, office engr., div. office, Can. Nor. Rly.; 1914-spring 1915, field charge location party and res. engr. on constrn., Toronto, Hamilton and Buffalo Rly., Smithville, Dunnville, Port Maitland Line; 1915, res. engr., on constr'n., 3 span concrete arch bridge, Toronto; engr., in charge Heron Bros., contractors, Toronto Harbour; 1915-16, field and office engr., P. Lyall & Sons, Toronto Union Station and Parliament Bldgs., Ottawa; 1917-20, asst. in charge hospital constrn., Military Hospitals Comm. In summer of '17 assumed full responsibility as gen. supt., of engr'g. for M.H.C. and D.S.C.R.; 1920-22, resigned position above but retained as consultant; appointed constrn. engr., E. G. M. Cape & Co., (estimates, design, constrn.) Nor. Elec. plant, Steel Co., of Canada, Dom. Cartridge Co., Redpath Library extension, McGill Univ.: 1922, appointed engr., in charge sales and development new lines Asbestos Mfg. Co., Lachine, P.Q.; 1922-23 obtained temporary release Asbestos Mfg. Co., and appointed sec'y. Hydro-Elec. Inquiry Commission., co-ordination of engr'g., financial, legal, investigations, Hydro-Elec. Power Commission of Ont.

References: P. Gillespie, C. R. Young, A. F. Stewart, R. L. Latham, H. E. T. Haultain, R. A. Ross, M. J. Haney, A. R. Sprenger, H. S. Johnston, J. T. Steeves, James Adam.

CONSTABLE—LAURENCE EARL, of 3 Benson St., Niagara Falls, Ont. Born at Seaforth, Ont., Oct. 11th, 1894. Educ., Collegiate 1 yr. and home study; 1917-18, rodman on reconnaissance surveys with H.E.P.C.; 1918-19, rodman and insp'r. Ontario Power Co., extension for the H.E.P.C.; 1919, (June-Oct.), exper. hydraulic work on intake model for H.E.P.C., Niagara development; Oct. 1919 - Feb. 1920, insp'n. and office work at Ontario Power Co., for the H.E.P.C.; Feb. 1920, to date with H.E.P.C., Niagara development instrument work on power house railroad; 2 yrs. insp'r on concrete and structural steel on canal and screen house; 1 yr. instrument work on power house layout.

References: A. C. D. Blanchard, W. Jackson, A. A. McLaren, F. W. Clark, U. R. Moore.

EVANS—HERBERT GEORGE, of St. John, N.B. Born at London, Ontario, July 15th, 1886; First class engr's. license, Prov. of Sask. 1913; has followed mech. engrg. work since 1902, as dftsman, erecting engr., supt., salesman, etc.; 1913-14, installed elec. light plant, Humboldt, Sask.; 1914-18, supt., T. M. McAvity & Sons, shell plants; 1919-23, engrg., salesman; At present district manager, Canadian Ingersoll Rand Co. Ltd., St. John, N.B.

References: E. G. Cameron, F. P. Vaughan, G. G. Hare, G. N. Hatfield, G. Stead, J. A. W. Waring, C. C. Kirby.

HENDERSON—JUDSON PULFORD, of Ottawa, Ont. Born at Toronto, Ont., March 2nd, 1891; Educ., B.A. 1914, M.A. 1915, Univ. of Toronto. Post-graduate in Univ. of Toronto excepting when on more specific electrical work in connection with war till 1919, when came to Ottawa; radio-telegraphic research work; 1916-17, teaching under D.S.C.R., radio and several branches of elec. engrg.; 1919 to date, in charge of radio equipment, Dominion Observatory, Ottawa, elec'l. testing, receiving and transmitting in connection therewith.

References: J. L. Rannie, H. M. Barton, J. W. Menzies, D. H. Nelles, W. A. Rush, C. P. Edwards, H. F. J. Lambart, G. H. Blanchet.

McLEISH—ARTHUR JOHN DENHOLM, of 304 Margaret Avenue, Peterborough, Ont. Born at Balloch, Dumbartonshire, Scotland, Jan. 11th, 1898; Educ., technical schools, Glasgow and Peterborough; 2 years, munitions inspr., Toronto and Peterborough; 4 years ap'ticeship course as dftsman, Can. Gen. Elec. Co., Peterborough; At present dftsman., Can. Gen. Elec. Co., Peterborough.

References: E. Maybee, F. Bowness, B. L. Barnes, G. R. Langley, D. L. McLaren.

RICHARDS—GEORGE HENRY, of 95 Peel Street, Brantford, Ont. Born at Willington, Derbyshire, England, May 25th, 1898; Educ., 4 years secondary school, O.L.S. 1923; Four years to date, with Lee and Nash, Engineers and Surveyors, in full charge of survey parties, design and constrn. of concrete curbs, walks and pavements, sewers, roads and drainage works.

References: A. M. Jackson, F. P. Adams, G. R. Marston, C. Robertson, D. T. Black, J. E. Jackson.

STALKER—COLIN HOLMES, of 11 Albany Avenue, Toronto, Ont. Born at Toronto, Oct. 1st, 1891; Two years, Faculty of Applied Science, Univ. of Toronto, 1914-15, 1919-20; 1916-18, overseas. Lieut., Can. Inf. and Can. Engrs.; 1920-21, leveller on water power surveys for Kerry & Chace, Ltd.; 1921 (Apr.-Sept.), leveller Temiskaming and Nor. Ont. Rly.; 1921 (Oct.-Dec.), transitman James Bay Extension; 1922 (Jan.-Apr.), in charge of party making contour surveys of power sites on the Abitibi and Blanche Rivers in connection with T. & N.O. Rly. electrification report; 1922 (May-June), trial lines and location surveys, Nipissing Central Rly.; July 1922, trial line, T. and N.O. Rly.; 1922 (Sept.-Dec.), exploration surveys, Mattagami and Abitibi Rivers; At present locating engr., Larder Lake extension, Nipissing Central Rly.

References: S. B. Clement, A. T. C. McMaster, A. L. McDougall, W. R. Maher, W. O. Collis, W. W. Christopherson, T. F. Harrison.

TAYLOR—HOWARD SMITH, of Dayton, Ohio. Born at Bangor, Maine, July 6th, 1881; Educ., B.C.E., Univ. of Maine, 1901; 1901-05, asst. engr. with Hardy Ferguson, pulp and paper mill engr.; 1906-10, asst. engr. with Geo. F. Hardy, pulp and paper mill engr.; 1911-16, chief engr., [illegible] River Pulp and Paper Mills, Ltd.; 1917-22, vice-president and chief engr., H. S. Taylor Limited, Montreal; [illegible] Engineering and Development Co., Dayton, Ohio. From May 1st 1923, H. S. Taylor, Limited, Montreal, and H. S. Taylor, Consulting Engineer, Dayton, Ohio.

References: G. A. Gaherty, R. O. Sweezy, J. H. Brace, C. W. Allen, J. D. [illegible], F. B. Brown.

TOPPING—VICTOR, of 72 Lowther Avenue, Toronto, Ont. Born at Hartlepool, England, Feb. 21st, 1890; Educ., B.A.Sc., (Honours) Univ. of Toronto, '17; M.A., Univ. of Toronto, '23; 1912-13, rodman, instrumentman, location and constrn., C.P.R. Lake Superior Divn.; 1914-15, in charge of field and office work, [illegible] Toronto district, Toronto Harbour Commissioners; 1916 (April-Dec.), [illegible] for 1915 report of Civic Transportation Committee, Toronto; 1916 (April-[illegible]), hydrographic and land surveys for Toronto Harbour Commissioners; 1917 (April-June), res. engr., western divn. of Toronto Harbour Commissioners' development; 1917-22, overseas, Flying Officer, R.A.F.; In hospital 1918-21; [illegible] engr. of traffic analyses, Toronto Transportation Commission; [illegible] M.A. degree from Univ. of Toronto for thesis, "The Urban Transportation Problem" 1923.

References: C. H. Mitchell, P. Gillespie, C. R. Young, N. D. Wilson, A. F. K. Bunnell.

WALLACE—GORDON LESLIE, of Toronto, Ont. Born at Saintfield, Ont. Oct. 25th, 1889. Educ., B.A.Sc., Univ. of Toronto, 1912, 1912-19, winter sessions, on staff University of Toronto. Summers, engineering work, including 3 summers chief checker on reinforced concrete and steel bldgs., with city arch'ts dept., Toronto, 1919-21, chief engr. in charge of all design on theatre work with Thos. W. Lamb, Archt.; 1921-22, designing engr. J. B. Nicholson, Ltd., Toronto, Board of Education, Toronto, and Dowswell & Dolphin, Toronto; 1922 (May-Sept.), engr., with Board of Education, Toronto; Sept. 1922 to date, designing engr. on bridges and bldgs. with Norman McLeod, Limited, General Contractor, Toronto. (Also private practice on bldg. constrn.)

References: C. R. Young, P. Gillespie, J. R. Cockburn, R. E. W. Hagarty, J. B. Carswell, W. W. Pearse, N. M. McLeod, C. W. Cornell.

FOR TRANSFER FROM THE CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

COLLIER—ERNEST VICTOR, of Maidan-i-Napthun, Ahwaz, Persia. Born at Falmouth, Cornwall, England, Sept. 12th, 1878; Educ., Falmouth Grammar School, and private tuition; 1899, junior, C.P.R., McGregor to Rapid City; 1900-02, asst., Dominion Public Works, Winnipeg; 1902-11, asst., St. Lawrence Ship Channel, under F. W. Cowie and V. F. W. Forneret; 1912-14, representative in Eastern Canada for Jas. Howden & Co. Ltd., Engineers, Glasgow; 1914-19, overseas. Lieut.-Col. mentioned in despatches. D.S.O.; 1921, appointed by Anglo-Persian Oil Co. Ltd., to examine ports on Persian Gulf and survey alignments to test areas inland. Report adopted and port of Ganowah recommended, now a coy depot; 1921-22, in charge of surveys-oil fields to Andaka testing areas. Plans and level sections covering 60 miles mountain country, also complete estimates roads and bridges; 1922, hydro-electric survey for H. Y. V. Jackson, M.C., M.Sc., chief engr., Anglo-Persian Oil Co. Ltd., River Karun to oil fields at Maidan-i-Napthun; 1922-23, pipe line, desert survey, Ahwaz to Mamatain with estimates and opening up new test areas. Engagement with A.P.O.C. Ltd. extended from two to five years.

References: V. F. W. Forneret, A. D. Swan, G. E. Bell, G. E. McCuaig, N. B. McLean.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

GIFFORD—FRANCIS DARRELL, of 333 Burnham St., Peterboro, Ont. Born at Port Hope, Ont., Eov. 3rd, 1889. Educ., high school and pvte study; 1910, rodman on constrn. Fraser River div., Can. Nor Pac. Rly.; 1911-13, instrument man and res. engr., on donstrd. Thompson River div., Can. Nor. Pac. Rly.: 1913-14, asst. surveyor B.C. Govt. Forestry Branch, Clearwater dist. B.C.; 1914, instrument man Pacific and Great Eastern Rly.; 1915-19, overseas, Major, M.C.; Feb. 1919- Nov. 1922, industrial surveyor, D.S.C.R., later insp'r. and dist. voc. officer, Peterboro dist.; since Jan. 1923, in charge field work on Crow River storage project under Jas. Mackintosh, A.M.E.I.C., H.E.P.C.

References: J. Mackintosh, R. L. Dobbin, A. A. Richardson, W. C. McLaren, R. M. Taylor.

HUGHES—BERNARD HOPE, of Kakuri, Nigeria. Born at London, England, Nov. 3rd, 1889; Educ., Completed 2 years S.P.S., Univ. of Toronto, 1914, 1910 and 1912 (summers), rodman, city of Toronto sewer dept., 1912, asst. engr., Winnipeg River Power Survey, Dept. of the Interior, 1913, (summer), rodman, on constrn. C.P.R.; 1914-19, overseas, Can. Engrs., 1920-21, instr'man., reclamation service, Dept. of the Interior, Ottawa, April 1921 to date, asst. engr., The Nigerian Railways, Nigeria.

References: W. R. Worthington, G. Phelps, W. M. Ogilvie, J. T. Johnston, F. S. Rutherford, T. Taylor, R. O. Wynne-Roberts.

WILSON—JOHN S., of Dryden, Ont. Born at Green River, Ont. Mar. 6th, 1892; Educ., B.A.Sc., Toronto Univ. 1920; 1912, 13, 14, 19, 20, (operating seasons) in charge power plant, Indian Lake Lumber Co., Osaguan, Ont.; 1915-19, overseas, Lieut., M.C., artillery; 1920, to date Dryden Paper Co., 1 yr. dftsman, 1 yr. master mechanic, Nov. 1922 to date, engineer in charge of design and constr'n of boiler plant and new main pumping station also in operating charge of boiler plant.

References: B. S. McKenzie, H. A. Mackay, K. E. Whitman, W. A. Mather, T. R. Loudon.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

JACKSON—CARL HENRY, of 249 Wilson Ave., Montreal, Que. Born at Montreal, Que., Mar. 10th, 1900; Educ., B.Sc., McGill Univ. 1921; 1920, (summer) floorman, and 1921, (June-Nov.), asst. operator and system operator, Southern Canada Power Co., Ltd.; Dec. 1921- May 1922, instructor in elect'l. engrg. Univ. of Sask.; 1922 to date testman, Can. Gen. Elec. Co. Ltd.

References: A. R. Greig, C. J. Mackenzie, G. M. Williams, C. V. Christie, A. B. Gates, C. E. Sisson.

NOONAN—WILLIAM HYSANTH, of Halifax, N.S. Born at Pictou, N.S., Oct. 13th, 1891; Educ., B.Sc. (Civil), N.S. Tech. Coll. 1913; F. W. Wilson course, reinforced concrete; 1911 (summer), engrg. staff, N.S. Steel and Coal Co.; 1912 (summer), student, dept. public works, Canada; 1913-14, designer and dftsman., Trussed Concrete Steel Co.; 1915-18, rodman, instr'man asst. engr., Halifax Ocean Terminals; 1918 to date, private practice, Halifax, N.S.

References: C. E. W. Dodwell, W. P. Morrison, C. A. D. Fowler, O. S. Cox, I. P. MacNab, H. W. L. Doane, J. R. Freeman.

THOMPSON—HOWARD GRANT, of Timiskaming, Que. Born at Belmont, Ont., Aug. 21st, 1896; Educ., B.A.Sc., Univ. of Toronto, '22; 1915-19, overseas, 2nd Lieut, R.A.F.; 1920 (summer), fitter and tester, Gould, Shapley & Muir, Ltd., Brantford, Ont.; 1921 (summer), office manager, Webster Constrn. Co. Ltd., London, Ont.; 1922 (May-Nov.), student sales course, American Blower Co., Detroit, Mich.; Nov. 1922 to May 1923, sales engr., Montreal office, Canadian Sirocco Co. Ltd.; At present stores engr., Kipawa Mill, Riordon Company, Limited.

References: C. H. Mitchell, P. Gillespie, C. R. Young, R. W. Angus, F. S. Keith, T. R. Loudon, W. L. Ketchen, R. W. Downie.

Recent Publications Received

General Publications

Presented by Gauthier-Villars et Cie, Editeurs, Paris, France.

"Statistique cinématique," par Robert d'Adhemar.

Reports

Presented by Department of Commerce, Bureau of Standards, Washington, D.C.

"Scientific papers of the bureau of standards" volume 17, 1922.

"Tables for the calculation of the inductance of circular coils for rectangular cross section" by Frederick W. Grover, consulting physicist, Bureau of Standards, No. 455, part of volume 18.

"Spectrophoto-electrical sensitivity of some halide salts of thallium, lead and silver," No. 456, part volume 18.

"Apparatus for the determination of the magnetite properties of short bars," No. 458, part of volume 18.

"Preparation and properties of pure iron alloys: II magnetic properties of iron-carbon alloys as affected by heat treatment and carbon content," No. 463, part of volume 18.

"The international metric system of weights and measures" second edition miscellaneous publications—No. 2.

"Copper". No. 73, second edition.

"Bibliography of scientific literature relating to helium" No. 81, second edition.

"Description and operation of an electron-tube detector unit for simple radio receiving outfits." No. 133.

Technologic Papers

"Test of a hollow tile and concrete floor slab reinforced in two directions," No. 220, part of volume 16.

"Rate of exhaustion of a closed tank by a reciprocating air pump," No. 224, part of volume 17.

"A new method for determining the rate of sulphation of storage-battery plates," No. 225, part of volume 17.

Technical Papers

Presented by Department of the Interior, Bureau of Mines, Washington, D.C.

"Proposed method for reducing mineral waste in the Wisconsin zinc district, Wisconsin," by Will H. Coghill and C. O. Anderson. Technical paper No. 301.

"Value of coke, anthracite and bituminous coal for generating steam in a low-pressure cast-iron boiler" by John Blizard, James Neil and F. C. Houghten. Technical paper No. 303.

"Specifications for petroleum products and methods for testing" standard specification No. 2, Technical paper No. 323.

Presented by Department of the Interior, Canada, Geodetic Survey of Canada.

"Annual report of the superintendent of the Geodetic survey of Canada for the fiscal year ending March 31, 1922."

Presented by Tidal and Current survey in the Department of Marine and Fisheries of the Dominion of Canada.

"Tide tables for Nelson, Hudson bay and tidal data for Hudson strait and James bay for the season of 1923."

Presented by Department of Mines, Province of Ontario.

"Thirtieth annual report of the Ontario department of mines, being volume 30, part 1, 1921."

Presented by The University of Wisconsin.

Bulletin of the University of Wisconsin, Engineering Series Volume 9, no. 1, "Experience on loss of head in valves and pipes of one-half to twelve inches diameter," by Charles Ives Corp and assisted by Roland O. Ruble.

EMPLOYMENT BUREAU

(*Continued from page 332*)

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A

ABRASIVE WHEELS

MANUFACTURE. Manufacturing Abrasive Wheels at Hamilton Plant. Can. Machy. vol. 29, no. 17, Apr. 26, 1923, pp. 17-19 and 26, 5 figs. Crushing ore and grading grains; removing magnetic material; mixing; preparing wheel for burning; truing and testing; method of grading.

ACCIDENT PREVENTION

WELDING APPARATUS, COMPRESSED-GAS. Regulations for the Prevention of Accidents in Welding and Cutting Plants Using Compressed Gases (Unfallverhütungsvorschriften fur die mit verdichteten Gasen arbeitenden Schweiss- und Schneidanlagen). Autogene Metallbearbeitung, vol. 16, nos. 7 and 8, Apr. 1 and 15, 1923, pp. 83-84 and 96-98. Details of German regulations in force Jan. 1, 1923.

ACCIDENTS

INDUSTRIAL. Industrial Accidents and Hygiene. Monthly Labour Rev., vol. 16, no 2, Feb. 1923, pp. 220-231. Safety activities of U S. Government. Coke-oven accidents in the United States during 1921 Coal-dust explosion tests. Gas masks and respirators for use in railroad tunnels Metalliferous mine accidents in Colorado, 1920 and 1921. Effects of fatigue and temperature on causation of industrial accidents, Great Britain.

ACCOUNTING

CORPORATION. Future Company Accounting and Disbursement, Charles Hine. Ry Age, vol 74, no 22, May 5, 1923, pp 1103-1105, 1 fig Criticisms of present methods and suggestions for simplification; pay-before-audit system.

INDUSTRIAL. Organized Account Keeping in Industrial Plants (Exemple d'organisation de la comptabilité en vue de son utilisation pour le contrôle de la marche et la direction d'une entreprise industrielle), C Barbet Arts et métiers, vol. 76, no. 28, Jan 1923, pp 408-416 Discusses complete scheme of accounts, payrolls, etc , as means of management of works.

AERONAUTICAL INSTRUMENTS

MEASURING INSTRUMENTS Aeronautical Measuring Instruments (Messgeräte der Luftfahrt) Zeit fur Flugtechnik u Motorluftschiffahrt, vol 14, nos 3-4, Feb. 26, 1923 Contains following articles Method of Measuring Speed Capacity of Airplanes, Heinrich Koppe, pp 17-25, 5 figs ; Measuring Instruments and Mechanics, E Everling, pp. 25-29, Bibliography of German Literature on Aeronautical Instruments, pp 28-33. Review of books on aeronautical instruments, pp. 33-34

AIR COMPRESSORS

PORTABLE. A Self-contained Portable Air Compressor Engineer, vol 135, no. 3511, Apr 13, 1923, p 399, 2 figs New type for use especially for steel construction, road-breaking and contractors' work generally

TURBO COMPRESSORS Calculation of Turbo Compressors (Calcul des turbo-compresseurs), G Rollet. Arts et Métiers, vol 75, no 27, Dec 1922 and vol 76, no. 28, Jan 1923, pp. 375-387 and 428-438, 7 figs Isothermic, adiabatic and polytropic compression, cooling systems, heating of gas in centrifugal compressors; calculations, application to air turbo-compressors for mines.

AIRCRAFT CONSTRUCTION MATERIALS

FABRICS, WING. Experiments with Fabrics for Covering Airplane Wings A Pröll Nat Advisory Committee for Aeronautics Tech Notes, no 137, Apr. 1923, 37 pp., 33 figs Deals with strength and deformation of fabric itself, both undoped and doped; it was shown that Cellon exercises predominant influence on results, according to nature and number of coats Translated from Technische Berichte vol. 3, no. 3, 1918.

AIRPLANE ENGINES

FINS, HEAT CONDUCTION IN. Mathematical Equations for Heat Conduction in the Fins of Air-Cooled Engines, D. R. Harper 3d and W. B. Brown. Nat. Advisory Committee for Aeronautics — Report no. 158, 1923, 32 pp., 12 figs. Results of laboratory investigations.

NAVY DEVELOPMENTS. Recent Developments in Aircraft Engines in the Navy, Bruce C. Leighton. Aerial Age, vol. 16, no. 5, 1923, pp. 220-226, 7 figs. Review of tests on different models; reduction in weights; air-cooled vs. water-cooled engine; influence of power-plant weight on transportation costs.

AIRPLANE PROPELLERS

CALCULATION AND MANUFACTURE. Calculation and Construction of Wooden Propellers (Le calcul et la construction des hélices en bois), Suffrin-Hebert. Technique Moderne, vol. 15, no. 8, Apr. 15, 1923, pp. 232-236, 10 figs. Characteristics of propellers; calculation of resistance; raw materials; processes of manufacture.

AIRPLANES

FACTORS, ANALYSIS OF. Analysis of Airplane Factors, A. F. Zahm. Franklin Inst. — Jl., vol. 195, no. 3, Mar. 1923, pp. 289-302, 9 figs. Factors occasionally used in forecasting and comparing performance of airplane are derived and graphically illustrated.

LACIERVA AUTOGIRO. New Type of Flying Machine — The Lacierva "Autogiro," Heraclio Alfaro. Aviation, vol. 14, no. 15, Apr. 9, 1923, pp. 397-398, 2 figs. Most interesting feature of Spanish gyroplane is said to be its ability to land with practically no forward speed, engine being shut off; experiments showed that it has remarkable stability; consists of big wind vane mounted in ball bearings on ordinary tractor airplane with 80-hp. Le Rhone engine and tractor propeller; see also (editorial) p. 393.

OSCILLATION, LONGITUDINAL. Complete Study of the Longitudinal Oscillation of a VE-7 Airplane, F. H. Norton and W. G. Brown. Nat. Advisory Committee for Aeronautics — Reports, no. 162, 1923, 5 pp., 4 figs. Investigation to study behavior of airplane when making longitudinal oscillation; air speed, altitude, angle with horizon and angle of attack were all recorded simultaneously and resulting curves plotted to same time scale.

RIBS. Influence of Ribs on Strength of Spars, L. Ballenstedt. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 139, May 1923, 13 pp., 12 figs., 2 tables. It is pointed out that assumption that ribs are connected to spars by flexible joints is not accurate, as they are attached very firmly to spars by means of brackets, nails and glue; investigation to determine what effect this type of joint has on strength of spars.

AIRSHIPS

RIGID, STRESSES IN. General Theory of Stresses in Rigid Airship, ZR-1, W. Watters Pagon. Nat Advisory Committee for Aeronautics — Tech. Notes, no 140, May 1923, 43 pp., 13 figs. Deals with primary and secondary stresses, and with effect of keel girder.

ALLOY STEELS

FIGURING PROPORTIONS. Short Method for Figuring Alloys, J. M Quinn Blast Furnace and Steel Plant, vol. 11, no. 5, May 1923, pp. 279-282. Comprehensive system of tables and proportions used by practical steel makers.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*
BEARING METALS. *See Bearing Metals.*
BRASS. *See Brass.*
BRONZE. *See Bronze.*
COPPER. *See Copper Alloys.*

HEAT TREATMENT. Heat Treatment of Alloys Sur la définition et les conditions de traitement thermique des alliages), J Garnet Technique Moderne, vol 15, nos 5 and 7, Mar 1 and April 1, 1923, pp 135-141 and 205-209, 14 figs Definition of alloys from standpoint of their application, constitution of alloys; unstable phases; effect of velocity of cooling, stabilizing treatments, etc.

IRON. *See Iron Alloys.*
MAGNESIUM. *See Magnesium Alloys.*

PROPERTIES Effect et Structure on Elastic and Mechanical Properties of Mixtures Considerations relatives à l'influence de la structure sur les propriétés élastiques et mécaniques d'un mélange), Albert Portevin Revue de Metallurgie, vol 20, no 1, Jan 1923, pp 49-62, 23 figs Expansion, electric resistance and other properties of alloys.

ALUMINUM ALLOYS

ALUMINUM-SILICON Some New and Important Alloys of Aluminum, T B I Cam Metal Industry (Lond), vol 22, no 17, Apr 27 1923, pp 413-414 Review of work done in development, founding, and field of use of aluminum-silicon alloys.

COPPER ZINC-ALUMINUM Physical and Metallographic Properties of Copper-Zinc-Aluminum Alloys Containing Small Amounts of Magnesium, J H Dix Jr and A J Lyon Air Service Information Circular, vol 4, no 393, Feb 15, 1923, 11 pp , 5 figs Investigation to determine effect of replacing part of aluminum alloy no 3 by small amounts of magnesium, use of beam-metal in place of iron was found to be undesirable

PROPERTIES AND USES Aluminum and Aluminum Alloys (Aluminium und Aluminiumlegierungen), W Siebert Giesserei-Zeitung, vol 20, nos 8 and 9, Mar 15 and Apr 1, 1923, pp 124-127 and 148-152, 1 fig Physical and chemical properties of aluminum, melting and casting, method of melting aluminum filings, aluminum as refining medium Light metals their alloys and technical applications, aluminum bronzes, zinc copper aluminum alloys, duralumin and silumin

AMMONIA

THERMODYNAMIC PROPERTIES. Tables of Thermodynamic Properties of Ammonia. U. S. Bur. of Standards, Circular no. 142, Apr. 16, 1923, 47 pp., 5 figs. Tables [illegible] and have been prepared in form convenient for refrigerating engineering; same data are also presented graphically in form of Mollier chart.

ASH HANDLING

CONVEYOR FOR. New Type of Ash Conveyor. Paper, vol. 31, no. 26, Apr. 18, 1923, pp. 137-138, 3 figs. Construction and operation of Combusco water-seal ash conveyor, which offers method of handling ashes from boiler room which does away with gases, steam, dust, etc. and moves refuse mechanically to any desired point, manual labor almost entirely eliminated.

ATOMS

ATOMIC PROJECTILES. Atomic Projectiles and Their Properties, Ernest Rutherford. Engineering, vol. 115, nos. 2982, 2983, 2984, 2985 and 2986, Feb. 23, Mar. 2, 9, 16 and 23, 1923, pp. 242-243, 264-266, 306-308, 338-340 and 358-359, 29 figs. Review of five lectures delivered before Roy. Instn. Account of properties of swiftly moving electrons and atoms, and of effects produced by their passing through matter.

STRUCTURE. The Structure of the Atom, H. Stanley Allen. Chem. and Industry, vol. 42, no. 14, Apr. 6, 1923, pp. 338-342. Development of atomic theory; atomic theory of electricity; atomic and molecular numbers; arrangement of electrons in space; mechanics of atom; structure of nucleus.

AUTOMOBILE ENGINES

HEAVY-OIL. The Bagnolo Heavy-Oil Engine (Il motore Bagnolo veloce ad olio pesante), Emanuele Koch. Bolletino della Sezione di Roma dell' A. N. I. A. I., vol. 16 no. 10, Oct. 1922, pp. 131-133, 2 figs. Comparison of heavy-oil and gasoline engines; construction and operation of 30-hp. Bagnolo engine working on an explosive air mixture of 23;1; fuel consumption 240 grams per hp.

IGNITION. *See Ignition.*

SUPERCHARGING. Super-charging. Autocar, vol. 50, no. 1437, May 4, 1923, pp. 757-759, 5 figs. Development of supercharger as means of increasing efficiency of a given size of engine.

The Benefits of Super-Charging. Autocar, vol. 50, no. 1434, Apr. 13, 1923, 615-618, 7 figs. Principle of supercharging. Description of Mercedes supercharger as standardized on the 10-40-hp. touring chassis; details of new 10-40 hp. Mercedes chassis and test made.

AUTOMOBILE FUELS

TYPE. Motor-Fuel Symposium. Jl. Indus. and Eng. Chem., vol. 15, no. 5, May 1923, pp. 476-488, 2 figs. Contains following articles: Fuel Requirements of Internal-Combustion Engines, Stanwood W. Sparrow; Economic Aspects of Motor-Fuel Supply from Petroleum, F. W. Lane and A. D. Bauer; Refinery Problems Affecting Motor-Fuel Supplied, F. A. Howard and N. E. Loomis; Alcohol as a Motor-Fuel Constituent, Henry A. Gardner; Coal Tar as a Source of Fuel for Internal-Combustion Engines, Wilbert J. Huff.

AUTOMOBILES

AIR RESISTANCE. Caiculation of Efficiency of Automobiles (Leistungsberechnung von Motorfahrzeugen), Hans Keitel. Motorwagen, vol. 26, no. 7, Mar. 10, 1923, pp. 108-110, 3 figs. With special consideration of net weight and air resistance, based on results of experiments with new Keitel air-stream car.

Air-Resistance Investigations on Automobile Models (Luftwiderstands-Untersuchungen an Automobil-Modellen), W. Klemperer. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 13, no. 14, July 31, 1922, pp. 201-206, 14 figs. Based on ideas and designs developed by P. Jaray, series of systematic tests were carried out in large wind tunnel of Zeppelin works to determine what advantages could be gained by building automobile bodies along aereodynamically favourable lines; investigation of Jaray streamline cars and other models.

BRAKES, FOUR-WHEEL. Four-Wheel Brakes Extensively Used in France, Italy and Belgium, W. F. Bradley. Automotive Industries, vol. 48, no. 12, Mar. 22, 1923, pp. 658-665, 27 figs. Sixty-seven manufacturers employ them on one or more models of passenger-car chassis; adopted on cars of nominally 10 hp.; describes braking mechanism of various cars.

DIFFERENTIALS. New Differential Prevents Stalling When One Wheel Turns Free. Automotive Industries, vol. 48, no. 18, May 3, 1923, pp. 979-980, 6 figs. A gearless, self-locking type, involving no changing in method of operation, developed by C. Andrade, Jr.; vehicle equipped with it can be run even though one live axle is broken; decreases tire wear.

NOISE-TESTING DEVICE. The Evaluation of Noise. Automobile Engr., vol. 13, no. 75, Apr. 1923, pp. 109-112, 7 figs. Describes sound-testing device for comparing and expressing sound in unit terms; consists of sonometer mounted on tripod, to which is fitted standard G-type set on bin-aural instruments.

PRODUCER-GAS APPLICATION. Gas Producers and Their Application to Industrial Automobiles (Les Gazogènes et leur application aux véhicules automobiles industriels), Maurice Dubois. Industrie des Tramways Chemins de Fer et Transports Public Automobiles, vol. 17, no. 195, Mar. 1923, pp. 80-83. Present state of application of producer gas to automobiles; notes on gas producers used for automobiles; details of tests carried out.

TAXICABS. Taxicab-Body Construction, Hugh G. Bersie. Soc. Automotive Engrs.—Jl., vol. 12, no. 5, May 1923, pp. 480-483, 7 figs. Differences in body requirements for taxicabs as compared with passenger cars; methods used to secure durability to discount severe service to which body is subjected; woods suitable for body framework; desirable types of roof and factors influencing design; summary of present conditions. Bibliography.

TORQUE SYSTEMS. Special Torque Systems. Autocar, vol. 50, no. 1435, Apr. 20, 1923, pp. 640-641, 8 figs. Selection of methods adopted to take torque reaction when engine and gear box are in one unit.

TRACTOR-AUTOMOBILE. The Citroën-Kegresse. Tractor-Automobile (Le propulseur Kégresse à bande souple), G. Delanghe. Génie Civil, vol. 82, no. 13, Mar. 31, 1923, pp. 293-300, 12 figs. The two pairs of rear wheels are developed tractor-fashion with enveloping tread, to enable traffic over snow, sand, stones, and any irregular ground.

B

BAGASSE

USE OF FUEL. Utilization of Bagasse Fuel, [illegible]. La. Planter & Sugar Mfr., vol. 10, no. 18, May 5, 1923, p. 349, 3 figs. Discusses question of fuel beds.

BEARING METALS

ANTI-FRICTION. A Note on White Anti-Friction Alloys, J. L. Hurst. Metal Industry (Lond.), vol. 22, no. 15, Apr. 13, 1923, pp. 357-358, 5 figs. Account of [illegible] observed by author, in which failure of bearing was due entirely to overheating and [illegible].

TESTING. Testing Bearing Metals and Lubricants, F. Johnstone-Taylor. Am. Mach., vol. 58, no. 10, Mar. 10, 1923, pp. 700-702, 3 figs. Account and results of extensive laboratory experiments made in England. Measurement of oil film; experiments with Michell pads and with bearing [illegible].

THERMIT. Thermit, a New Bearing Metal, [illegible]. Technische Blätter, vol. 13, no. 16, Apr. 21, 1923, pp. [illegible], 4 figs. Wear of lead and tin bearing compositions, casting and properties of new bearing metal produced by [illegible] Co., Berlin.

BEARINGS, ROLLER

SPHERICAL TYPE. The Spherical Type Roller Bearing, H. L. Brenner. Wood-Worker, vol. 42, no. 2, Apr. 1923, pp. 56-57, 2 figs. Describes construction and analyzes design from technical point of view of new type of roller bearing.

TESTS. Roller Bearing Tests in England. Loc. Ry. Jl., vol. 64, no. 16, Apr. 21, 1923, pp. 682-683, 4 figs. Tests carried by Nat. Physical Laboratory in London and Wigan on Hoffmann bearings.

BEAMS

I-BEAMS. Testing Steel Reinforced I-Beams (Essais de poutres double T en fonte armée d'acier), Albert de Marneffe. Revue Universelle des Mines, vol. 16, no. 6, Mar. 15, 1923, pp. 411-426, 13 figs. Results of tests to ascertain most suitable proportion of steel or iron to be used, and results of flexure tests with various reinforcements.

REINFORCED-CONCRETE. Rapid Calculation of Beams and Slabs With Any Kind of Reinforcement (Calculo rapido de vigas y losas de hormigon, con armadura cualquiera), Sergio Bobrovsky. Ingenieria, vol. 26, nos. 9, 10, 11 and 12, Sept., Oct., Nov. and Dec. 19, 1923, pp. 477-486, 537-543, 593-601 and 649-654, 10 figs. Sept. and Oct.: Percentage, height and shearing forces. Nov.: Compound flexure and deformation due to flexure. Dec.: Calculation of T-sections.

Reinforcement for Shear in Reinforced Concrete Beams, Edward Godfrey. Concrete & Constr. Eng., vol. 18, no. 4, Apr. 1923, pp. 235-242, 10 figs. It is shown that analogy which asserts that reinforced-concrete beam is modified Howe or Pratt truss is totally false, and that one that asserts that stirrups act in concrete beam as bolts or pins is also totally false. (Abstract.)

BELTING

LEATHER. New Findings on Transmission of Power by Leather Belting, J. Edgar Rhoads and R. R. Tatnall. Belting, vol. 22, no. 4, Apr. 1923, pp. 38, 40, 44, 46 and 48, 7 figs. Considers step by step factors having to do with power transmission. Big overloads possible because coefficient of friction increases with slip; improved production makes belts carry a third more power than formerly.

BLAST FURNACES

BLOWING-IN. Blowing-in a Blast Furnace (Mise à feu des hauts-fourneaux), Maurice Derclaye. Revue de Métallurgie, vol. 20, no. 4, Apr. 1923, pp. 209-234, 11 figs. Composition of charge; furnace operations; difficulties met with in starting a furnace.

PROGRESS. Progress in Iron Blast-furnace Practice, Ralph H. Sweetser. Min. & Metallurgy, vol. 4, no. 197, May 1923, pp. 247-249. Wider acceptance of fact that satisfactory results are largely dependent on coke quality; ash in coke an economic waste; enrichment of mixture; furnace capacity; blast-furnace labour; research work.

BLASTING

BLACK POWDER, WITH. A New Method of Blasting, T. W. Bacchus. Explosives Engr., vol. 1, no. 2, Apr. 1923, pp. 33-36, 4 figs. Discovery by which, under certain conditions, black powder in column loading reduces blasting costs 30 per cent.

BLOWERS

TURBO. Results of Tests on an Escher Wyss & Cie Turbo-Blower (Versuchsergebnisse an einem Turbo-gebläse Bauart Escher Wyss & Cie), P. Ostertag. Schweizerische Bauzeitung, vol. 81, nos. 14 and 15, Apr. 7 and 14, 1923, pp. 165-168 and 181-183, 15 figs. Tests were carried on one of three blast-furnace blowers delivered to Royal Dutch Blast Furnace & Steel Works, The Hague, Holland. Description and regulation of blower; experimental apparatus and results.

BOILER FEEDWATER

DEAREATION. Deareation of Feed Water. Elec. Times, vol. 63, no. 1640, Mar. 22, 1923, pp. 295-296, 3 figs. Deals with system of Contraflo Condenser & Kinetic Air Pump Co. for deareation of feed for water-tube boilers, recommends type of deaerator in which heater is combined with deaerator, lower part of apparatus containing bank of steam-heated tubes over which water falls.

OXYGEN ESTIMATION. Estimating Dissolved Oxygen in Water. Power Engr., vol. 19, no. 205, Apr. 1923, pp. 144 and 146, 1 fig. Simple testing apparatus and method for determining amount of oxygen dissolved in sample of water.

TREATMENT. Industrial Waters (Les eaux Industrielles), G. Paris. Chimie & Industrie, vol. 9, no. 3, Mar. 1923, pp. 439-453, 10 figs. Deals with boiler-feed and other waters. Modern methods of purification; filtration and filters; chemical, thermic, and electrolytic purification; elimination of iron and gas; separating oil.

BOILER FURNACES

ARCH DESIGN. The McLeod & Henry Flat Suspended Furnace Arch. Power, vol. 57, no. 21, May 22, 1923, p. 795, 2 figs. Describes new type of flat suspended sectional furnace arch, in which any single block can be removed either from underneath or above, without disturbing any other block or suspension.

FIREBARS, ALLOY FOR. The Burning of Cast Iron. Power Engr., vol. 19, no. 205, Apr. 1923, p. 143, 3 figs. Describes new alloy for firebars known as Usco alloy.

BOILER OPERATION

STEAM DATA CHART. Graphic Determination of Steam Data and Factors of Evaporation, H. C. Linderman. Blast Furnace & Steel Plant, vol. 11, no. 5, May 1923, pp. 291-293, 2 figs. Graphical method of finding factor of evaporation and total heat when temperature, pressure, superheat and quality of steam and boiler feedwater are given.

BOILER PLANTS

HAND-FIRED, STEAM ECONOMY OF. Cutting Steam Costs in Hand Fired Boiler Plants, A. R. Mumford. Power House, vol. 16, no. 8, Apr. 20, 1923, pp. 35-36, 1 fig. 30 per cent saving in fuel costs effected by few simple changes in furnaces and in control of operation of boilers.

BOILERS

HEAT TRANSFERENCE AND COMBUSTION. Heat Transference and Combustion Tests in Small Domestic Boiler, John Blizard, W. M. Myler Jr., J. K. Seabright and C. P. Yaglogau. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 29, no. 4, May 1923, pp. 317-343, 17 figs. Report of series of tests made with various fuels and with and without secondary air.

LOCOMOTIVE. *See Locomotive Boilers.*

BONUS SYSTEMS

GROUP. A Group Bonus Plan That Reduces Costs, J. R. Rogers. Factory, vol. 30, no. 5, May 1923, pp 538-540, 1 fig. Describes plan which does away with much of costly routine required in gaging actual performance of individual workman; applicable in both large and small plants.

BRASS

FOUNDRY ALLOYS. Modern Brass Foundry Alloys, Francis W. Rowe. Foundry Trade Jl., vol 27, no. 350, May 3, 1923, pp 354-359, 12 figs Deals with tin and phosphor bronzes, gun metals, brasses, manganese and aluminum bronzes, nickel alloys, copper castings and light aluminum alloys.

BREAKWATERS

RUBBLE MOUND. Breakwater Construction, Toronto Island Shore, John M. Wilson. Can. Engr., vol. 44, no. 15, Apr. 10, 1923, pp. 387-390, 5 figs. Formation of Toronto Island; early protection work; describes rubble mound breakwater founded on mattresses; mattress sections 100 by 60 by 3 ft. thick; stone for mound subjected to frost test; abstract of specifications.

BRICK

CONCRETE. The Field for Concrete Common Brick, A. F. R. Curtis. Rock Products, vol. 26, no. 8, Apr. 21, 1923, pp. 13-19, 15 figs. Statement embracing a survey of possibilities, costs, etc., of concrete brick manufacture as an outlet for crushed stone, sand and gravel.

MASONRY SPECIFICATIONS. Specifications for Brick Masonry. Am. Architect & Architectural Rev., vol. 123, no. 2417, Apr. 11, 1923, pp. 341-343. Miscellaneous specification data; testing of cement; screching of old foundations; concrete proportions, and mixing; damp-proof concrete; depositing of concrete; construction joints and work planes.

STRUCTURAL VALUE. Brick — Its Structural Value, G. C. Mars. Am. Architect & Architectural Rev., vol. 123, no. 2418, Apr. 25, 1923, pp. 383-387, 6 figs. Discusses types of construction.

BRIDGED

ARCHED. Static Calculation of Arched Bridges (Beitrag zur statischen Berechnung von Bogenbrücken als räumliche Fachwerke), Karl Pohl. Bautechnik, vol. 1, no. 12, Mar. 20, 1923, pp. 111-131, 64 figs. Double- and triple-hinged bridges; effect of one-sided braking, one-side heating and one-sided wind loads.

BRIDGES, CONCRETE

DESIGN. Reinforced-Concrete Bridges Over the Sorocabana (Pontes de concrete armado na E. F. Sorocabana), Alvaro Neves da Rocha. Revista Brasileira de Engenharia, vol. 5, no. 3, Mar. 1923, pp. 90-98, 9 figs. Details of construction; calculation of reinforced-concrete bridge of 15 m. roadway.

PRECAST PARTS, WITH. Reinforced Concrete Footbridge at Neepsend, Sheffield. Engineering, vol. 115, no. 2991, Apr. 27, 1923, pp. 514-517, 43 figs. partly on p. 526. Design and erection of bridge making use of precast parts.

BRIDGES, RAILWAY

LOCOMOTIVE LOADS. Equivalent Loads on Bridges, P. H. Parr. Engineer, vol. 135, no. 3512, Apr. 20, 1923, pp. 411-412, 2 figs. Shows rapid method of determining equivalent loads for one or more locomotives on bridges of various spans

REINFORCEMENT OF STEEL. Check Bridge Reinforcement with Strain Gage, H. S. Loeffler. Ry Age, vol 74, no 23, May 12, 1923, pp. 1157-1159, 3 figs. Tests after introduction of center truss show exceedingly uniform stress distribution.

WIDENING AND REINFORCING. Railroad Bridge Widened and Reinforced, G. H. Wilsey. Eng. News-Rec., vol. 90, no 18, May 3, 1923, p. 796, 1 fig. Main spans of old bridge are used in new structure over Mississippi River in Minneapolis.

BRIDGES, STEEL

ARCH. Gerrard Street Steel Arch Bridge, Toronto, J. S. Burgoyne and G. Allison. Can Engr., vol. 44, no 17, Apr 24, 1923, pp. 425-428, 12 figs Consists of three steel arch spans of four ribs each, each arch being three-hinged; bridge deck of reinforced-concrete slab 9 in. thick; expansion joints every 50 ft.

BRONZES

CORONIUM. A New Bronze Alloy, E. Hall Craggs Foundry Trade Jl., vol. 27, no. 350, May 3, 1923, p. 359. Physical properties of new alloy allied to bronze, known as Coronium. (Abstract.) Paper read before Cleveland Instn. Engrs.

C

CABLES, ELECTRIC

CURRENT-CARRYING CAPACITY. Cable Geometry and the Calculation of Current-Carrying Capacity, Donald M. Simons. Am Inst Elec Engrs Jl., vol. 42, no 5, May 1923, pp 525-539, 4 figs Deals with errors in standard formulas for calculating thermal resistance and geometric properties between conductors and sheath; geometric factor for 3-conductor cables under 3 phase voltage; examples of calculation of current-carrying capacity under various conditions, and of dielectric loss.

SINGLE-CORE SHEATHED. The Use of Single-Core Sheated Cables for Alternating Currents, W. Cramp and Nora I. Calderwood. Instn Elec Engrs Jl., vol 61, no. 317, Apr 1923, pp 477-485, 4 figs. Losses are analyzed for single cable, pair of single-phase cables, and set of 3 phase cables, it is shown that sheath eddies are in all cases negligible, and that sheath circuit eddies may be kept within reasonable limits by proper regulations regarding spacing of cables.

UNDERGROUND. Underground Cables at 150,000 volts, A. M. Taylor. Elec Rev., vol 92, nos 2370 and 2371 Apr 27 and May 4, 1923, pp 648-649 and 709-710, 7 figs. Author explains what constitutes special features of his [illegible] phase transmission system, how it is carried out, and how parts during transmission of power

CAR WHEELS

STEEL, THERMAL STRESSES IN. Thermal Stresses in Steel Car Wheels, George K. Burgess and G. Willard Quick. U. S. Bur. of Standards Tech. Paper, vol 17, no. 235, Mar [illegible] 1923, pp [illegible] [illegible] steel wheels were tested by [illegible] method [illegible] for testing [illegible] car wheels in laboratory under conditions approximating [illegible] brake application, data on properties of wheels tested

CARBON BLACK

[illegible] Tests of [illegible] Carbon Black, [illegible] vol [illegible], no 15, Apr 14, 1923, pp [illegible] figs. [illegible] rubber [illegible] black, particle size, [illegible] [illegible] carbon black

FUTURE DEVELOPMENT. Future of Carburetor Lies in Detail Development, Not New Inventions, H. Dechamps. Automotive Industries, vol. 48, no. 16, Apr. 19, 1923, pp. 878-883, 16 figs. Points out that greater accessibility and ease of adjustment are much needed; discusses existing devices.

CARS

ALUMINUM PARTS. Weight Reduction in Rolling Stock. Elec. Rev., vol. 92, no. 2370, Apr. 27, 1923, pp. 644-646, 4 figs. Discusses use of aluminum and its alloys for purpose of reducing weight of cars, and refers to parts of car equipment which could be satisfactorily lightened by adoption of aluminum.

CARS, FREIGHT

BOYDEN CO-ORDINATING TRUCK. The Boyden Six-Wheel Co-ordinating Truck. Ry. Mech. Engr., vol. 97, no. 5, May 1923, pp. 285-287, 6 figs. Designed to provide extreme flexibility in order to minimize curve resistance and flange wear.

CARS, PASSENGER

DESIGN. Passenger Carriages, Int. Ry. Congress Assn. — Bul., vol. 5, no. 4, Apr. 1923, pp. 344-365. Discussion on improvements to be made in design of carriages and rules to be observed in make-up of trains, so as to increase safety and comfort of passengers.

CAST IRON

HARDNESS CONTROL. Controlling Cast Iron Hardness, S. J. Felton. Foundry, vol. 51, no. 8, Apr. 15, 1923, pp. 321-322. Metallographic study showing different constituents indicates causes of hardness; control methods; close-grained iron not apt to be porous but has large internal shrinkage.

PEARLITIC. Pearlitic Cast Iron, Its Production, Properties of Strength, and Useful Possibilities (Das Perlitgusseisen seine Herstellung, Festigkeitseigenschaften und Anwendungsmöglichkeiten), O. Bauer. Stahl u. Eisen, vol. 43, no. 17, Apr. 26, 1923, pp. 553-557, 7 figs. Describes method for obtaining pearlite-graphite texture in cast iron; strength properties of pearlitic iron in comparison with other varieties of cast-iron; technical uses of pearlitic castings and review of development of gray castings

PHYSICS OF. Physics of Cast Iron, E. Adamson. Foundry Trade Jl., vol. 27, no. 349, Apr. 26, 1923, pp. 332-336. Replies of author to criticisms by J. E. Hurst and H. J. Young of his paper printed in same journal, Mar. 29, 1923.

CELLULOSE

DISINTEGRATION. Chemical Production of Vegetable Fibers (Die chemische Aufschliessung pflanzlicher Rohfaserstoffe: Spinnfasser- und Zellstoffgewinnung), Carl G. Schwalbe. Zeit. für angewandte Chemie, vol. 36, nos. 25 and 26, Mar. 28 and 31, 1923, pp. 173-176 and 179-183. Celluloses, hemieelluloses and lignine; extraction for different purposes; oxidation; hydrolizing, boiling; dissolving with calcium bisulphate under pressure; recent patents.

CEMENT, PORTLAND

MANUFACTURE. Viscosity of Raw Material Used in Manufacture of Portland Cement, J. W. Christelow and E. Bowes. Cement, Mill and Quarry, vol. 22, no. 7, Apr. 5, 1923, pp 41 and 44-49, 4 figs. Results of investigation by British Portland Cement Research Assn. to devise a laboratory method of arriving at amounts of water which can be removed from various cement raw material slurries by addition of definite quantities of soda ash (i.e., crude sodium carbonate) and to investigate action of other substances likely to be of value for purpose. Describes method devised.

CHROME STEEL

PROPERTIES. Some Mechanical Properties of a Series of Chromium Steels, Charles R. Austin. Iron and Steel Inst., advance paper, no 3, for meeting May 1923, 15 pp., 4 figs. Record of effect of heat treatment on mechanical properties of two groups of steels, containing 0.35 per cent carbon and 1 per cent carbon respectively, chromium content varying from 2 to 12 per cent.

CIRCUIT BREAKERS

OIL. Oil Circuit Breakers for High Power and High Voltage (Alcune considerazioni sugli interruttori in olio per grandi potenze ed altissime tensioni), Carlo Palestrino. Elettrotechnica, vol. 10, no. 9, Mar. 25, 1923, pp. 173-181, 18 figs. Proper distance; quality of oil; standards for construction.

COAL

BITUMINOUS. United States Bituminous Coals Available for Canada. Can. Inst. Min. and Metallurgy, no. 133, May 1923, pp. 370-382. Discussion of paper by Geo. H. Cushing.

CARBONIZATION, LOW TEMPERATURE. The Low-Temperature Carbonization of Coal, Harry A. Curtis and Walter J. Chapman. Chem. and Met. Eng., vol. 28, no. 1, Jan. 3, 1923, pp. 11-17, 7 figs. Development of Carbocoal process at Irvington plant of Int. Coal Products Corp.

RESEARCH. Present State of Coal Research (Etat actuel des recherches sur le charbon), J. Arnoul de Grey and G. de Boisdemange. Chaleur et Industrie, vol. 4, no 35, Mar. 1923, pp 233-236. Differentiation of coal and lignites, origin, composition, dissolution, distillation, hydrogenation of coal; recovery of nitrogen and sulphur

CALORIFIC VALUE, DETERMINATION. Determination of the Calorific Value of Coal (Vereinfachte Bestimmung des Heizwertes der Kohle), Fritz Konig. Chemiker-Zeitung, vol 47, no 47, Apr 19, 1923, pp 335-336. Describes new and simple method based on knowledge of water and ash content and yield in coke.

MOISTURE CONTENT. The Specific Gravity and Moisture Content of Coal, T. J. Drakely and W. O. Jones, Chem and Industry, vol 42, no 16, Apr 20, 1923, pp 163T-166T, 2 figs. Investigation to determine standard method of preparation of coal sample which might be generally adopted; deals with saturation, drying, and air drying of coal samples, moisture content of coal

COKE OVENS

INCLINED REVOLVING FURNACE. Low Temperature Coking in Inclined Revolving Furnaces, A. Thau. Iron and Coal Trades Rev., vol 106, no 2875, Apr 6, 1923, pp 485-487, 6 figs. Describes [illegible] type of inclined [illegible] furnace recently started in [illegible] Germany [illegible] coke-discharging device, treatment of low temperature gases [illegible] of coking gases products [illegible]

COLUMNS

LOAD RESISTANCE. [illegible]

COMBUSTION

[illegible]

COMPRESSED AIR

Mining. Compressed Air Economies in Mining (Die Druckluftwirtschaft und die [illegible] der Hochdruckluft im Bergbau). Bergbau, vol. 36, no. 7, [illegible] 1923, pp. 111-11[illegible], [illegible] figs. Application of compressed air in [illegible] [illegible] compressed air plant construction and their [illegible] dangers from high-pressure air.

CONCRETE

Aggregates. Stone Crushing as Fine Aggregate for Concrete, Duff A. Abrams. Concrete, vol. 22, no. 4, Apr. 1923, pp. 128-132, 4 figs. Results of tests on relative merits of natural sand and screenings for making mortar and concrete.

Composition. Determination of Suitable Composition of Concrete (Zur Bestimmung der zweckmässigen Zusammensetzung des Betons), Otto Graf. Beton u. Eisen, vol. 22, no. 4, Feb. 20, 1923, pp. 49-51, 12 figs. Results of tests on effect of powdered rock on concrete and mortars, composition to assure impermeability to water, effect of water addition on resistance of concrete.

Freezing, Protection Against. Use of Calcium Chloride As a Protection Against Freezing of Concrete, Paul Cottringer and Harold S. Kendall. Concrete, vol. 22, no. 4, Apr. 1923, pp. 150-155, 7 figs. Details of experiments and results obtained.

CONCRETE CONSTRUCTION

Canals. Paving a 34-Degree Slope With Concrete, A. C. D. Blanchard. Concrete, vol. 22, no. 4, Apr. 1923, pp. 125-128, 6 figs. Describes concreting methods employed in construction of canal of Queenston-Chippawa Power development.

Plants. Contractor's Plant. Concrete, vol. 22, no. 4, Apr. 1923, pp. 156-159, 4 figs. Analysis of chuting and wheeling plant; rental, installation cost, maintenance and operating cost. Abstract of report of Am. Concrete Inst. Committee.

CONCRETE CONSTRUCTION, REINFORCED

Calculation. The Use of a Slide Rule for Reinforced-Concrete Calculation (L'Utilisation d'une règle à calcul pour l'étude des projets de beton armé), René Deguillaume. Génie Civil, vol. 82, no. 15, Apr. 14, 1923, pp. 350-354, 2 figs. Details of Deguillaume circular slide rule and examples of calculation.

Slabs. Reinforced-Concrete Slabs Under Flexure (Eisenbewehrte Platten bei allgemenem Biegungszustende), H. Leiz. Bautechnik, vol. 1, nos. 16 and 17, Apr. 13 and 30, 1923, pp. 155-157 and 163-167, 6 figs. Inferior forces; determination of cross sectional stresses from changes in form of slabs.

CONDENSERS, ELECTRIC

Action of. Electrical Condensers. Practical Engr., vol. 57, no. 1887, Apr. 26, 1923, pp. 231-232, 10 figs. Action of electrical condenser; describes some types.

Losses. Measuring Condenser Losses (Verlustmessungen an Kondensator en), Ulfilas Meyer. Zeit. für Fernmeldetechnik, vol. 4, no. 1,Jan. 16, 1923, pp. 1-3, 1 fig. Experiments to show that dimmer condensers do not possess desired constancy for measuring purposes, although losses are small.

CONDENSERS, STEAM

Ejecteau-Air. Ejecteau-Air Condenser. Power Plant Eng., vol. 27, no. 10, May 15, 1923, p. 516, 1 fig. Combination water and air pump and steam condenser of French design.

CONVEYORS

Marcus. Shaking-Sliding Conveyor and the Marcus Acceleration Process (Die Schüttelrutschenförderung und das Beschleunigungsverfahren von Marcus), Otto Ohnesorge. Fördertechnik u. Frachtverkehr, vol. 16, no. 4, Feb. 16, 1923, pp. 37-40, 5 figs. Describes principles of acceleration process in conveying and its application in mining, and reviews apparatus leading up to its development.

COOLING LIQUIDS

Safety Devices for. Safety Devices for Circulating Systems. Engineering, vol. 115, no. 2993, May 11, 1923, pp. 584-585, 22 figs. Monitor safety devices for application to cooling-water supply systems of air compressors, oil and gas engines, electric controllers for large winders, transformers, etc., as well as to oil-cooling systems for large bearings, gearing and thrust blocks.

COPPER ALLOYS

Melting and Casting. Melting and Casting Copper Alloys (Quelques Considérations à propos de la Fusion et du Moulage des Alliages de Cuivre), Fonderie Moderne, vol. 17, Mar. 1923, pp. 76-78. Chemical properties of some metals; fluxes; reducing agents and their properties.

CORROSION

Theory and Practice. Practical and Theoretical Aspects of Corrosion, W. R. Douglas Shaw. Beama, vol. 12, no. 61, May 1923, pp. 269-273. Author endeavors to throw more light on unexplained phenomena of corrosion; discusses corrodibility of alloys; corrosive mine water, corroded economizers, turbine practice, eddying in pumps, absorption and corrosion, etc.

COST ACCOUNTING

Production. Nature and Bases of Calculating Cost of Production (Wesen und Grundlagen der Selbstkostenberechnung), Kurt Maier. Gummi-Zeitung, vol. 37, nos. 15-16, 19-20 and 27-28, Jan. 19, Feb. 16 and Apr. 13, 1923, pp. 233-234, 296-297 and 438-439. Definition of cost of production; kinds of costs; distribution of costs; methods of determining costs.

Time-Saving Plan. More Accurate Costs in Less Time, H. A. Krill. Factory, vol. 30, no. 5, May 1923, pp. 545-547, 5 figs. Plan for tying up operation costs with payroll disbursements readily adaptsble to any plant, large or small.

COTTON MILLS

Four-Roll Drafting. Four Roll Drafting on Roving Frames, A. N. Sheldon. Textile World, vol. 63, no. 17, Apr. 28, 1923, pp. 147-148. Experiments to show its effect on yarn strength and evenness, number of processes, drafts and doublings; gentler treatment of fiber and better parrallelization claimed. From paper read before Textile Division, A.S.M.E.

CRANES

Electric. Electric Gantry Crane of 25 Tons at the Zurich Freight Station (Portique roulant de 25 tonnes, avec commande électrique, à la gare des marchandises de Zurich), W. Druey. Bul. Technique de la Suisse Romande, vol. 49, no. 8, Apr. 14, 1923, pp. 91-97, 5 figs. Details of design and construction.

Rotary. Slewing Crane of 60 Tons Capacity, at Harfleur Navy Yard (Grue pivotante et basculante de 60 tonnes, installée aux Chantiers navals d'Harfleur). Génie Civil, vol. 82, no. 15, Apr. 14, 1923, pp. 341-343, 4 figs. For loading boilers, turbines and other heavy machinery; design and operation.

Steam. Steam Cranes (Der Dampfkran im Eisenbau), Benedict. Bantechnik, vol. 1, no. 18, Apr. 27, 1923, pp. 169-170, 3 figs. Advantages of locomotion and transportation; comparison with electric cranes.

CRANKSHAFTS

Critical Speeds. Torsional Resonance, J. Morris. Automobile Engr., vol. 13, no. 175, Apr. 1923, p. 13[illegible], 4 figs. Consideration of critical speeds of crankshafts.

CUPOLAS

Charging. Dexter Flexible Charging System. Iron Trade Rev., vol. 72, no. 17, Apr. 27, 1923, pp. 1237-1240, 7 figs. Charging methods and equipment of Marion Foundry and Machine Co., Marion, Ind.; includes outside and inside traveling cranes and charging hoist for handling materials from railway car to yard and from yard into cupola.

Reactions. Theories on Cupola Reactions, S. J. Felton. Foundry, vol. 51, no. 9, May 1, pp. 1923, 351-35[illegible], 1 fig. Work of different investigators reviewed to show location and effect of melting zone; flexibility of cupola as melting furnace, slag reactions.

CUTTING METALS

Electric Arc Cutting. Electric Arc Cutting, A. M. Candy. Welding Engr., vol. 8, no. 4, Apr. 1923, pp. 36 and 38, 9 figs. Graphite or carbon electrodes used; process applied to cutting risers and rivets, economical for cutting copper.

CUTTING TOOLS

Design. Metal Cutting Tools, W. E. Splain. Am. Mach., vol. 58, no. 18, May 3, 1923, pp. 663-664, 2 figs. Factors affecting speed with which tool cuts economically; angles of tools for cutting different metals; why round-nosed tools are best.

D

DAMS

Earth. The Design of Earth Dams, Joel D. Justin. Am. Soc. Civ. Engrs. — Proc., vol. 49, no. 5, May 1923, pp. 856-916, 24 figs. Author's object is to aid in establishing more scientific methods of designing earth dams; six criteria for design are presented, which are practically axiomatic.

Hetch Hetchy, San Francisco. O'Shaughnessy Dam Completed and Reservoir Storage Begun. Eng. News-Rec., vol. 90, no. 17, Apr. 26, 1923, pp. 741-742, 3 figs. Closure made at low water "in the dry"; precast railing placed in short sections to be used again when dam is raised.

DIESEL ENGINES

Developments. The Development of Diesel Engines at the Krupp Concern (Aus der Entwicklung des Dieselmotors bei der Firma Krupp). Kruppsche Monatshefte, vol. 4, Feb.-Mar. 1923, pp. 25-39, 22 figs. Initial development as stationary engine; development as marine engine before and during war, U-boat engines; development since the war; compressors.

Manufacture. Building Diesel Engines. Eng. Production, vol. 6, nos. 127 and 128, Apr. and May 1923, 237-241 and 259-263, 26 figs. Methods and equipment of Mirrless Watson Co., Glasgow, Scotland.

Operating Costs. Report on Heavy-Oil Engine Working Costs. Diesel Engine Users Assn. — Report, no. 31, 19 pp. Report submitted at meeting, Mar. 2, 1923, including discussion. Costs per unit generated; maintenance, working and fuel-oil costs. Bibliography.

DROP FORGINGS

Manufacturing. The Manufacture or Drop Forgings, Arthur Stubbs. Metal Industry (Lond.), vol. 22, nos. 12, 13, 17 and 18, Mar. 23, 30, Apr. 27 and May 4, 1923, pp. 287-289, 315-316, 427-428 and 454-456, 9 figs. Design: hardening of dies; quenching arrangements; casting and ingots; preliminary heat treatment; tools for drop forgings; final forging temperature; heating furnaces; connecting rods; crankshafts; etc. Choice of fuels; pyrometers; testing. Future of industry.

DRYING PLANTS

Hot-Air. The Design of Hot-Air Drying Plant, George H. Gill. Engineering, vol. 115, nos. 2991 and 2992, Apr. 27 and May 4, 1923, pp. 511-512 and 541-542. Types of hot-air driers which are divided into main classes, namely, batch, and continuous or tunnel-type driers; construction of driers; rate of drying; calculation of air supply.

E

EDUCATION, ENGINEERING

Technical School and Practical Training. The Training of Engineers (Zur Ingenieurerziehung), G. M. Strobl. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 17, Apr. 28, 1923, pp. 419-421. Refers to paper by G. Lippart in same journal (Dec. 16, 1922) on demands made upon technical schools for practical requirements of engineers. Present author recommends less theoretical and more practical mathematics, training of practical constructors in place of draftsmen, and closer co-operation between instructor and student.

ELECTRIC CONDUCTORS

Diameter Calculation. Calculation of the Diameter of Transmission Lines (Processo para o calculo do diametro de uma linha transmissao), Pantoja Leite. Revista Brasileira de Engenharia, vol. 5, no. 3, Mar. 1923, pp. 85-89, 5 figs. Formulas; graphic calculation of reactances to find diameter of conductor and examples.

ELECTRIC CURRENTS

Superimposing A.C. on D.C. The Electrochemical Effects Produced by Superimposing Alternating Currents upon Direct Currents, W. R. Copper. Faraday Soc. — Trans., vol. 18, part. 1, no. 52, Oct. 1922, pp. 102-111, 11 figs. Results of author's observations.

ELECTRIC FURNACES

Acid. Operation of an Acid Electric Furnace, Thomas Hill. West. Machy. World, vol. 14, no. 4, Apr. 1923, pp. 128-130 and 148. Notes on acid and basic charges; charging; melting and oreing down; formation and functions of slag; power input; final additions; electrodes; etc.

Design. Design and Construction of Electric Furnaces, Larry P. Barton. Blast Furnace and Steel Plant, vol. 11, no. 5, May 1923, pp. 272-276, 6 figs. Comparative sizes of various types; practical wiring and diagrams.

Development. Recent Electric Furnace Developments, Edward T. Moore. Forging and Heat Treating, vol. 9, no. 4, Apr. 1923, pp. 187-192, 6 figs. Increase in installations during 1922; types of furnaces including Heroult, Greaver-Etchells and Moore Lectromelt furnaces; density, electrical and thermal resistivity of electrodes; use of electric furnaces in non-ferrous field.

INDUCTION. Heating by High-Frequency Induction (Chauffage par induction à haute fréquence), G. Ribaud. Technique Moderne, vol. 15, no. 8, Apr. 15, 1923, pp. 225-231, 15 figs. Historical review; describes various types of furnaces and their operation.

PYRELECTRODE. The Combustion-Flame Electrode, George T. Southgate. Assn. Iron and Steel Elec. Engrs., vol. 5, no. 4, Apr. 1923, pp. 87-100 and (discussion) 101-104, 12 figs. Describes process and apparatus involving use of combustion flames as paths along which to induct electric arcs into furnaces or other spaces where work of high temperatures is desired; apparatus is called pyrelectrode.

STEEL. Advantages of Electric Furnace in Steel Making, Ernest W. Cornelius. Can. Foundryman, vol. 14, no. 4, Apr. 1923, pp. 41-43, 1 fig. Product is of more uniform quality; meets demand for high standards; better temperature control; less loss in melting and refining; etc.

THREE-PHASE. Some Problems in Electric Furnace Operation, F. V. Andreae. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 5, May 1923, pp. 498-509, 14 figs. General equations of 3-phase furnace are developed; methods are suggested to reduce unbalancing of load.

ELECTRIC GENERATORS, A.C.

HIGH-SPEED. Some Problems in High-Speed Alternators, and Their Solution, J. Rosen. Instn. Elec. Engrs. — Jl., vol. 61, no. 317, Apr. 1923, pp. 439-458 and (discussion) 458-476, 40 figs. History and failures of turbo-alternators; mechanical construction of rotors and caps supporting coil ends; stator windings and insulation; statot slots; alternator ventilation and water cooling; exciter instability; eddy currents in rotors; oscillograph tests.

ELECTRIC LOCOMOTIVES

4000-HP. New 4000 Hp. Locomotives for the Norfolk & Western Railway, T. C. Wurts. Railroad Herald, vol. 27, no. 5, Apr. 1923, pp. 23-27, 4 figs. Describes Baldwin-Westinghouse, consisting of two cabs permanently connected to form a locomotive; single-phase current is collected from trolley and transformed inside locomotive to three-phase at voltage suitable for induction-type traction motors.

ITALIAN. The Electrification of the Italian Railways, F. Savorgnan di Brazzi. Elec. Rev., vol. 92, no. 2367, Apr. 6, 1923, pp. 525-526, 2 figs. Describes new 3000-hp. 3-phase locomotive.

VIBRATIONS. Natural Vibration of Systems with Periodically Variable Elasticity (Eigenschwingungen von Systemen mit periodisch veränderlicher Elastizität), L. Dreyfus. Archiv für Elektrotechnik, vol. 12, no. 1, Mar. 10, 1923, pp. 38-59, 13 figs. Discusses shaking vibrations of electric locomotives and gives mathematical treatment of question of periodically variable elasticity connected with it.

ELECTRIC MOTORS, A.C.

ASYNCHRONOUS. Asynchronous Motors and Generators (Moteurs et génératrices asynchrones), P. Pierre. Electricien, vol. 54, no. 1321, Apr. 1, 1923, pp. 153-155, 2 figs. Leblanc's principle; application to three-phase electric traction mining industry and low heads of water.

SPECIFICATION OF PERFORMANCE. British Standard Specification for the Electrical Performance of Industrial Electric Motors and Generators with Glass A Insulation. Brit. Eng. Standards Assn., no. 168, Feb. 1923, 31 pp. Definition; types of enclosure and of machine; standard voltages, frequency, phases and wave form; service conditions; classes of rating; overloads; efficiency of power factor; etc.

ELECTRIC MOTORS, D.C.

REACTANCE VOLTAGE. The Dependence of Reactance Voltage on the Width of Brush in D.C. Motors. (Die Abhängigkeit der Reaktanzspannung von der Bürstenbreite bei Gleichstrommaschinen), Claudius Schenfer. Elektrotechnische Zeit., vol. 44, no. 16, Apr. 19, 1923, pp. 358-362, 18 figs. Presents reactance curves with different brush widths and different commutator-segment widths; results of tests.

ELECTRIC RAILWAYS

CAR MAINTENANCE. East Bay Electric Service of the Southern Pacific Railroad. Elec. Ry. Jl., vol. 61, no. 15, Apr. 14, 1923, pp. 633-637, 6 figs. Describes system of maintenance followed in order to keep maximum number of cars in service.

PRACTICE AND EQUIPMENT. Observations on Electric Railway Practice, William B. Potter. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 5, May 1923, pp. 490-497, 13 figs. Practice and equipments in America and Europe; systems of railway electrification adopted in various countries; locomotive types.

THREE-WIRE DISTRIBUTION. The Principles of Three-Wire Distribution for Electric Railways, W. Nelson Smith. Eng. Jl. (Eng. Inst. Can.), vol. 6, no. 5, May 1923, pp. 235-243, 7 figs. As applied to mitigation of electrolysis due to stray currents.

ELECTRIC TRANSMISSION LINES

HIGH-TENSION. The Cinca Line of the Iberica Hydro-electric Company (La linea de Cinca, de la Hidroelectrica Iberica). Energia Electrica, vol. 25, no. 5, Mar. 10, 1923, pp. 61-63. Has working current of 132,000 volts, stepped-up by American type out-door transformer stations from 6600; length of line 298 km.

ELECTRIC RAILWAYS, TRACK

TRACK CIRCUITING. Track Circuit Developments on the Underground Railways. Ry. Gaz., vol. 38, no. 15, Apr. 13, 1923, pp. 585-586, 3 figs. Installation of what is claimed to be latest development in a.c. track-circuiting work consists of 14 single-rail track circuits of condenser-feed type, using two-element vane relays, and six siding tracks with indication only.

ICE LOAD. White Frost on a 120,000-Volt Transmission Line (Observations relatives au givre sur une ligne à 120,000 volts), C. Duval. Revue générale de l'Electricité, vol. 13, no. 13, Mar. 31, 1923, pp. 544-545, 1 fig. Effect of ice load, 20 cm. in diameter in some places, on conductors, and precautions to be taken in construction of poles and lines.

PROTECTION. Protective Systems — The Callender-Hunter Four-Conductor System. Beama, vol. 12, no. 61, May 1923, pp. 308-309, 2 figs. Combination of Merz-Price and split-conductor system, resulting in greatly reduced capital cost and simplified connections.

ELECTROMAGNETIC WAVES

PROPAGATION. Propagation of Electromagnetic Waves on the Surface of the Earth (La propagation des ondes électromagnétiques à la surface de la Terre), Léon Bouthillon. Journal Télégraphique, vol. 47, no. 3, Mar. 25, 1923, pp. 49-54. Present state of research on the subject, laws of propagation, stray and parasitic waves, presence of ions in atmosphere.

ELECTRIC WELDING, ARC

DEVELOPMENTS. Recent Developments in the Arc Welding Field, W. L. Warner. Am. Welding Soc. — Jl., vol. 2, no. 4, Apr. 1923, pp. 10-30. Standardization activities of Am. Bur. of Welding. General reports and research work on following subjects: specifications for steel to be welded, unfired pressure vessels, welding oil-storage tanks; welded rail joints; welding applications; welding monel metal, manufacture of pure iron, arc welding apparatus. Suggested research activities.

ELEVATORS

ELECTRIC AND HYDRAULIC. Electric and Hydraulic Lifts, C. H. J. Day. Power Engr., vol. 18, nos. 205 and 206, Apr. and May 1923, pp. 133-140 and 177-180 and (discussion) 180-181, 12 figs. Apr.: Notes on safety gears, guides, signaling devices controller operation of electric elevators, electric motors, methods of blancing, electric self-levelling elevator, suitable car speeds, passenger elevators, etc.

MOTOR CONTROLLERS. Operation of a Slow Speed Elevator Electric Motor Controller, Charles A. Armstrong. Power, vol. 57, no. 18, May 1, 1923, pp. 670-673, 8 figs. Detailed explanation of controller's operation; troubles that may develop and how to locate them.

ROPES. Life of Elevator Ropes, C. W. Naylor. Nat. Engr., vol. 27, no. 5, May 1923, p. 212. Length of service of elevator ropes in a modern department store hints on care, service and selection.

EMPLOYEES' REPRESENTATION

UNION PACIFIC R. R. The Union Pacific Plan of Employees' Representation, G.H. Sines. Ry. Rev., vol. 72, no. 18, May 5, 1923, pp. 760-765. Shop and miscellaneous employees' association works with management to improve efficiency.

ENGINEERS

CLASSIFICATION OF POSITIONS. Progress in the Classification of Engineering Positions, A. B. McDaniel. Eng. News-Rec., vol. 90, no. 17, Apr. 26, 1923, pp. 744-745. Progress made by Committee of Am. Assn. Engrs.

TRAINING. The Training of Graduate Engineers (Ingenieurfortbildung), O. Lasche. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 14, Apr. 7, 1923, pp. 341-344. Discusses work being done in Germany in organizing advanced courses for experienced and active engineers; courses planned by Assn. for Advancement of Industry, and other associations in Berlin; suggestion for further extension of this work; appendix contains account of experiences with so-called works students.

EVAPORATION

INTERNAL HEAT OF. Relations Concerning the Internal Heat of Vaporization, J. E. Mills and P. K. Smith. Jl. Physical Chem., vol. 27, no. 4, Apr. 1923, pp. 301-321. Mathematical study.

REACTION DUE TO. The Reaction Consequent upon the Evaporation of a Liquid and upon the Emission of Vapours from Small Orifices, W. G. Duffield. Lond., Edinburgh and Dublin Philosophical Mag. and Jl. of Sci., vol. 45, no. 268, Apr. 1923, pp. 641-688, 10 figs. Describes type of interference between molecules of vapor and those of external medium, which appears to pay considerable part in phenomenon of evaporation and in discharge of vapor from boiler; manner in which vapor is discharged into atmosphere from boiling liquid.

F

FANS

SELECTION AND APPLICATION. The Selection of Fans and Their Application, A. Fleming Browne. Power Eng., vol. 18, no. 204, Mar. 1923, pp. 105-109 and (discussion) 109-111. Ventilating fans; mechanical draft; cupola fans; dust and fume removal; drying plants; propeller fans; centrifugal fans; fan standardization.

TESTING. Standard Code for the Testing of Centrifugal and Disc Fans. Am. Soc. Heating and Vent. Engrs.—Jl., vol. 29, no. 4, May 1923, pp. 371-380, 5 figs. Code framed by joint committee from Nat. Assn. Fan Mfrs. and Am. Soc. Heating and Vent. Engrs.

FILTRATION PLANTS

DETROIT 320-M. G. D. Detroit 320-M.G.D. Filtration Plant Is World's Largest, Theodore A. Leisen. Eng. News-Rec., vol. 90, no. 20, May 17, 1923, pp. 860-865, 8 figs. Eighty 4,000,000 gal. daily units treat Detroit River water at high rate of 160 m.g.d. per acre; steel roofs over filters and coagulant basins give uniform appearance; whole plant on piles.

FLAME PROPAGATION

GASEOUS FUEL. The Measurement of Flame Velocity, Walter Mason. Fuel in Sci. and Practice, vol. 2, no. 4, May 1923, pp. 110-114, 8 figs. Points out that general behavior of gaseous fuel on burning can be judged from speed-percentage curve for uniform movement of flame in its mixture with air, and describes how such speed percentage curves are obtained.

FLOORS

LOADS, SCHOOL BUILDINGS. Excessive Floor Loads Specified for School Buildings, Norman M. Stineman. Am. Architect and Architectural Rev., vol. 123, no. 2417, Apr. 11, 1923, pp. 334-335. In author's opinion, 60-lb. load specified by state codes of Cair and Wisconsin seem very conservative, and there is not excuse for specifying loads of 75 or 100 lb. per sq. ft. as some cities do.

FLOW OF WATER

DISCHARGE OF SLUICES. The Similarity of Motion of Water through Sluices and through Scale Models. Experiments with Models of Sluices of the Assuan Dam, H. E. Hurst and D. A. F. Watt. Instn. Civ. Engrs — Sessional Notices, no. 3, Apr. 1923, pp. 71-74. Results of experiments demonstrate usefulness of models to determine discharge of large sluices, etc. (Abstract.)

PIPES. Law of Resistance to Flow in Pipe of Circular Cross Sections (Das Gesetz für den Durchflusswiderstand in Rohrleitungen kreisförmigen Querschnittes), H. Lang. Bautechnik, vol. 1, no. 18, Apr. 27, 1923, pp. 174-175. Discusses Lang's formulas and his most recent proofs of their correctness.

FLUE-GAS ANALYSIS

CO_2 RECORDER. Mechanical Force Made Use of to Indicate CO_2. Power Plant Eng., vol. 27, no. 10, May 15, 1923, p. 517, 3 figs. Rapid determination of gas samples is featured in new instrument, called Ranarex recorder, which does not use chemicals or delicate electrical device.

CO_2 TESTS. The Practical Utility and Limitations of CO_2 Tests, Chas. F. Wade. Practical Engr., vol. 67, no. 1885, Apr. 12, 1923, pp. 199-200. Discusses methods of flue-gas testing under three heads, viz., snap tests, tests of samples taken over an extended period, and continuous records. CO_2 bonus schemes.

TESTING APPARATUS. Automatic Flue Gas Analysis. Power Engr., vol. 18, no. 206, May 1923, pp. 174-176, 6 figs. Comparatively novel forms of automatic apparatus for determination of various constituents in waste gases.

The Econometer CO_2 Tester. Engineering, vol. 115, no. 2991, Apr. 27, 1923, pp. 520-521, 2 figs. Describes new and very simple type of portable apparatus for testing amount of CO_2 in flue gases.

UNBURNED GAS DETERMINATION. A Method of Determining Loss of Heat in Flue Gases Due to Incomplete Combustion, O. L. Hansen and K. E. Nielsen. Fuel in Sci. and Practice, vol. 2, no. 4, May 1923, pp. 115-120, 4 figs. Results of investigation conducted in Denmark show that new method of flue gas analysis gives quick, reliable and, within limits of error of formula, exact determination of loss of heat due to unburned gases.

FLUIDS

VISCOUS STABILITY OF. Stability of a Viscous Liquid Contained Between Two Rotating Cylinders, G. I. Taylor. Roy. Soc. Lond. — Philosophical Trans., vol. 2[illegible] no. A 612, 1923, pp. 289-343, 22 figs. Discusses special type of fluid instability and describes experiments in which results of analysis are subjected to numerical verification.

FLYWHEELS

EXPLOSIONS. Flywheel Explosions and Their Prevention, F. B. Tolsted. Tech. Eng. News, vol. 4, no. 2, May 1923, pp. 51 and 61. Limiting speeds for flywheels and pulleys, overloading and defects.

FORGING

DIES. Prolonging the Life of Forging Dies, Morgan Parker. Machy. (N.Y.), vol. 29, no. 9, May 1923, pp. 671-674, 3 figs. Method of increasing resistance of steel to repeated shocks and resulting fatigue and crystallization.

PRACTICE. Forgings and Smithwork. Metal Industry (Lond.), vol. 22, nos. 6, 7, 8, 9, 10 and 11, Feb. 9, 16, 23, Mar. 2, 9 and 16, 1923, pp. 131-132 and 133, 155-157, 177-180, 203-206, 231-232 and 259-261, 69 figs. Selection and testing of materials; forging methods; examination of typical class of smithwork; general problems of drop forging; production of forgings from iron and steel scrap; production of forgings from steel ingots, especially in respect to forgings made under hydraulic forging press; manufacture of chain cable.

FOUNDRIES

COST ACCOUNTING. Material Cost Accounting in a Foundry, F. C. Everitt and Johnson Heywood. Iron Age, vol. 111, no. 17, Apr. 26, 1923, pp. 1165-1169, 5 figs. Outline of procedure and blank forms suitable for small and large foundries.

Non-ferrous Foundry Costing, H. Scheffield. Metal Industry (Lond.), vol. 22, no. 17, Apr. 27, 1923, pp. 419-421. Suggestions with regard to special needs of non-ferrous industry.

FUELS

See Bagasse; Pulverized Coal.

FURNACES

LININGS. Fireproof Furnace Linings (Feuerung und feuerfestes Futtermaterial), Tonindustrie-Zeitung, vol. 47, nos. 19 and 20, Mar. 7 and 10, 1923, pp. 143-145 and 152-154, 12 figs. Properties of various types of refractories and their behavior on exposure to heat; melting points of coal and lignites; proper mortise for slag brick.

FURNACES, ANNEALING

FUEL ECONOMY. Fuel Economy in Connection with Annealing Furnaces, Chas. F. Wade. Metal Industry (Lond.), vol. 22, no. 14, Apr. 6, 1923, pp. 332-333, 3 figs. Emphasizes need for reduction in amount of fuel consumed in furnace plant and shows how this may be effected by adopting improved methods of operation.

G

GARAGES

RAMP. The Ramp Garage. Am. Architect and Architectural Rev., vol. 123, no. 2418, Apr. 25, 1923, pp. 375-382, 19 figs. Three examples of different types.

GAS ENGINES

LARGE. Large Gas Engines, F. Johnstone Taylor. Gas and Oil Power, vol. 18, nos. 211, Apr. 5, 1923, pp. 109-110 and 115-116 and 125-128, 11 figs. Demonstrates value of large gas engines in reducing power production costs, and gives particulars of most recent design together with notes on suitable producer plants and figures relating to operating costs.

GAS PRODUCERS

BRITISH PRACTICE. British Steelworks Gas-Producer Practice, Fred Clements. Iron and Steel Inst., advance paper, no. 6, for meeting May 1923, 15 pp., 15 figs. on supp. plates. Producer test data. Arrangement and details of testing apparatus; chemical and thermal balance sheets; schedules of producer practice; comparison of producer arrangements; general notes and definitions. See also (abstract) in Engineering, vol. 115, no. 2993, May 11, 1923, pp. 597-599.

GASES

ENTROPY DIAGRAMS. Entropy Diagrams for Gases (Le Diagramme d'Entropie des gaz), F. D'Espine. Chaleur et Industrie, vol. 4, no. 33, Jan. 1923, pp. 27-34, 4 figs. partly on supp. plate. Discusses simplification by Stadola.

PROPERTIES. Certain Noteworthy Properties of Gases (Ueber einige merkwürdige Eigenschaften der Gase), Friedrich Wächter. Zeit. für technische Physik, vol. 4, no. 2, 1923, pp. 56-63. In an earlier publication, author referred to three properties of gaseous substances which had heretofore been little or not at all observed; in present article these phenomena are experimentally confirmed.

GEAR CUTTING

RACK-CUTTING MACHINE. Rack-cutting, Franklin D. Jones. Machy. (N.Y.), vol. 29, no. 9, May 1923, pp. 711-713, 5 figs. General practice in cutting racks on machines designed for this work.

GEARS

MARINE-TURBINE MACHINING. Machining a Marine Turbine Gear Wheel. Machy. (Lond.), vol. 21, no. 547, Mar. 22, 1923, pp. 769-773, 10 figs. Practice of Wm. Beardmore & Co., Ltd., in machining large second-reduction or main gear wheel for marine turbine.

PINIONS FOR. Calculation of Pinions for Gears (Note sur le calcul des pignons d'engrenages), Georges Prudon. Génie Civil, vol. 82, no. 16, Apr. 21, 1923, pp. 373-376, 5 figs.

TESTING. Testing Machine Developed to Solve Gear Strength Problem, Wilfred Lewis. Automotive Industries, vol. 48, no. 18, May. 3, 1923, pp. 974-978, 7 figs. Designed for use in determining increment load due to speed, will establish relationship between this load on one hand and tooth-form errors and mechanical properties of material on other; permits study of endurance and efficiency. Paper read before Am. Gear Mfrs. Assn.

TOOTH PROFILES. The Experimental Determination of Gear-tooth Profiles, Henry E. Merritt. Machy. (Lond.), vol. 21, no. 547, Mar. 22, 1923, pp. 778-780, 4 figs. Describes new process for generation of tooth sections.

GLASS

HEAT-RESISTING. Heat Resisting Glasses, W. E. S. Turner. Roy. Soc. Arts — Jl., vol. 71, no. 3677, Apr. 27, 1923, pp. 401-408 and discussion 408-412, 2 figs. Discusses efforts which have been made to improve heat-resisting power of glass, and forecasts possible developments.

GRINDING

INTERNAL. Internal Grinding and Its Advantages, Frank W. Curtis. Am. Mach., vol. 58, no. 18, May 3, 1923, pp. 653-656, 8 figs. Grinding as means of producing precision parts; factors influencing internal grinding; types of machines; selection of grinding wheels.

GRINDING MACHINES

CENTERLESS. Centerless Grinding Methods. Machy. (N.Y.), vol. 29, no. 9, May 1923, pp. 721-724, 5 figs. Operations on Heim centerless grinding machine.

SPUR-GEAR. New Spur Gear Grinder Generates True Involute Tooth Curve. Automotive Industries, vol. 48, no. 18, May 3, 1923, pp. [illegible], 3 figs. Also capable of handling reasonable variations, can be used for pressure angles up to 25 deg.

H

HARDNESS

BRINELL NUMBER, VARIATION WITH LOAD. The Variation of Brinell Hardness Number with Testing Load, Hugh O'Neill. Iron and Steel Inst., advance paper, no. 19, for meeting May 1923, 28 pp., 10 figs. Brinell number at low and ordinary loads; maximum Brinell number; tests on soft metals; tests on viscous materials; effect of cold work; theoretical considerations. Brinell and scleroscope hardness. Bibliography.

STUDY. A Contribution to the Study of Hardness, C. A. Edwards and Charles R. Austin. Iron and Steel Inst., advance paper, no. 9, for meeting May 1923, 18 pp., 7 figs. Determination of relationship existing between heights of fall and heights of rebound, heights of fall and volumes of indents produced, Brinell hardness numbers and rebounds obtained from falls that gave certain constant volume of indent; Brinell hardness numbers and rebounds obtained from constant height of fall.

HEAT TRANSMISSION

DEPENDENCE ON VELOCITY. The Dependence of Heat Transmission on Velocity (Die Abhängigkeit des Wärmeüberganges von der Geschwindigkeit), Wilhelm Nusselt. Stahl u. Eisen, vol. 43, no. 14, Apr. 5, 1923, pp. 458-462, 3 figs. Development of underlying principle; rapid mathematical solution; numerical examples; possibilities of different measurement of heating surfaces.

HEATING

TESTING METHODS. Research Work on Practical Scientific Testing Methods in Heating (Relatives Forschen oder wissenschaftlich-praktische Versuchsverfahren in der Heizungstechnik), K. Brabbee. Gesundheits-Ingenieur, vol. 46, no. 16, Apr. 21, 1923, pp. 157-162, 15 figs. Methods of "absolute" measurement of efficiency of furnaces, heating and cooking apparatus, heat transmission, central heating boilers, calorific value of fuel, heat transmission of building materials, etc.

HEATING AND VENTILATION

HOSPITAL. Heating and Ventilating Plant of a Kansas City Hospital, Walter E. Gillham. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 3, Apr. 1923, pp. 289-294, 5 figs. Oil-fired supply steam for power and heating; exhaust ventilating fans in attic form main system for maintaining comfortable air conditions.

HEATING, HOT-AIR

REGISTER TEMPERATURES. Register Temperatures in Warm-Air Heating, V. S. Day. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 4, May 1923, pp. 367-369, 1 fig. Conditions to be met in designing gravity-furnace installation to operate at maximum air temperatures of 140 deg. at registers.

HEATING, STEAM

DISTRICT. District Heating Progress in Boston, D. S. Boyden. Am. Soc. Heating and Vent. Engrs. — Jl., vol. 29, no. 4, May 1923, pp. 355-365, 5 figs. Outline of equipment and rates with discussion of advantages and economics of production and distribution of steam service.

HOISTS

ELECTRIC. Calculation of Motor Performance in Electric Hoists (Berechnung der Motorleistung für elektrisch betriebene Hebezeuge) M. Otto. Praktische Maschinen-Konstrukteur, vol. 56, nos. 7-8 and 11-12, Feb. 23 and Mar. 23, 1923, pp. 72-73 and 103-105. Examples for traveling cranes, slewing cranes, etc.

HYDRAULIC TURBINES

ACTION OF WATER IN. Action and Effect of Water in Turbines and Centrifugal Pumps (Die Art der Bewegung und Wirkung des Wassers in Turbinen and Kreiselpumpen), Danckwerts. Zentralblatt der Bauverwaltung, vol. 43, nos. 25-26, Mar. 28, 1923, pp. 150-152, 11 figs. Discusses known formulas based on water-filament theory; comparative table giving data on axial, normal, low-speed, and high-speed turbines.

HIGH-SPEED SUCTION. Largest Low-Head Turbines Installed in Siphon Settings. Power, vol. 57, no. 21, May 22, 1923, pp. 784-788, 7 figs. Four turbines of high-speed suction type installed in siphon settings and equipped with hydraucone regainers, drive double generators. Installation at power house in Green Island, N.Y.

TESTING STATIONS. Testing Station of Escher Wyss & Co., Zurich (Station d'essai de la Société Escher Wyss & Cie, Zurich) R. Dubs. Bul. Technique de la Suisse Romande, vol. 49, nos. 7 and 8, Mar. 31 and Apr. 14, 1923, pp. 77-83 and 89-91, 10 figs. Details of station at Revensburg, Germany, for testing turbines of low head, and of station at Kapfnach, Switzerland, for turbines of high head, including their equipment.

HYDRO-ELECTRIC DEVELOPMENTS

HETCH HETCHY, SAN FRANCISCO. Hetch Hetchy Water Power Development, A. W. Copley. Power Plant Eng., vol. 27, no. 10, May 15, 1923, pp. 507-513, 11 figs. Details of project which will supply San Francisco with 400,000,000 gal. of water per day and develop 250,000 hp. Water wheels, generation units; transformer installation; transmission lines.

HYDRO-ELECTRIC PLANTS

AUTOMATIC. Largest Automatic Hydro-Electric Station. Power, vol. 57, no. 21, May 22, 1923, p. 789, 2 figs. Describes plant of N.E. Power Co. at Searsburg, Vt., having capacity of 5000 kw. in single unit.

FRANCE. Hydraulic Energy of the Alps, the Central Plateau and the Pyrenees (Etude sur la compensation des énergies hydrauliques des Alpes, du Plateau Central et des Pyrénées au moyen d'un réseau d'interconnexion [illegible] et de secours hydrauliques et thermiques), Ch. David and Ch. [illegible]. Revue Générale de l'Electricité, vol. 13, no. 12, Mar. 24, 1923, pp. 479-487, 8 figs. Distribution of electric energy in France by a high-tension system linking-up power stations of Alps, Central Plateau and Pyrenees.

I

ICE MANUFACTURE

Water Treatment. Lime is Basis of Water Treatment for Ice Making. Power Plant Eng., vol. 27, no. 10, May 15, 1923, pp. 535-537. Includes table showing effect on ice of various minerals contained in water and how they are eliminated.

ICE PLANTS

Brine Tanks. Some Notes on Freezing Tank Design, H. I. Lewis. Refrig. Eng., vol. 9, no. 10, Apr. 1923, pp. 301-306, 8 figs. Heat transfer in brine tank is said to be very much dependent upon hydraulics thereof; by proper attention to fundamentals of fluid flow, heat-transferring capacity of apparatus within tank can be greatly increased.

Raw-Water. Kosmos Ice Plant is Electrically Operated. Power Plant Eng., vol. 27, no. 9, May 1, 1923, pp. 455-460, 10 figs. Raw-water ice plant in Chicago installs water-softening system to reduce core-pumping costs.

IGNITION

Electric Systems. Electrical Ignition Systems, A. P. Young. Beama, vol. 12, nos. 59 and 60, Mar. and Apr. 1923, pp. 148-157 and 235-244, 37 figs. Mar.: Describes hot-wire, break-spark, trembler coil, and jump-spark ignition. Apr.: Relation to high-tension magneto. British magneto industry. Bibliography.

IMPACT TESTING

Izod Test. The Izod Impact Test, J. H. Andrew and Robert Hay. West of Scotland Iron and Steel Inst. — Jl., vol. 30, part 4, Jan. session 1922-23, pp. 48-51 and (discussion) 51-53, 11 figs. on supp. plate. Results of experiments on carbon steels low in manganese.

Metals. Some Experiments on Impacts, Junzô Okubo. Tôhoku Imperial University — Sci. Reports, vol. 11, no. 6, Dec. 1922, pp. 455-461, 4 figs. Results of author's observations on impact phenomena and conclusions regarding mechanical properties of metals based on experimental data.

INDICATORS

Hydraulic Pressure. Hydraulic Pressure Indicator, John N. Sioussa. Machy. (N.Y.), vol. 29, no. 9, May 1923, pp. 708, 1 fig. Device for determining pressures of more than 100,000 lb. per sq. in.

INDUSTRIAL MANAGEMENT

Engineering Department. The Successful Operation of an Engineering Department, W. E. Irish. Indus. Management (N.Y.), vol. 65, no. 5, May 1923, pp. 292-299. The engineer's pay.

Paper Industry. Management Engineering in the Paper Industry, R. B. Wolf. Mech. Engr., vol. 45, no. 5, May 1923, pp. 295-296. Measurement of performance a factor in good management; points out that industry should be organized to encourage rather than repress individual development.

Planning Department. The Planing Department, J. Knowles. Indus. Management (Lond.), vol. 9, nos. 7 and 9, Apr. 5 and 19, 1923, pp. 199-201 and 228-230, 7 figs. Practical advice on organization of this department, and examples of works records in common use.

Progress. The Management Movement, Richard H. Lansburgh. Taylor Soc. — Bul., vol. 8, no. 2, Apr. 1923, pp. 46-52. The work of Frederick W. Taylor and growth of management movement; effect of war in changing operating methods in American industry, interest of public is considered best criterion for continued growth of management movement.

Taylor System. Notes on the Taylor System (Remarques sur les méthodes de Taylor), H. Pillet Arts et Métiers, vol. 75, no. 27, Dec. 1922, pp. 361-366, 3 figs.

Time Study. *See Time Study.*

INDUSTRIAL RELATIONS

Improvement in. Is There Enough Leadership in Management To-day? A. B. Farquhar. Factory, vol. 30, no. 5, May 1923, pp. 535-537. In author's opinion, change that has come in status of employer and employed is not to be deplored; point way toward even better relations in future.

INLAND WATERWAYS

Interrelationship to Highways. The Interrelationship of Highways and Waterways, F. W. Fenn. World Ports, vol. 11, no. 6, Apr. 1923, pp. 31-38. Describes plan with reference to New York State Barge Canal in combination with motor trucks.

INTERNAL-COMBUSTION ENGINES

Two-Stroke, Development of. Development of the Two-Stroke Engine (Zur Weiterentwicklung des Zweitaktmotores), Curt Hanfland. Motor u. Auto, vol. 20, no. 6, Mar. 25, 1923, pp. 42-44, 3 figs. Discusses two-channel and three-channel systems of construction; 2-stroke engines with rotary compressors; comparison with 4-stroke engine.

See also Airplane Engines; Automobile Engines; Diesel Engines; Gas Engines.

IRON

Chromizing. Chromizing, F. C. Kelley. Am. Electrochem. Soc. advance paper, no. 19, for meeting May 7, 1923, pp. 233-250, 8 figs. Summary of work done on diffusion of metals in solid state, process of chromizing and its effects upon physical and chemical properties of iron; practical application of process.

Grain Growth. Some Experiments on Grain Growth in Iron and Steel, L. E. Benson and F. C. Thompson. Iron and Steel Inst., advance paper, no. 4, for meeting May 1923, 19 pp., 14 figs. Investigation of crystal growth during annealing in ferrous materials, work is confined to temperatures not exceeding 800 deg. cent. and deals with influence of composition only so far as carbon and manganese are concerned.

Gray, Graphite in. Graphite Controls Gray Iron, J. W. Bolton. Foundry, vol. 51, no. 10, May 15, 1923, pp. 405-407, 12 figs. Points out that size of flakes influences quality, high carbon sometimes stronger than lower carbon irons, need shown of standard testing methods and research on fundamental principles. Paper read before Am. Foundrymen's Assn.

IRON ALLOYS

Electro-Chemical Behavior. Electro-Chemical Behavior of Alloys of Iron With Chromium, Iron With Molybdenum and Iron With Aluminum (Ueber das elektrochemische Verhalten der Legierungen des Eisens mit Chrom, des Eisens mit [illegible] Zeit. [illegible] Allgemeine Chemie, vol. 127 [illegible] 1923, pp. 257-272, 10 figs. [illegible] anodic and cathodic passivity and attempt [illegible]

Iron-Carbon-Silicon. On the Structural Constitution of Iron-Carbon-Silicon Alloys, Kotaro Honda and [illegible]. Iron and Steel Inst., advance paper, no. 13, for meeting May 1923, [illegible] pp., [illegible] figs. [illegible] thermal and magnetic [illegible] at high temperature, structural constitution, microscopic investigation.

Iron-Nickel. The Constitution of the Alloys of Iron and Nickel, D. Hanson and J. R. Freeman, Jr. Iron and Steel Inst., advance paper, no. 11, for meeting May 1923, 14 pp., 6 figs. Research undertaken at Nat. Physical Laboratory. Determination of constitution of alloys up to their melting points.

IRON AND STEEL

Corrosion. Corrosion of Rustproofed Iron and Steel, W. P. Wood. Chem. and Met. Eng., vol. 28, no. 17, Apr. 30, 1923, pp. 769-772, 1 fig. Galvanizing said to be best method of protecting against rusting when immersed in fresh water saturated with oxygen; uncoated iron and low-carbon steel corrode at about equal rates under those conditions.

Production and Consumption. Iron Ore, Pig Iron and Steel in 1921, Ernest F. Burchard and Hubert W. Davis. U. S. Geological Survey, no. 1: 30, Apr. 23, 1923, pp. 565-597, 4 figs. Quantities of iron ore mined and shipped; total output, principal mines, and prices per ton of iron ore; iron ore mining developments; foreign trade in iron ore; production of iron ore by countries; production, shipments, and prices of pig iron; blast furnaces for pig iron; imports and exports of ferro-alloys; production and foreign trade in steel.

IRON CASTINGS

Automotive. Studies Automotive Castings, H. B. Swan. Foundry, vol. 51, no. 10, May 15, 1923, pp. 414-418, 4 tables. Data collected and compiled shows variations in constituents of metal used by different manufacturers; total carbon content governed by height of bed; steel additions do not lower it. Paper presented before Am. Foundrymen's Assn.

Feeding Heads. Facts About Sound Castings, Feeding Heads, Runners and Venting, E. V. Ronceray. Foundry Trade Jl., vol. 27, no. 347, Apr. 12, 1923, pp. 289-294, 12 figs. Results of author's experience in past year. Leonard's experiments; O. Smalley's researches. See also (discussion), no. 349, Apr. 26, 1923, pp. 336-340, 3 figs.

Foundry Methods. Castings Given Pressure Test, H. E. Diller. Foundry, vol. 51, no. 9, May 1, 1923, pp. 354-362, 19 figs. Complicated work made airtight by skillful method of gating and judicious use of risers. Describes procedure of foundry making light and medium gray-iron and semi-steel castings of every description.

Gray-Iron. Compares Practice in Gray Iron, H. B. Swan. Iron Trade Rev., vol. 72, no. 20, May 17, 1923, pp. 1445-1458. Data on automotive castings compiled from questionnaires returned by 16 plants; for engine cylinders scrap steel of fairly good section, such as rails, produces best results. (Abstract.) Paper read before Am. Foundrymen's Assn.

Manufacturing Gray Iron Castings at the Plant of the Best Steel Casting Company, C. A. Handschin. West. Machy. World, vol. 14, no. 4, Apr. 1923, pp. 123-125, 9 figs. Description of methods and equipment used in different departments.

IRON, PIG

Constituent Elements. How the Constituent Elements of Pig Iron are Determined. Raw Material, vol. 5, no. 11, Dec. 1922, pp. 420-423 and vol. 6, no. 1, Jan. 1923, pp. 15-16. Methods of chemists of U.S. Steel Corp. for sampling and analysis of pig iron. Dec. Determination of silicon and sulphur. Jan. Phosphorus.

INSULATORS, ELECTRIC

Design and Manufacture. The Design and Manufacture of Insulators, K. A. Hawley. Tech. Eng. News, vol. , no. 2, May 1923, pp. 49, 70, 72 and 74, 3 figs. Discusses insulators for transmission lines.

INVAR

Properties and Uses. Invar and Elinvar (L'Invar and l'Elinvar), Ch.-Ed. Guillaume. Nature, no. 2559, Apr. 21, 1923, pp. 250-254, 4 figs. New researches; on properties and uses.

J

JIGS

Bushings for. Standard Jig Bushings. Am. Mach., vol. 58, no. 17, Apr. 26, 1923, pp. 625-626, 5 figs. System known as Briney standard comprises both liner and wearing bushings; coking method requires use of neither screws nor pins. Data as to range of sizes together with all dimensions.

L

LABOUR

Wages and Hours. Wages and Hours of Labour. Monthly Labour Rev., vol. 16, no. 2, Feb. 1923, pp. 132-165. Wage rates on American and foreign cargo steamships, 1922. International comparison of real wages. Wages and hours of labour in Australia; Belgian coal mines; Canada; Hamburg, Germany; British railway service. Leave with pay in British industries. Wages of European workers in S. Africa.

LATHES

Countershafts. Lathe Countershafts, Hubert Bentley. Mech. World, vol. 73, no. 1892, Apr. 6, 1923, pp. 210-211, 6 figs. Considers various pulley arrangements applicable to one- and two-speed countershafts and reversing countershafts, together with mechanism for appropriately shifting belt from fast to loose pulley, and vice versa.

LIGHTNING ARRESTERS

Autovalve. 1922 Developments in Autovalve Lightning Arresters, A. L. Atherton. Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 5, May 1923, pp. 485-490, 8 figs. Deals with research, development and test, commercial forms of arresters are shown and performance characteristics described, test methods and results.

LIME

Plants. Few Men Needed at This Stone and Lime Plant. Rock Products, vol. 26, no. 7, Apr. 7, 1923, pp. 17-2[illegible], 6 figs. [illegible] Stone and Lime Co., [illegible], Pa., produces 1500 tons crushed stone and 125 tons lime per day, [illegible]

LIQUIDS

Weighing Meter. A New Weighing Meter for Liquids. [illegible]

LOCOMOTIVE BOILERS

Tube Expanders. Types of Tube Expanders Used in French Shops, [illegible] Boiler Maker, [illegible] types of tube expanders used in France[illegible] almost exclusively used.

Water Circulation. Locomotive Boiler Water Circulation, C. A. Selby. Southern and Southwest Ry. Club — Proc., vol. 17, no. 2, Mar. 1923, pp. 10, 13-14, 17-18, 21-22 and 2 and discussion 25-26, 29-30 and 33-34, 2 figs. Also Ry. Mech. Engr., vol. 97, no. 4, May 1923, pp. 274-275. Details of Nicholson thermic syphon which can be applied to firebox of any locomotive, and functions which it will perform.

LOCOMOTIVES

Crossheads. Unique Type of Crosshead for Heavy Locomotives. Ry. Mech. Engr., vol. 97, no. 5, May 1923, pp. 268-270, 6 figs. After extended experiments Pa. R.R. adopts crosshead with large bearings which greatly increase durability.

Design. As to the Locomotive, What Next? C. M. Bastord. Jl. Pac. Ry. Club — Proc., vol. 6, no. 12, Mar. 1923, pp. 7, 9, 11, 13, 15, 17, 19-32 and (discussion) 32-35, 6 figs. Notes on locomotive co-ordination factors; problems of design, dealing with superheaters, feedwater heaters, mechanical stokers, improved valve, motion water purification, steam separators, lubrication, boosters, ashpans, grates, etc., threatening limit to locomotive progress.

Improvement Possibilities. Possibilities of Increased Efficiency in Railway Locomotives, T. Grime. North-East Coast Instn. Engrs. and Ship builders, advance paper for meeting Apr. 20, 1923, 21 pp., 5 figs. Thermal efficiency of steam locomotive; developments which may be expected in construction of condensing steam locomotives, electrification of railways, and development of internal-combustion engine. Appendix presents records of results attained in actual practice on various railways.

Steam Production and Use. Economic Production and Use of Steam on Locomotives. Int. Ry. Congress Assn. — Bul., vol. 5, no. 4, Apr. 1923, pp. 292-328, 3 figs. Discussion on superheating of steam, compounding, heating feedwater, and special devices, including water-tube boilers, etc. Also includes following articles: Development of Steam Locomotive in North America, by G. L. Bourne; Apparatus for Bringing Coal Forward on Locomotive Tenders, Halla-Haken System, by Paul Koller; Note on Hot Water Washing Out Plant at Locomotive Shed at St. Lorenzo, Rome, by R. Cassinis.

Trucks, Axles, and Springs. Bogies (Trucks), Axles and Springs of Locomotives. Int. Ry. Congress Assn. — Bul., vol. 5, no. 4, Apr. 1923, pp. 329-343. Discussion on best arrangement of bogies, axles and springs of locomotives, especially of locomotives for high speeds, with long wheelbases, so as to facilitate running round curves and to insure proper stability of engines.

Valve Gears. Graphical Kinematics in the Construction of Stephenson Links for Locomotives with Poppet Valve Gear (Zeichnende Kinematik im Bau von Kulissensteuerungen für Lokomotiven mit Ventilsteuerung), Rudolf Laugner. Glasers Annalen, vol. 92, no. 7, Apr. 1, 1923, pp. 101-105, 7 figs. Method of determining, from initial speed of driving-crank and fly-crank pin, speed and acceleration of point connected with valve-gear shaft.

The Walschaert Gear Adapted to Inside Cylinder Locomotives. Engineering, vol. 115, no. 2993, May 11, 1923, pp. 596-597, 3 figs. Recent adaptation of gear to inside-cylinder engine.

LUBRICATING OILS

Manufacture and Application. Lubricants, Their Manufacture, Testing and Application (Schmiermittel, ihre Herstellung, Prüfung und Verwendung), Georg Wolff. Praktische Maschinen-Konstrukteur, vol. 56, nos. 9-10, Mar. 9, 1923, pp. 87-89. Discusses various types of lubricating oils, their properties, viscosity, flash-point, etc., and their behavior in lubrication.

Tests. Testing the Quality of Lubricating Oils, Winslow H. Herschel. Engrs.' Soc. West. Pa. — Proc., vol. 38, no. 10, Jan. 1923, pp. 503-518 and (discussion) 519-541, 1 fig. Of tests in general use, gravity is necessary to determine absolute viscosity; fire and flashpoints are inadequate substitutes for evaporation test or fractional distillation; and pour point and viscosity determine suitability but not quality. Bibliography.

Viscosity. Viscosity of Lubricating Oils at High Pressures. Mech. Engr., vol. 45, no. 5, May 1923, p. 315. Progress report of special research committee on lubrication.

M

MAGNESIUM ALLOYS

Electron Metal. Electron Metal (Le métal électron). H. Kalpers. Fonderie Moderne, vol. 17, Mar. 1923, pp. 74-76, 1 fig. Contains 80 per cent magnesium, plus zinc, etc.; foundry sand and its preparation.

MALLEABLE CASTINGS

Failures. Some Failures in Malleable Castings, F. H. Herren. Foundry Trade Jl., vol. 27, no. 347, Apr. 12, 1923, pp. 295-297 and (discussion) 297-298. Time losses in experimenting in author's firm; possible variations; metallurgical failures; skin defects; draws; fragile castings; hard spots from grinding; failures from cans; effect of silicon; etc.

MALLEABLE IRON

Melting. Melting Small Lots of Malleable Iron, S. J. Felton. Iron Trade Rev., vol. 72, no. 18, May 3, 1923, pp. 1302-1303. Discussion based on use of 500- and 1000-lb., horizontal, barrel-type, non-crucible, tilting furnaces using oil as fuel. (Abstract.) Paper read before Am. Foundrymen's Assn.

Production. Notes on Malleable Iron Production, W. H. Poole. Foundry Trade Jl., vol. 27, nos. 348 and 349, Apr. 19 and 26, 1923, pp. 309-311 and 329-331, 13 figs. Deals essentially with Reaumur-type malleable iron, generally known as white-heart malleable.

MANOMETERS

Liquid. New Liquid Manometers and Their Application to Heating and Ventilation (Neue Flüssigkeits manometer und deren Anwendung in der Heizungsund Luftungstechnik), E. Nickel. Feuerungstechnik, vol. 11, no. 12, Mar. 15, 1923, pp. 137-140, 7 figs. Describes improvements in that type of manometer which, through inclined position of measuring tube, gives magnification of relatively low pressures.

MATERIALS

Strength-Weight Factors. Material Selection Should Be Based on Strength-Weight Factors, Horace C. Knerr. Automotive Industries, vol. 48, no. 16, Apr. 19, 1923, pp. 868-872. Use of strength-weight factors in comparing materials; presents tables of strength-weight factors of metals; wood; rope, cable, thread, etc.; fabric, paper, etc.; and miscellaneous materials.

MEASUREMENTS

Length. Industrial Length Measures (La fot des longueurs industrielles), F. Bayle. Technique Moderne, vol. 15, nos. 5, 6 and 7, Mar. 1, 15 and Apr. 1, 1923, pp. 129-124, 165-169 and 209-211, 7 figs. Necessity for standardization; principles of standardization; units of length; national and international law for length measure; advantages of a universal length measure.

MEASURING INSTRUMENTS

Plastic Materials. New Device for Measuring Consistency and Plasticity of Plastic Materials. Rubber Products, vol. 20, no. 7, Apr. 7, 1923, p. 47, 1 fig. Describes device for measuring consistency and plasticity of cement, clay and gypsum that promises satisfactory and has been accepted as more practical and practical than "slump test" or "flow table."

METAL DRAWING

Power Required. Power Required for Drawing Metal (Kraftbedarf zum Ziehen), Hermann Jäger. Werkstattstechnik, vol. 17, no. 7, Apr. 1, 1923, pp. 193-197, 8 figs. Mechanics of producing iron and steel rods by drawing through a die; deformation of metal in process of drawing; calculation of strains and stresses; drawing-power formulas.

METALS

Calorizing. Minimizing Heat Oxidation of Metals. Power Engr., vol. 18, no. 204, Mar. 1923, pp. 95-96, 3 figs. Points out that very definite economies in replacement of metal parts subjected to heat are possible by their treatment by calorizing process.

Crystallization. A Note on the Systems in Which Metals Crystallize, John L. Haughton and G. Winifred Ford. Faraday Soc. — Trans., vol. 18, part 1, no. 52, Oct. 1922, pp. 112-118, 2 figs. It is shown that in most cases system in which metal crystallizes is dependent on its position in periodic table in nearly every case, alloys which form homogeneous series of solid solutions right across diagram crystallize in same system.

Deformation. Permanent Deformation of Metals (Sur les déformations permanentes des métaux), A. H. Leblond. Revue de Métallurgie, vol. 20, no. 4, Apr. 1923, pp. 250-256, 10 figs. Results of experiments with various metals strained beyond their elastic limit.

Fatigue. An Investigation of the Fatigue of Metals, Series of 1922, H. F. Moore and T. M. Jasper. University of Ill. Bull., vol. 20, no. 37, May 14, 1923, 97 pp., 45 figs. Investigation by Eng. Experiment Station of University. Endurance limit for wrought ferrous metals under reversed stress; miscellaneous tests and results; resistance to repeated stress other than reversed stress; unsolved problems; testing machine for tests of metals under reversed bending.

Mechanically Stressed, Behavior of. The Behavior of Mechanically-Stressed Metals (Das Verhalten mechanische beanspruchter Metalle), E. Honegger. Eisenbau, vol. 13, nos. 3, 4 and 5, Mar. 17, Apr. 21 and May 16, 1922, pp. 47-51, 77-89 and 95-100, 22 figs. Life of various elements of machines and structures; static problems; experimental investigation of deformations and distribution of stress; fracture; X-ray examination. Bibliography.

Temperature Effect on Strength. The Influence of Temperature on the Strength of Material. Mar. Engr. and Naval Architect, vol. 46, no. 547, Apr. 1923, pp. 125-126 and 137, 1 fig. Deterioration of metal and reduction of strength, due to continuous application of high temperatures, in internal-combustion turbine; increase of working temperatures of modern prime mover.

MILLING MACHINES

Automatic. Cincinnati 48-Inch Worm-Driven Automatic Milling Machine. Am. Mach., vol. 58, no. 18, May 3, 1923, pp. 645-648, 9 figs. Worm drive on spindle is feature; made in duplex, widened duplex and plain models; single-pulley drive and intermittent feed; examples of work done.

Plate-Scarfing. Double-headed Milling Machine for Scarfing Plates. Engineer, vol. 135, no. 3512, Apr. 20, 1923, p. 418, 3 figs. Machine for performing scarfing of plates used in manufacture of steel pipe lines.

MOTOR BUSES

Clydesdale. Clydesdale Designs Special Bus. Motor Transport (N.Y.), vol. 28, no. 7, May 1, 1923, pp. 172-174, 7 figs. Chassis can be adapted for any body; 4-wheel brakes; capacity 12 to 25 passengers; 6-cylinder 70-b.hp. at 2200 r.p.m. engine.

Lancia. The Lancia Coach. Motor Transport, vol. 36, no. 945, Apr. 9, 1923, pp. 445-447, 11 figs. Details of 20-seater vehicle designed to provide travelling comfort of high-class light car; 35-hp. four-cylinder monobloc type engine.

MOTOR-TRUCK TRANSPORTATION

Railway Terminals. English Cartage-Practice a Standard for Our Railway-Terminal Trucking, F. C. Horner. Soc. Automotive Engrs. — Jl., vol. 12, no. 5, May 1923, pp. 437-445, 6 figs. Discusses English system under two main divisions of delivery and collection; outlines field for motor truck in railway-terminal service; merits and demerits of unit containers; English "flats," or demountable bodies.

MOTOR TRUCKS

Development. What Is Right with the Motor Truck Industry, Stephen G. Thompson. Soc. Automotive Engrs. — Jl., vol. 12, no. 5, May 1923, pp. 446-448. Author presents statistical data showing that there is nothing fundamentally wrong with motor-truck industry.

Operating Costs. Truck Operating Costs, Ben H. Petty. Purdue University Eng. Experiment Station — Bul. no. 10, vol. 7, no. 1, Feb. 1923, 44 pp., 13 figs. Development of motor-truck transportation; motor truck vs. railroad; failures; items considered in cost system; relative importance of cost items; analysis of factors governing motor-truck operating costs; systems for recording operating cost data — National standard truck-cost system. Bibliography.

Steam. Steaming Up 1 in 4½. Motor Transport, vol. 36, no. 947, Apr. 23, 1923, pp. 498-499, 3 figs. Details of new 6-ton Mann truck and test made; normal consumption figures.

The Super-Sentinel. Motor Transport (Lond.), vol. 36, no. 946, Apr. 16, 1923, pp. 469-472, 7 figs. Details of 6-ton steam truck, manufactured by Sentinel Wagon Works, Ltd., Shrewsbury, Eng., driven by side chains; new design of steam generator.

O

OPEN-HEARTH FURNACES

Improvements. Progress in Martin Steel Works. (Les progrès réalisés dans les aciéries Martin), A. Berberot. Revue de Métallurgie, vol. 20, nos. 1 and 2, Jan. and Feb. 1923, pp. 1-26 and 95-111, 21 figs. Steel manufacture in open-hearth furnaces; development of regeneration of lost heat; gas producers of various types; furnaces; utilization of heat of flue gases; Hoesch process with oscillating furnace; Talbot process; Duplex process.

OXY-ACETYLENE WELDING

Tanks. Fabricating Storage Tanks by Oxy-Acetylene Welding. Boiler Maker, vol. 23, no. 4, Apr. 1923, pp. 87-90, 8 figs. Methods employed by a producer of gasoline storage tanks to speed up output and increase economy of operation of his plant.

Training Welders. Training Course for Oxy-Acetylene Welders. Am. Welding Soc. — Jl., vol. 2, no. 4, Apr. 1923, pp. 31-57. Report prepared by committee of Am. Bur. of Welding, giving analysis of work of oxy-acetylene or gas welder.

P

PAINTS

Films, Microstructure of. Microstructure of Paint Films, Harold L. Maxwell. Chem, and Met. Eng., vol. 25, no. 19, May 14, 1923, pp. 850-852, 10 figs. Attempt to determine relation between microstructure and protective value of certain paints and pigments.

Fire-Retardant. Report of Fire Retardant Paints for Shingle Roofs, Henry A. Gardner Paint Mfrs. Assn. of U.S., Scientific Section, Circular No. 175, May 1923, pp. 186-206, 17 figs. Details of tests made and results obtained with a type of paint named Pamak developed by author to prevent fire occurring from flying cinders of passing locomotives or from near-by conflagrations. Note on newer uses for roof paints.

Plasticity. A Study of the Plasticity of Paint, Eugene C. Bingham, Herbert D. Bruce and Martin O. Wolbach. Franklin Inst. — Jl., vol. 195, no. 3, Mar. 1923, pp. 303-317, 2 figs. Materials and method of measurement; densities of mixtures were calculated on assumption that there is neither expansion nor contraction in volume on mixing; conclusions, based on results.

Marine-Borer. Marine Borer Paints, Henry A. Gardner. Paint Mfrs. Assn. of U.S. Scientific Section, Circular No. 176, May 1923, pp. 207-219, 8 figs. Details of tests made with various paints and results obtained.

Reflection Factors. The Influence of Paint on Interior Illumination, R. L. Hallett, and Paint Characteristics and Conditions to be Considered in Effecting Better Illumination, C. H. Bryce. Illuminating Eng. Soc. — Trans., vol. 18, no. 4, Apr. 1923, pp. 338-354 and (discussion) 357-365. First article deals with effect of colour and surface finish on reflection of light, and reflection properties of paint made with various materials. Second article discusses use of paint under artificial light and daylight; data on variation of reflection factors of various paints.

PAPER MANUFACTURE

Corrosive Solutions, Handling of. Handling Corrosive Solutions. Paper, vol. 31, no. 26, Apr. 18, 1923, pp. 110, 112 and 116, 4 figs. Discusses duriron, an iron alloy having a very high silicon content, and its use for pipe, valves, pumps, etc., to eliminate deterioration of plant equipment due to chemical action of chlorine and sulphite bleach solutions necessary manufacture of paper.

Froth Troubles. Froth Troubles in Papermaking, R. B. Best. Paper, vol. 32, no 1, Apr 25, 1923, pp 9 and 22. Some of the causes of annoying formation of foam and how they may be overcome. Paper read at session of Tech. Assn. Pulp and Paper Industry at Paper Industries Exposition.

Sizing. Ten Difficulties Experienced in Engine Sizing, E. C. Tucker. Paper Trade Jl., vol 76, no 18, May 3, 1923, pp. 47-49. General discussion on mechanism of process of sizing paper with rosin and aluminum sulphate; difficulties that are experienced in rosin sizing, and possible ways of solution of difficulties.

PAPER MILLS

Machinery Lubrication. Lubrication and Its Relation to Paper Making, A. A. Capelle. Paper Trade Jl., vol 76, no. 15, Apr. 12, 1923, pp. 193, 195 and 197. Discusses high grade lubricants, where to apply oil on machine, and proper way of applying oil. Read before Tech. Assn Pulp and Paper Industry convention. See also Paper, vol 31, no. 26, Apr. 18, 1923, pp. 122 and 124-126.

Steam Economy. Steam Economy in Paper and Pulp Mills, E. P. Gleason. Paper Trade Jl., vol. 76, no. 15, Apr. 12, 1923, pp. 199-201, 203, 205 and 207, 8 figs. Generation of steam in boiler room, and distribution and use of steam in mill. Read before Tech Assn Pulp and Paper Industry.

Ventilation. Heat Transference in the Ventilation of Machine Rooms, J. O Ross. Paper Trade Jl., vol 76, no 15, Apr. 12, 1923, pp. 167-169. Efficiency of vapor removal; agitation to do away with removal of hoods; proper method of introducing air; heat recovery; etc. See also Paper, vol. 31, no. 26, Apr. 18, 1923, pp. 69-72.

PATTERNS

Foundry. Metal Patterns for the Foundry, J. F. Hines. Machy. (N.Y.), vol. 29, May 1923, pp. 695-697, 5 figs. Describes metal patterns developed to produce accurate molds.

PAVEMENTS

City. Symposium on City Pavements, Boston Soc. Civ Engrs. — Jl., vol. 10, no. 5, May 1923, pp. 187-215 and (discussion) 215-220, 5 figs. Contains following papers: Cambridge Pavements, Lewis M. Hastings; Notes on Roadway Surfacing and Maintenance Treatments, Newton, Edwin H. Rogers; Brookline pavements, Henry A. Varney; History of New Bedford Pavements, George H. Nye; Fitchburg pavements, David A. Hartwell; Worcester Pavements, J. C. Blake; Repair and Maintenance of Boston Street Surfaces, Edgar S. Dorr.

PAVEMENT, BRICK

Bases. Broken Stone Bases and Brick Pavements, Charles Carroll Brown. Public Works, vol 54, no 4, Apr 1923, pp 117-121. Discussion of tests made on Bates Experiments Highway and some conclusions and lessons drawn therefrom.

PETROLEUM

World Supply. The Oil Supply of the World, David White. Automotive Mfr., vol 65, no 1, Apr 1923, pp 17-20. Estimates of oil resources of the various regions of the earth, economic future as to oil in United States; measures necessary to be taken in order to increase and conserve domestic supply. Paper slightly abridged presented before Local Session A.S.M.E.

PIPE, STEEL

Water Mains. Steel Pipe for Large Water Mains, Theodore A. Leisen. Am Water Works Assn. — Jl., vol 10, no 3, May 1923, pp 393-399. Notes on selection, cost, life, strength and types of steel pipe; coating.

PIPE, WOOD STAVE

Pressure. Calculation of Wood Stave Pressure Pipes (Berechnung von hölzernen, aus Lamellen [illegible] zusammengesetzten Druckrohrleitungen), [illegible] Schmitt. Zeit. des Oesterr. Ingenieur u. Architekten Vereines, vol. 75, nos 9-10, Mar 9, 1923, pp [illegible], 3 figs. Formulae and calculations.

Manufacture. [illegible] Large Steel Pipe, Ellis H. Custer. Am Mach., vol 58, no 19, May 10, 1923, pp [illegible], 5 figs. Plate [illegible] in rotary shearing machine, rivet holes drilled by [illegible], press and dies used for curving plate, riveting and caulking.

PORTS

Facilities. Port Facilities. World Ports, vol 11, no 6, Apr 1923. Contains following articles: Port Facilities from the Viewpoint of the Steamship Line, [illegible] W. Cook, pp 17-24; Port Facilities from the Viewpoint of the Railroad, Paul [illegible], pp 25-[illegible].

POWER FACTOR

Measuring Instruments. Modern Measuring Instruments for Control of Power Factor (Neuere Messgeräte zur Ueberwachung des Leistungsfaktors und der Blindleistung), Fr. Voller. Elektrotechnische Zeit., vol. 44, no. 14, Apr. 5, 1923, pp. 312-314, 7 figs. Operation of phasemeter developed from alternating action of 3-phase and alternating field; recording phasemeters with automatic reversal; power-factor measurement with phases of unequal load; blind power and current meters; power-factor relays.

POWER TRANSMISSION

Radio. Can Power Be Transmitted by Radio? Power Plant Eng., vol. 27, no. 9, May 1, 1923, pp. 482-484, 2 figs. Principles of radio phenomena; possibilities of reflecting or refracting waves; use of standing waves.

PRESSWORK

Blanking Process. How the Blanking Process Is Used to Make a Sheet Metal Sleeve, C. J. Dorer. Am. Mach., vol. 58, no. 17, Apr. 26, 1923, pp. 609-612, 6 figs. Four operations necessary; making die oversize; how blanking die operates; designing piercing die stripper and punch pad; two forming dies used.

PULVERIZED COAL

Advantages and Disadvantages. Powdered Coal as Fuel, J. T. Dunn. North East Coast Instn. Engrs. and Shipbldrs., advance paper for meeting Apr. 6, 1923, No. 2733R, 8 pp. Discusses typical installations for burning of pulverized coal; systems of transport of coal from pulverizer to furnace burner, comparing Fuller-Kinyon and Holbeck systems; advantages and disadvantages; costs. See also Chem. Trade Jl., vol. 72, no. 1873, Apr. 13, 1923, pp. 444-446.

Cement Mills. The Use of Pulverized Coal, H. A. Schaffer. Power, vol. 57, no. 19, May 8, 1923, pp. 718-719. Experience gained through use of powdered coal in process of cement manufacture, especially with reference to handling.

Development. The Development of Pulverized Fuel, David Brownlie. Chem. Trade Jl., vol. 72, no. 1873, Apr. 13, 1923, pp. 443-444. Serious rival to mechanical stoking; résumé of rapid development and reasons for it; advantages and disadvantages.

Drying Before Pulverization. Why Dry Coal Before Pulverization and Combustion? E. R. Knowles. Combustion, vol. 8, no 5, May 1923, pp. 311-312. States that "imperative necessity" is too strong a term to be used in considering the dryer question.

Malleable-Iron Foundries. Use Powdered Coal for Malleable, E. E. Griest. Iron Trade Rev., vol. 72, nos. 18 and 19, May 3 and 10, 1923, pp. 1309-1314 and 1387-1392, 7 figs. Application of pulverized fuel to air furnaces for melting points way to further advancement; use for annealing already established; equipment for crushing and handling coal; operating data. Paper presented before Am. Foundrymen's Assn

Power Plants. Providence Plant Installs Pulverized-Fuel Equipment. Power, vol. 57, no. 18, May 1, 1923, pp. 680-681, 2 figs. Details of boiler plant, driers, pulverizers and seperators.

Pulverized Fuel Plant at Providence. Elec. Ry. Jl., vol. 61, no.. 28, 1923, pp. 725-727, 3 figs. United Elec. Rys. is making power-plant improvements to cost upward of million dollars; new boilers equipped to burn pulverized coal are being installed in one-half of boiler house.

Preparation and Combustion. Preparation, Transportation, and Combustion of Powdered Coal, John Blizard. U.S. Bur. of Mines, Bul. 217, 1923, 122 pp., 42 figs partly on supp plates. Drying and pulverizing; indirect and direct systems of distribution; fan at furnace system of feeders, mixers and burners; uses of powdered coal; powdered coal for steam raising, and types of boilers to which it is adaptable; costs of preparing and delivering powdered coal to furnace, danger from use of powdered coal; boiler tests with powdered coal.

PUMPS

Rotary. The Stone-Hodgson Rotary Pump. Engineering, vol. 115, no. 2989, Apr. 13, 1923, p. 459, 6 figs. Small and simple pump for service with viscous fluids, also suitable for pumping water for domestic, sanitary and general purposes.

PUMPS, CENTRIFUGAL

Coal Mines. Power in Colliery Working, J. Kirsopp. Power Engr., vol 18, nos. 204 and 205, Mar and Apr 1923, pp 97-99 and 147-149, 7 figs. Mar.: Modern designs of centrifugal pumps suited to mining requirements. Apr.: Electrically driven sinking pumps.

Diffusers. The Diffuser (Le Diffuseur), Raymond Defeld. France-Belgique, vol. 3, no. 3, Mar 1923, pp 106-111, 9 figs. Deals with diffusers of centrifugal pumps. Action of various types of blades.

R

RADIOTELEGRAPHY

Amplifiers. Various Systems of Amplifiers (A propos des divers schemas d'amplificateurs), L. Brillouin. Radioelectricité, vol 4, no 3, Mar 1923, pp 109-113, 9 figs. Construction and operation of transformer and resistance amplifiers of various types.

Antennas. The Wave Antenna, Harold H. Beverage, Chester W. Rice and Edward W. Kellog. Am Inst Elec Engrs. — Jl., vol 42, nos 3, 4 and 5, Mar., Apr. and May 1923, pp 258-269, 372-381 and 510-519, 40 figs. Describes new type of highly directive antenna, consisting of two copper wires on line of poles, which has made possible simultaneous reception of large number of messages by one antenna, and automatic relaying of messages over land and wires; practical engineering problems in connection with wave antenna, including its application to short wave reception.

Signaling. The Measurement of the Electric Intensity of Received Radio Signals, J. Hollingworth. Instn. Elec. Engrs. — Jl., vol 61, no 317, Apr 1923, pp 501-509 and discussion 510-516, 5 figs. Discusses principles on which measurement is based, and practical application of these principles under working conditions. Describes system developed at Nat. Physical Laboratory which differs in several details from previous systems.

Transatlantic. Transatlantic Tests (Les essais transatlantiques). Onde Electrique, vol 2, no 15, Mar 1923, pp [illegible], [illegible] figs. Report of [illegible] of tests carried out in Dec. 1922 between [illegible] and [illegible].

Transmission Measurements. Radio Transmission Measurements, [illegible]. Inst Radio Engrs. — Proc., vol 11, no 2, Apr 1923, pp [illegible]. Analysis of radio transmission circuits; [illegible] [illegible] method of measuring radio [illegible].

RAILWAY ELECTRIFICATION

Italy. Electrification of the [illegible] [illegible] [illegible]

RAILWAY MANAGEMENT

CANADA. Re Organization of the Canadian National Railways. Ry Gaz., vol 38, no. 16 Apr 13 1923, pp. 589-591, 1 fig. System, comprising 22,000 route miles of line, has been divided into three regions for operating purposes, and new organization, termed Strengthened Divisional Scheme, has been introduced.

PURCHASE AND STORES DEPARTMENT. Control of Purchases and Stores on the C. & O. Ry. Ry. Rev., vol. 72, no. 19, May 12, 1923, pp. 795-814, 63 figs. Account of what has been accomplished in past two years; organization, methods and policies responsible for rapid deflation in surplus material stocks and improvement in supply service.

RAILWAY MOTOR CARS

CANADA. Rendering a Service That the Modern Public Want. Ry. Rev., vol. 72, no. 17, Apr. 28, 1923, pp. 715-719, 5 figs. Self-propelled car destined to become potent factor in Can. Nat. Ry. service.

STORAGE-BATTERY. Storage Battery Cars on the Canadian National, F. B. Walker. Ry. Age, vol. 74, no. 23, May 12, 1923, pp. 1147-1150, 5 figs. Cars maintain schedules which would be difficult for steam trains; operating costs low.

TRAIN CONTROL. Automatic Train Control Developments. Ry. Elec. Engr., vol. 14, no. 4, Apr 1923, pp. 116-120, 4 figs. Describes Richards automatic system, which is of intermittent non-contact, magneto induction type, affording practically continuous control of train. See also description of Schweyer induction train control, pp. 120-121, 1 fig.

TRAIN DESPATCHING. Train Dispatching by Radio, J. H. Reed. Railroad Herald, vol. 27, no. 5, Apr. 1923, pp. 28-29. Adaptation of radiophone to train despatching by Frank Wickersham, Signal Engineer of Atlanta & West Point Ry. at College Park, Ga.; promises to replace telegraph; data on stations to be built.

RAILWAY SIGNALING

BLOCK SYSTEM. Systematic Signal Construction on I.C., John Price. Ry. Signal Engr., vol. 16, no. 5, May 1923, pp. 214-215, 5 figs. Installation of 17 mi. of single-track automatic block signals between Fox Run, Ky., and Graham, comprising 33 automatic signals of 3-position, upper-quadrant, semaphore type; 4 high-voltage, semi-automatic interlocking signals, and 1 semi-automatic dwarf signal.

ELEVATED RAILWAY. Signaling on the Frankford Elevated (Philadelphia), J. N. Dodd. Elec. Ry. Jl., vol. 61, nos. 17 and 18, Apr. 28, and May 5, 1923, pp. 711-715 and 761-765, 18 figs. Special problems met and how they were solved. Apr. 28: Deals with signals, trips, electric circuits and air lines. May 5: Interlocking features and speed-control signals.

RAILWAY TIES

TREATED AND UNTREATED. Valuable Data Provided by Twelve Years' Service Record of Treated and Untreated Ties on the Baltimore & Ohio Railroad, Earl Stimson. Wood Preserving News, vol. 1, no. 2, Mar. 1923, pp. 33-37, 4 figs. Test to determine relative values of various kinds of preservatives used in different kinds of wood as compared with untreated white oak tie.

RAILWAYS

PAN-AMERICAN PROJECT. Propose Restudy of Pan-American Railway Project, Frank B. Morris. Eng. News-Rec., vol. 90, no. 19, May 10, 1923, pp. 837-839, 1 fig. Proposed route from Columbia to Argentina would tap vast region and enable connection with many existing lines.

REFRACTORIES

PROPERTIES. Properties of Refractory Materials (Sur quelques propriétés intéressantes des matériaux réfractaires), B. Bogitch. Revue Universelle des Mines, vol. 17, no. 2, Apr. 15, 1923, pp. 65-80, 2 figs. Chemical composition; mechanical resistance; expansion; causes of destruction.

REFRIGERANTS

METHYL CHLORIDE. Properties of Methyl Chloride, Charles H. Herter. Refrig. World, vol. 58, no. 4, Apr. 1923, pp. 15-18. Latest available tables; peculiarities to consider in actual operation of machines.

REFRIGERATING MACHINES

ABSORPTION. Proper Steam Pressures for Absorption Refrigerating Machines, A. W. Akins. Power, vol. 57, no. 20, May 15, 1923, pp. 762-763, 1 fig. Presents table giving temperature, pressure and concentration of aqua ammonia and chart showing specific gravity.

REFRIGERATING PLANTS

TEMPERATURE AND PRESSURE READINGS. Determining Refrigerating Efficiency by Temperature and Pressure Readings, J. H. H. Voss. Refrig. Eng., vol. 9, no. 10, Apr. 1923, pp. 307-312, 9 figs. Points out that simple comparison of practical and ideal cycle should be used by all plants without distinction of size.

REFRIGERATION

HEAT CHART, MOLLIER. Mollier Chart, E. F. Mueller and C. H. Meyers. Refrig. Eng., vol. 9, no. 10, Apr. 1923, pp. 295-296 and 300. Describes new chart issued by Bur. of Standards in which heat content is used as abscissa.

RESEARCH

INDUSTRIAL. The Need for More Practical Information in Industry, J. S. Unger. Forging and Heat Treating, vol. 9, no. 4, Apr. 1923, pp. 196-199. Lack of dependable information emphasized by relating number of incidents; suggestions for possible researches and investigations.

RIVETED JOINTS

COMPRESSION MEMBERS. Tests on the Action of Different Kinds of Riveted Joints of Bi-Sectional Compression Members (Versuche über die Wirkung verschiedenartiger Nietverbindungen doppelteiliger Druckstäbe), H. Kayser. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 17, Apr. 28, 1923, pp. 408-410, 10 figs. Results of tests carried out to investigate the different arrangements of brace plates of compression member consisting of two crossed angles.

RIVETING

PNEUMATIC RIVETER. Large Portable Riveter. Iron Age, vol. 111, no. 18, May 3, 1923, pp. 1255-1256, 1 fig. Machine for fabricating plates forming volute of casing and penstock for hydraulic turbine.

ROADS

EXPERIMENTS. What Arlington Investigations are Showing, A. T. Goldbeck. Highway Engr. and Contractor, vol. 8, nos. 3 and 4, Mar. and Apr. 1923, pp. 41-46 and 43-48, 24 figs. Scope and purpose of investigations in road design conducted by U. S. Bur. of Pub. Roads; physical characteristics of subgrade materials; statements based on tests; special tests of bearing value of soils; static load tests of concrete and broken-stone bases; impact tests of motor trucks; aggregates; etc.

TESTING APPARATUS FOR FIELD. Development of Apparatus for Field Testing of Roads, H. F. Clemmer. Can. Engr., vol. 44, no. 18, May 1, 1923, pp. 359-362. Description of static load and repeated load bearing power determinator; cutting slab specimens by means of Calyx core drill. Read before Am. Good Roads Congress.

ROADS, CONCRETE

CONSTRUCTION. Mixing and Delivering Concrete for City Pavements, F. S. Besson. Concrete, vol. 22, no. 4, Apr 1923, pp. 137-140, 6 figs. Discusses the three methods, i.e., roadside proportioning, central proportioning, and central mixing; example of central mixing, transportation by truck.

MAINTENANCE. Modern Developments in Maintenance of Concrete Pavements, Leroy C. Smith. Can. Engr., vol. 44, no. 16, Apr. 17, 1923, pp. 421-422. Repairing cracks and joints, new method of distributing tar; concrete patching; compressed-air equipment. Abstract of paper read at Conference on Highway Engineering.

ROADS, MACADAM

MAINTENANCE AND SALVAGE. Salvage and Maintenance of Macadam Roads, W. A. Van Duzer. Contract Rec. and Eng. Rev., vol. 37, no. 17, Apr. 25, 1923, pp. 408-410. Pennsylvania's experience; organization and planning, equipment, base survey, waterbound resurfacing, surface treatment, bituminous macadam resurfacing, unbound macadam. Paper read at Am. Road Builders Assn. convention.

ROLLING MILLS

ROD AND WIRE. New Wire Mill Has Unusual Features, J. E. McDonald. Iron Age, vol. 111, no. 18, May 3, 1923, pp. 1245-1249, 8 figs. Automatic coiling and conveying system; slow start for motor-driven wire blocks; continuous wire-drawing machines. Rod-rolling and wire drawing mills of Whitaker-Glessner Co., Portsmouth, O.

SHEET MILLS. Modern Sheet Mill Practice. Blast Furnace and Steel Plant, vol. 11, no. 5, May 1923, pp. 283-284, 1 fig. Describes practical aspect of sheet-mill practice; recent development tending toward combination of one roughing stand between two finishers.

ROLLS

BENDING. Power Calculations for Bending Rolls, A. L. Roberts. Machy. (Lond.), vol. 21, no. 547, Mar. 22, 1923, pp. 774-777, 4 figs. Method for calculating strength and deflection of bending rolls and power required to bend flat plates.

ROOF TRUSSES

REPAIRING. Repairing of Roof Trusses in Toronto City Hall. Can. Engr., vol. 44, no. 17, Apr. 24, 1923, pp. 436-437, 3 figs. Replacement of decaying ends of heavy timber trusses; notes on two methods which proved successful; details of design of steel roof trusses known as Nos. 28 and 39.

S

SANITATION

ODORS, ELIMINATION OF. Odors — Their Sanitary Significance and Their Elimination J. Rosslyn Earp. Am. Jl. Pub. Health, vol. 13, no. 4, Apr. 1923, pp. 283-293. Effect of odor on health; classification and measurement of odors; elimination. Bibliography.

SCREW THREADS

COMPARATORS. Hartness Modified Screw Thread Comparator. Machy. (Lond.), vol. 22, no. 551, Apr. 19, 1923, p. 81, 2 figs. Describes modified Hartness comparator for inspection of gears and other parts having irregular profiles, in addition to inspection of screw threads.

COSTS. Figuring Cost of Threads on a Mileage Basis, C. W. Bettcher. Can. Machy. vol. 29, no. 16, Apr. 19, 1923, pp. 20-21 and 46, 6 figs. Cost of cutting tools; threading tool requirements; selecting right thread; screw-plant layout.

SEPARATORS

ASH AND COAL. Modern Electromagnetic Separation Process to Recover Fuel From Ashes (Die Anwerdung des neuen elektromagnetischen Scheideverfahrens zum Rückgewinnen von Brennstoffen aus Feuerungsrückständen im praktischen Betriebe). Wärme, vol. 46, nos. 10 and 11, Mar. 9 and 16, 1923. pp. 103-105 and 113-114, 21 figs. New system of stationary and movable separators of various capacities; magnetic drum separators for large grain; examples of installations at various factories.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Importance of Oxygen and Stirring for Activated-Sludge Growth Eng. News-Rec., vol. 90, no. 19, May 10, 1923, pp. 835-837, 5 figs. Tests indicate forced aeration unnecessary as little oxygen needed; air, suspension and stirring factors evaluated.

HAMILTON, ONT., CANADA. Report on Sewage Disposal at Hamilton, Ont. Can. Engr., vol. 44, no. 18, May 1, 1923, pp. 454-457. Review of existing conditions; results of investigations; schemes suggested for dealing with sewage problem; costs of various works.

SHAFTS

CRITICAL SPEEDS. Critical Speeds of Shafts, T. E. Dodds. Practical Engr., vol. 67, no. 1887, Apr. 26, 1923, pp. 228-230, 5 figs. Critical speeds due to transverse and torsional vibrations, in machinery.

WHIRLING OF ELECTRICALLY LOADED. The Whirling of an Overhung Electrically Loaded Shaft, S. Lees. Lond., Edinburgh and Dublin Philosophical Mag. and Jl. of Sci., vol. 45, no. 268, Apr. 1923, pp. 689-708 and (note by W. McF. Orr), 708-714, 4 figs. Author attempts to indicate kinematics of motion of free and of shaft assuming negligible torsional effects, investigation of elastic yielding at bearing both for symmetrical and unsymmetrical elasticity.

SMOKE ABATEMENT

PROBLEMS. Smoke Production and Its Abatement, Chas. F. Wade. Power Engr., vol. 18, no. 205, Apr. 1923, pp. 125-126. Discussion of causes and cures of smoke nuisance.

SOLAR HEAT

UTILIZATION. Using Solar Heat for Automatic Evaporators (L'utilisation de la chaleur solaire par l'emploi d'appareils auto-évaporateurs), P. Caufourier. Génie Civil, vol. 82, no. 14, Apr. 7, 1923, pp. 327-329, 5 figs. Describes Mouchot, Shuman, Berland, and Caufourier evaporators, and their application.

SOUND

VELOCITY UNDER WATER. Velocity of Sound in Sea Water, E. B. Stephenson. Physical Rev., vol. 21, no. 2, Feb. 1923, pp. 181-185, 2 figs. Results of experiments conducted in Block Island Sound, New York, over a distance of 15,500 m., to determine time for sound wave produced by explosion of a bomb to travel to each of five hydrophones anchored at widely separated points, and distance travelled in each case; velocity of sound was found to be 1453 m. per second.

STEAM

Driers for. A Centrifugal Anti-Priming Steam Dryer, Power Eng., vol. 18, no. 206, May 1923, pp. 188-189, 5 figs. Principle and application of Tompkins' steam drier which, acting as centrifugal separator, insures dry steam without superheating.

High-Pressure. Using Steam at Very High Pressure (L'Emploi de la vapeur à très haute pression), Ouvrier Moderne, vol. 6, no. 1, Apr. 1923, pp. 9-11, 3 figs. Theoretical advantages of using high-pressure steam; advantages for steam engines; notes on Schmidt 60-atmos. boiler.

STEAM ACCUMULATORS

Types. Steam Accumulators (Les accumulateurs de vapeur), M. Emanaud. Technique Moderne, vol. 15, nos. 7 and 8, Apr. 1 and 15, 1923, pp. 193-197 and 237-241, 13 figs. Principles: operation; describes various types, especially hot-water accumulators; applications.

STEAM-ELECTRIC PLANTS

Milwaukee. The Lakeside Electric Power Station at Milwaukee. Engineer, vol. 135, nos. 3511, 3512, 3513 and 3514, Apr. 13, 20, 27 and May 4, 1923, pp. 383-386, 409-411, 437 and 438, and 480-481, 18 figs. partly on p. 422. New station is intended for ultimate capacity of 200,000 kw. and is especially designed for use of pulverized coals as fuel; details of coal crushing and pulverizing; main power equipment; boiler and economizers.

Records. Accurate Records Required for Plant Progress, John M. Drabelle. Power Plant Eng., vol. 27, no. 9, May 1, 1923, pp. 470-472, 2 figs. Deals with records and statistics of operation, quantities and financial expenses.

STEAM ENGINES

Uniflow. Driving a Textile Mill by a Uniflow Engine. Power Engr., vol. 18, no. 206, May 1923, pp. 185-188, 5 figs. Describes Sulzer 1100-i.hp. engine for driving textile mill.

STEAM POWER PLANTS

Records. Power Plant Records, Fred S. Rutledge. Nat. Engr., vol. 27, no. 5, May 1923, pp. 218-221, 5 figs. Systematic method of tabulating important data is essential to efficient operation of a power plant; examples of what this means.

Steam Extraction. Possibilities in Stage Heating and Steam Extraction in Steel Mill Power Plants, H. T. Watts. Assn. Iron and Steel Elec. Engrs., vol. 5, no. 4, Apr. 1923, pp. 105-116, 3 figs. Relates to principles involved, and possible applications to steam plants within steel works.

STEAM TURBINES

Geared. The Design of Pinions for Geared Turbines, Richard Gardner. Engineering, vol. 115, no. 2291, Apr. 27, 1923, pp. 512-513, 4 figs. Calculation of greatest deflection of pinion with and without center bearing.

Inspection. Pointers on the Inspection of Steam Turbines, John T. Willison. Power Plant Eng., vol. 27, nos. 5 and 6, Mar. 1 and 15, 1923, pp. 271-274 and 309-311, 6 figs. Mar. 1: Oiling system, bearings, packing, and alignment. Mar. 15: Inspection of piping and associated equipment.

Operation and Maintenance. Steam Turbine Operation and Maintenance, Terrell Croft. Nat. Engr., vol. 27, no. 5, May 1923, pp. 206-211, 4 figs. General precautions that should be observed; starting newly installed turbine; care of turbine while in operation; inspections and adjustments.

Single-Flow Reaction. Largest Single-Cylinder, Single-Flow Reaction Turbine Yet Built. Power, vol. 57, no. 20, May 15, 1923, pp. 746-752, 14 figs. First of new-type turbines undertaken by Westinghouse Co.; Large capacity at moderate peripheral speeds and conservative stresses made possible by use of Baumann system of blading; symmetrically expanding steam path eliminates eddies; provision is made for bleeding at four points.

Speed Regulation. Steam-Turbine Governors and Valve Gears Adjusting Speed and Speed Regulation, Eustis H. Thompson. Power, vol. 57, no. 21, May 22, 1923, pp. 790-795, 5 figs. Points out that no-load speed of turbine depends primarily on tension or compression of main governor spring; increasing spring resistance to centrifugal pull of moving weights or flyballs will ordinarily raise no-load operating speed; governor-speed regulation can be adjusted by one or more of three general methods which are explained.

Valve Gears. Schenectady Type General Electric Valve Gear, Eustis H. Thompson. Power, vol. 57, no. 19, May 8, 1923, pp. 710-715, 10 figs. Design and advantages of Gen. Elec. Schenectady type of valve gear for steam turbines.

Steam turbine Governors and Valve Gears — Adjusting the Valve Travel, Eustis H. Thompson. Power, vol. 57, no. 18, May 1, 1923, pp. 675-678, 3 figs. Principles of adjustments.

STEEL

Alloy. *See Alloy Steels.*

Chrome. *See Chrome Steel.*

Cold Working. The Cold-Working of Steel with Reference to the Tensile Test, John Stead. Iron and Steel Inst., advance paper, no. 21, for meeting May 1923, 39 pp., 13 figs. Results of experiments to obtain true stress-strain diagram from yield point to fracture of steel undergoing ordinary tensile test, and from it to derive equation connecting stress and strain.

Globular Cementite. Some Properties of Steels Containing Globular Cementite, Cecil H. Desch and Aubrey T. Roberts. Iron and Steel Inst., advance paper no. 8, for meeting May 1923, 11 pp., 4 figs. First section deals with effect of heat treatment on 1.28-per cent carbon steel slowly cooled from molten state, and heated under such conditions as to produce globular cementite; second section describes experiments on steels used in manufacture of safety-razor blades, with account of factors which determine their efficiency.

Impact Tests. An Investigation of the Behavior of Certain Steels under Impact at Different Temperatures, F. C. Langenberg. Iron and Steel Inst., advance paper, no. 16, for meeting May 1923, 34 pp., 19 figs. Results of experiments made with Charpy impact-testing machine of 2170 ft.-lb. capacity.

Tin in, Effect of. Some Observations on the Effect of Small Quantities of Tin in Steel, J. H. Whiteley and A. Braithwaite. Iron and Steel Inst., advance paper, no. 24, for meeting May 1923, 9 pp., 8 figs. Experimental evidence showing that presence of small percentages of tin in medium carbon steel is liable seriously to impair its ductility, so that in rails even 0.06 per cent may be unsafe. Appendix on estimation of small quantities of tin in steel, J. H. Whiteley.

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Zirconium in, Effect of. Some Effects of Zirconium in Steel, F. M. Becket. Iron Age, vol. 111, no. 19, May 10, 1923, pp. 1321-1323. Remarkable effect on rolling properties in presence of high sulphur; deoxidizer and scavenger; role in heat treated steel.

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Basic Facts. Heat Treatment of Steel with Special Reference to Production, J. W. Urquhart. Machy. (Lond.), vol. 22, nos. 552 and 553, Apr. 26 and May 3, 1923, pp. 110-111 and 139-141, 2 figs. Outline of basic facts modified by present day experience, with special reference to tests undertaken by English authority.

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Electric Power in. Economic Principles Governing the Use of Electrical Power in Iron and Steel Works, C. A. Ablett. Iron and Steel Inst., advance paper, no. 1, for meeting May 1923, 16 pp., 1 fig. Discusses power produced by works themselves from natural resources available within works, from exhaust steam and from fuel used for that purposed, and power purchased from outside source.

STOKERS

Chain-Grate. A Chain Grate Stoker Installation Fifty Years Old, David Brownlie. Combustion, vol. 8, no. 5, May 1923, pp. 294-303, 9 figs. History of mechanical stoking, particularly chain-grate stoker; details of working of chain-grate stokers of Whitworth-Wrigley modification of original John Juckes stoker installed about 1870-1875 in Ordsall Dye Works, Manchester, England, and still running.

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Statically Indeterminate. A New Method for Determining Statically Indeterminate Supporting Structures (Ein neues Verfahren zur Berechnung der statisch unbestimuten Tragwerke), G. Kriwoschein. Bautechnik, vol. 1, nos. 6, 7 and 9, Feb. 9, 16 and Mar 2, 1923, pp. 42-44, 51-52 and 67-69, 13 figs. Formulas and calculations; numerical examples for continuous beams on four supports and for Gmündertobel bridge.

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Collapsible. Collapsible Taps, Roy G. Mumma, Machy. (N.Y.), vol. 29, no. 9, May 1923, pp. 706-708. Advantages; limitations in regard to pitch of thread; general classes of work for which collapsible taps are adapted; different styles and their application; chasers.

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Distillation. A Modern Tar Distillation Plant, Wilbert J. Huff. Chem. and Met. Eng., vol. 28, no. 16, Apr. 23, 1923, pp. 720-724, 9 figs. Plant of Am. Tar Products Co., Chicago, handling of tar; distilling condenser house; power equipment; oil and pitch handling; felt saturating.

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Light, by. Transmission of Speed by Light. Engineering, vol. 115, no. 2991, Apr. 27, 1923, p. 531, 3 figs. Effected by modulating intensity of beam of light by means of acoustical vibrations; in distance fluctuating beams falls upon receiver, a selenium cell in circuit with battery and telephone; analogy between telephony by light and radio-telephony. Review of lecture before Roy. Instn. by A. O. Rankins.

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Freight. New Claremont Freight Terminal, L. V. R. R. Ry. Rev., vol. 72, no. 17, Apr. 28, 1923, pp. 726-731, 11 figs. Describes new freight pier on New York harbour at Jersey City, two-thirds of mile long and 400 ft. wide; first of three piers to be built; whole will comprise one of largest and best equipped freight terminals of metropolitan district.

Passenger. The Proposed Cleveland Union Passenger Station. Ry. Rev., vol. 72, no. 17, Apr. 28, 1923, pp. 731-732. Important terminal development for steam and electric railways promoted by Van Sweringen interests.

TEXTILE MILLS

See Cotton Mills.

THERMOMETERS

Electric. Electric Thermometers (Les thermomètres électriques). Industrie Electrique, vol. 32, no. 739, Apr. 10, 1923, pp. 125-128, 5 figs. Temperature measurement in electric central stations; use of pyrometers, thermocouples, and resistance thermometers, their advantages and drawbacks.

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Development. Time Study, Dwight V. Merrick. Taylor Soc. — Bul., vol. 8, no. 2, Apr. 1923, pp. 66-68. Review of development since introduction by Taylor; suggestions in taking time studies.

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Production and Uses. Titanium, A. H. A. Robinson. Can. Department of Mines — Mines Branch, no. 579, 1922, 127 pp., 7 figs. Titanium and its compounds; occurrences in Canada, sources, production and uses.

Properties and Uses. Titanium Its Uses, Properties, and Sources of Supply, R. J. Anderson. Chem. Age (Lond.), vol. 8, no. 198, Mar. 31, 1923, pp. 331-332. Review of present state of knowledge of element titanium with special reference to practical uses of its alloys.

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Oils. Transformer Oils (Les huiles pour transformateurs), A.-R. Matthis. Revue Générale de l'Electricité, vol. 13, no. 14, Apr. 7, 1923, pp. 582-583. Dielectric tests of oils and how they should be carried out, oxidation and polymerization of hydrocarbons and oil.

Three Phase. Rapid Calculation of Voltage Drop in Three-Phase Transformers (Evaluation rapide des chutes de tension dans un transformateur triphasé), Ch. Devant. Revue Générale de l'Electricité, vol. 13, no. 12, Mar. 24, 1923, pp. 475-477, 2 figs. Describes simple method which is sufficiently exact.

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Highway. Military and Commercial Highway Transport, Brainerd Taylor. Soc. Automotive Engrs. — Jl., vol. 12, no. 5, May 1923, pp. 413-432, 7 figs. Presentation of practical solution for coordination of military and commercial transport with rail and water transport. The Army plan of highway transport, its development, commercial organization, location of traffic centers, formation of highway transport centers, etc., maintenance, extending the army plan.

Motor Bus and Railway Coordination. The Coordination of the Motorbus and the Street Railway, vol. 12, no. 5, May 1923, pp. 433-436 and 464. Author reviews attempts made to displace railways and substitute motor vehicle service; discusses limitation of motor bus service and factors of expense that apply to motor vehicle when it becomes common carrier.

TUBES

Seamless Steel. Plant Making Small Weldless Tubes. Iron Age, vol. 111, no. 20, May 17, 1923, pp. 1399-1402, 6 figs. Specially designed mill with capacity of [illegible] portable piercer for product 1¼ to 3½ in. outside diam.; [illegible] straightener a feature.

TUNGSTEN

EVAPORATION CHARACTERISTICS. Evaporation Characteristics of Tungsten, G. R. Fonda. Physical Rev., vol. 21, no. 3, second series, Mar. 1923, pp. 343-347. Rate of evaporation from tungsten filaments at 2825 K.

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Internal Pressure. Tunnel Construction Under Internal Pressure (De la construction de galeries sous pression intérieure). R. Maillart. Bul. Technique de la Suisse Romande, vol. 49, nos. 4 and 5, Feb. 17 and Mar. 3, 1923, pp. 41-45 and 53-58, 8 figs. Methods employed for different kinds of rock; reinforcing steel.

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40,000-Kw. Large Turbo-Alternators at Gennevilliers. Elec. Rev., vol. 92, nos. 2369 and 2370, Apr. 20 and 27, 1923, pp. 604-606 and 646-647, 11 figs. Details of 40,000-kw. alternators of Société Alsacienne.

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V

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SPECIFIC HEAT. New Equations for the Determination of the Specific Heat of Dry Saturated Vapors and Boiling Liquids (Neue Gleichungen zur Bestimmung der spezifischen Wärme trocken gesättigter Dämpfe und siedender Flüssigkeiten, etc.). Victor Fischer. Zeit. für technische Physik, vol. 4, no. 1, 1923, pp. 29-36, 5 figs. Applications of equations to carbonic acid and air. See also article by same author in same journal, vol. 4, no. 2, pp. 72-76.

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VISCOSITY AND COLOUR STANDARDS. Reprint of Circulars on Viscosity and Colour Standards for Varnishes. H. A. Gardiner and P. C. Holdt. Paint Mfrs. Assn. of U.S. Scientific Section, Circular No. 178, Apr. 1923, pp. 227-236, 2 figs. Reprint of circulars entitled "A Standardized Apparatus for Air Bubble Consistency Test on Varnish," and "Suggestions for Colour Standards for Varnish," bringing out changes that have been made in methods of preparing standards.

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GÖCKEL. Viscosimeters (Viscosimeter), E. Stern. Chemiker-Zeitung, vol. 47, no. 41, Apr. 5, 1923, pp. 291-292, 1 fig. Describes new apparatus by H. Göckel, Berlin, and its application.

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DEVELOPMENTS. Vocational Education. Monthly Labour Rev., vol. 16, no. 3, Mar. 1923, pp. 104-109. Work of Federal board for vocational education, 1917-1922. Special training for vocational teachers in Sweden.

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PREPARATION OF WATER. Preparation of Water for Filtration. F. A. Dallyn and A. V. Dekaporte. Contract Rec., vol. 37, no. 15, Apr. 11, 1923, pp. 344-345. Problems involved in dealing with water and modern ideas concerning their handling; effect of hydrogen-ion concentrations.

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CONCRETE. Reinforced Concrete Elevated Water Tanks. S. R. Ross. Can. Engr., vol. 44, no. 18, May 1, 1923, pp. 445-450, 6 figs. Methods of designing sides, bottom and roof; suspended, dome-shaped and double-dome bottoms; preventing leaks; comparison of waterproofing methods.

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SMALL TOWNS. Design of City Water System. J. D. Galloway. Am. Water Works Assn. — Jl., vol. 10, no. 3, May 1923, pp. 405-410. Describes plan which, it is believed, comprehends most of problems met with in water supply of small towns.

WATERSHED PROTECTION. Progress Report of Committee on Watershed Protection. Am. Water Works Assn. — Jl., vol. 10, no. 3, May 1923, pp. 453-461. Deals with ownership of watersheds; physical character and water courses; data on water-borne diseases; elimination of nuisances; laboratory as aid in protection; regulations for protection and need for enforcing them.

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WELDING. *See Electric Welding, Arc; Oxy-Acetylene Welding.*

WIRE DRAWING

CONTINUOUS MACHINE. Morgan-Connor Continuous Wire Machine. Kenneth Be. Lewis. Iron Age, vol. 111, no. 20, May 17, 1923, pp. 1409-1412, 3 figs. Operates on flexible principle of looping mill; maintains tension without slip; survey of development of continuous wire drawing.

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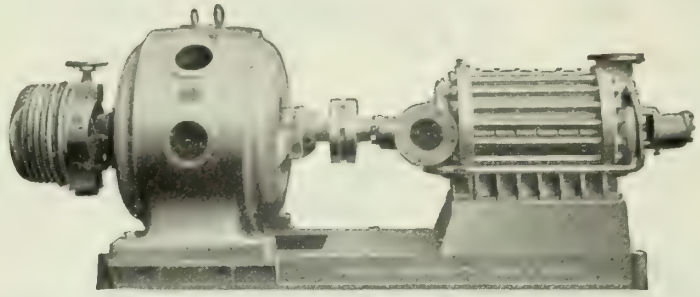

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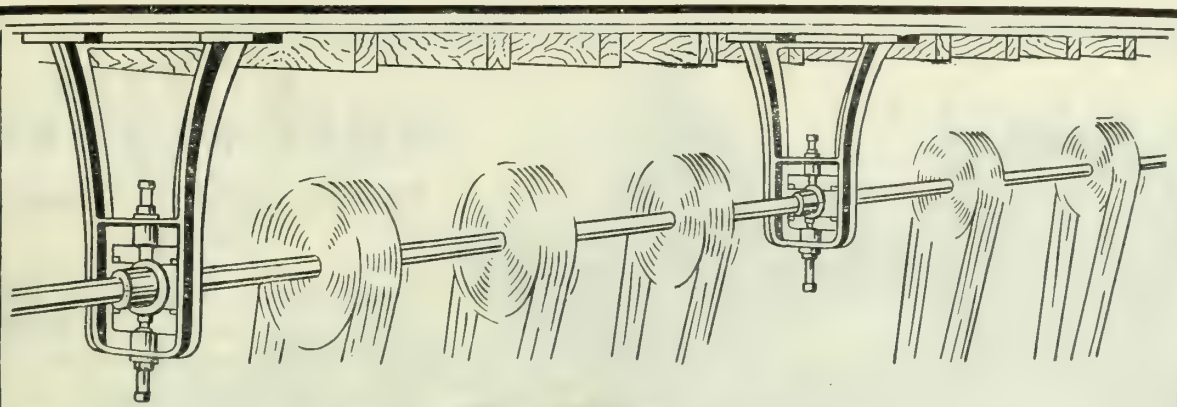

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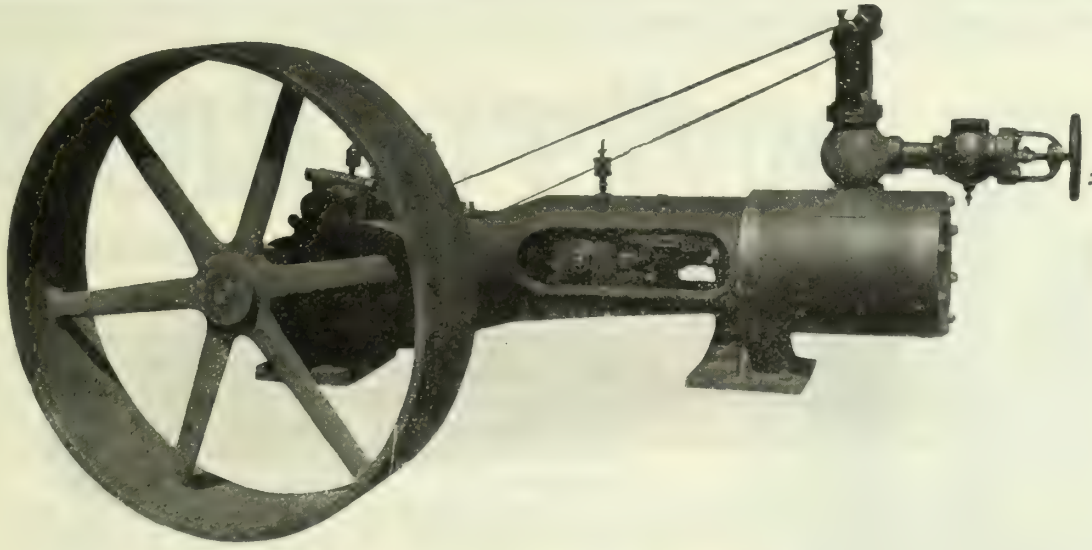

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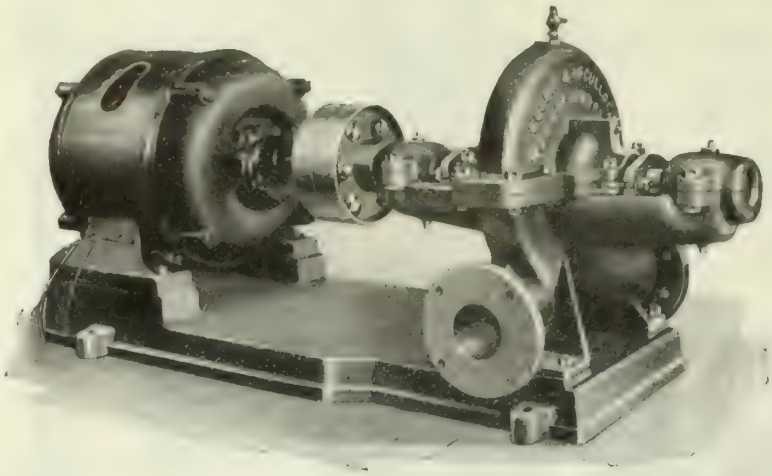

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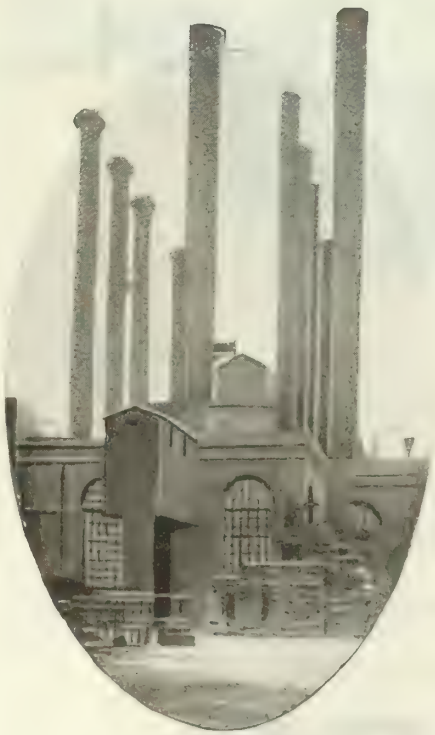

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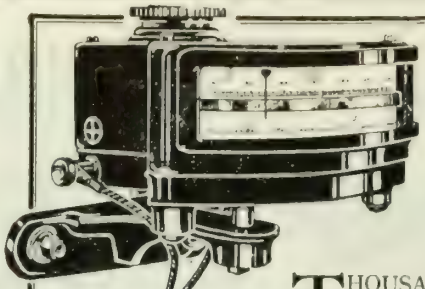

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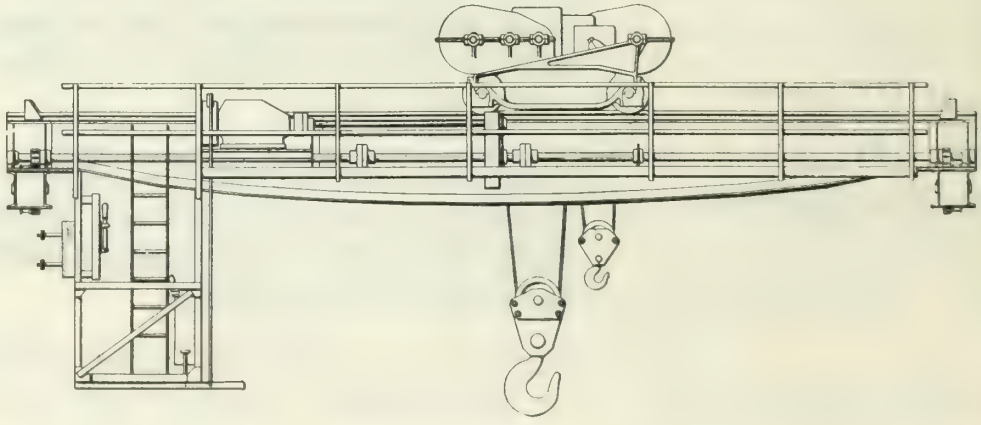

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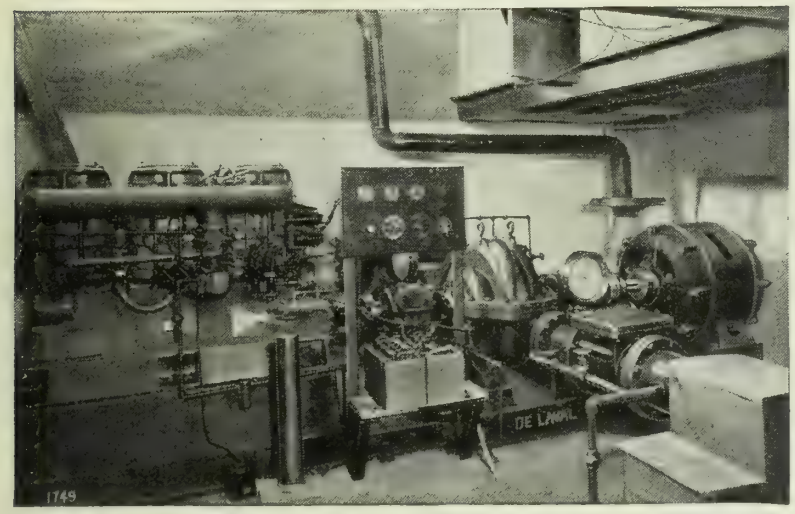

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Brass and Iron Body Gate Valves, Check Valves, Globe and Angle Valves, Radiator Valves, Underwriters Approved Valves, Indicator Posts and FIRE HYDRANTS

THE KERR ENGINE CO.,
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STANDARD - STEEL - SERVICE

STEEL BUILDINGS & BRIDGES
GIRDERS, COLUMNS, TRUSSES
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MANUFACTURERS OF HEAVY CHEMICALS.

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Standard or Special
Made to Suit Your Needs

All our bevel gears have teeth accurately planed on Gleason bevel gear planers.

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WHETHER you have one brush equipped unit or a thousand, Columbia Data Sheet Service is at your command.

Correct analysis of the relevant facts is necessary in deciding the most suitable brushes for any machine. The essential facts are ascertained by Columbia Brush specialists. They are then carefully analysed by the Columbia Board of Engineers.

The Columbia Pyramid Brushes as specified for each unit are guaranteed correct.

CANADIAN NATIONAL CARBON CO. LIMITED
TORONTO - CANADA

C N C

Look for this mark on your brushes

MG3

Five Months on the Job Without a Day's Lost Time

Read This Record on Government Work on the Welland Canal

L. D. Hara, Esq.,
Supt. Engineer, Welland Canal,
St. Catharines, Ont.

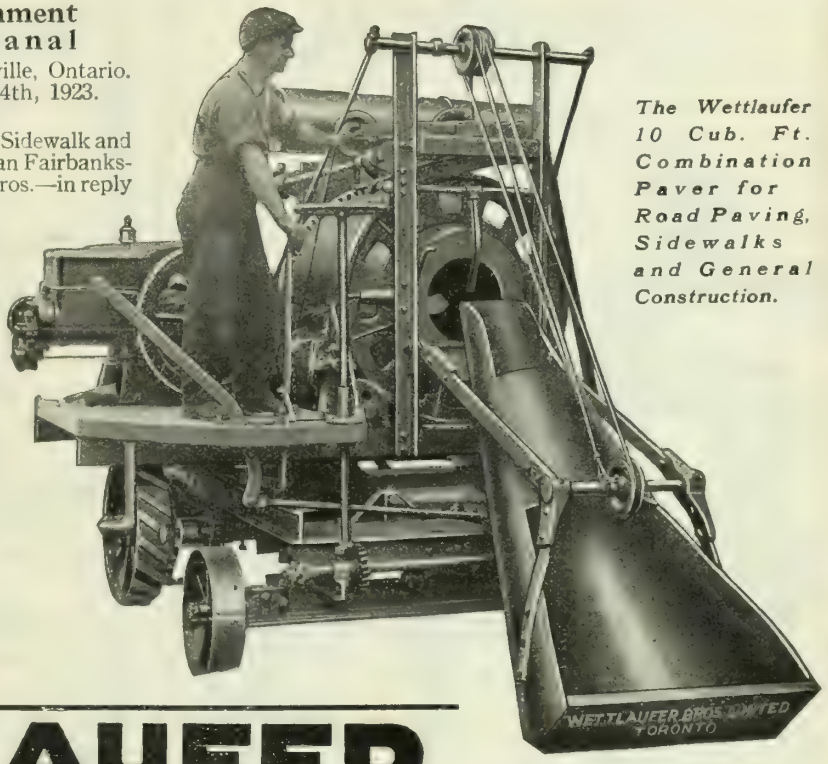
Dunnville, Ontario.
May 14th, 1923.

Dear Sir:—Yours of the 11th received. Re Sidewalk and Road Paver bought last June from the Canadian Fairbanks-Morse Co., and made by Messrs. Wettlaufer Bros.—in reply would say that the Machine has given every satisfaction and surprised Mr. Wilson, who had charge of the 5 miles of Paving between Dunnville and Stromness. I might say that during nearly five months continuous running (Sundays excepted) altogether there would not be a half a day lost time on account of break downs, then it was nothing serious. When we first got the machine Mr. Wilson condemned it, on account of the castings being too light, and asked the writer to get a duplicate lot of castings in case of the ones on the Machine wearing out, but we have never had to renew a Casting, and they look to be good for a lot of work yet.

Yours truly,
(Signed) D. T. ROGERS, Overseer.

This Machine Will Quickly Pay for Itself. Write now for Folder 191.

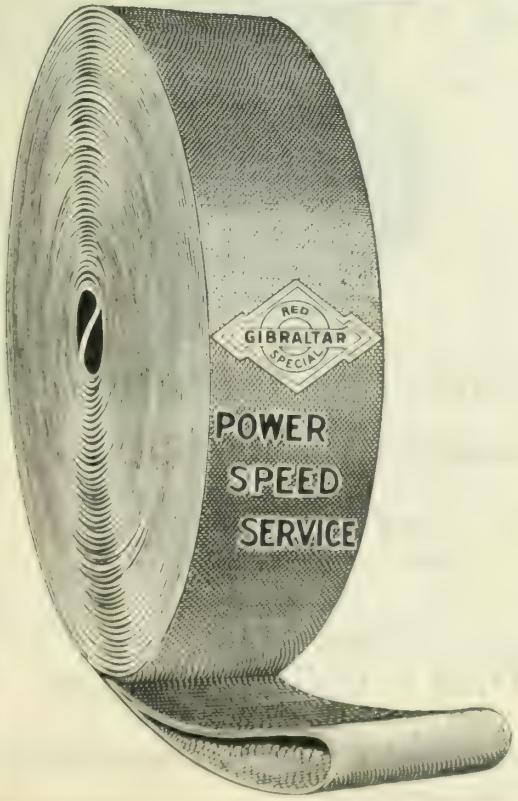
WETTLAUFER BROS. Limited
198 Spadina Ave., Toronto



The Wettlaufer 10 Cub. Ft. Combination Paver for Road Paving, Sidewalks and General Construction.

WETTLAUFER
CONCRETE MACHINERY

DUNLOP



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Satisfactory, Economical Transmission Belt Service

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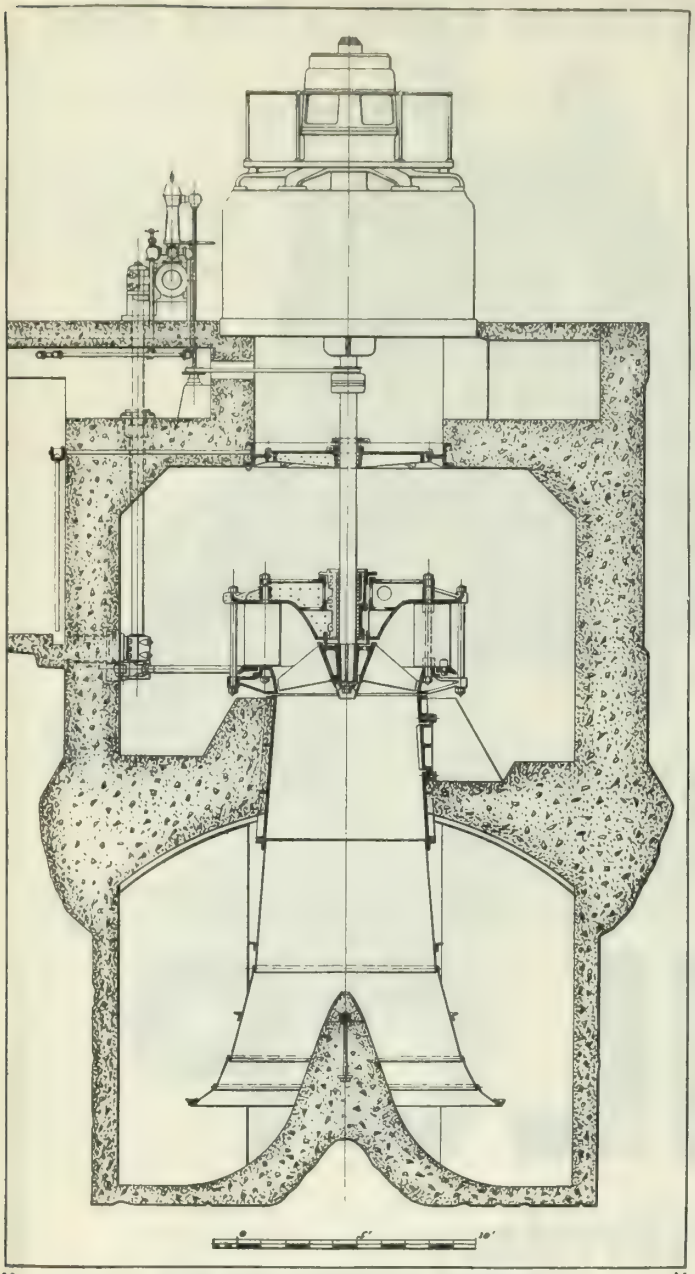
Branches in Leading Cities



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A Modern, Low Head, Open Flume Installation

This unit will develope 1400 h.p. at 225 r. p. m. under 29 ft. effective head. The use of the Moody Diagonal Runner with its unusually high speed for its diameter results in important economies throughout the entire design.

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Dominion Engineering Works

LIMITED

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SELF ALIGNING PLUMBER BLOCKS.

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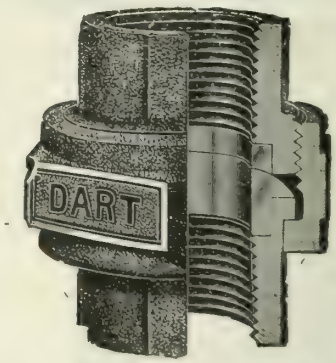

ALL DART UNIONS

HAVE A

Bronze to Bronze Ball Shaped Joint

Because of this feature, the Dart cannot deteriorate at the vital part, and is easily connected whether pipes are in or out of line.

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Specialists for Industrial Chemical Problems, Cement and Asphalt Construction Work, Steel Inspection and Water Supply.

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SPRINGS

OFFICE and WORK: Ontario St. East, DARLING and DAVIDSON

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JENKINS
Bronze
Swing Check Valve

Fig. 475

Adapted for use in horizontal or vertical position.

A strong handsome and durable valve equipped with Disc Holder and Composition Disc.

The Disc lifts well out of the passage and offers no more resistance to the flow than the best gate valve.

Fig. 475, shown here, is the screwed standard pattern for 150 pounds working pressure. This Valve can be furnished with flanged ends if desired (Fig. 476). These Valves have the *renewable* disc feature, and like all genuine Jenkins Valves have the Diamond Trade Mark on the Body.

Catalog No. 9 tells about these valves in detail. Write for free copy.

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FACTORIES:
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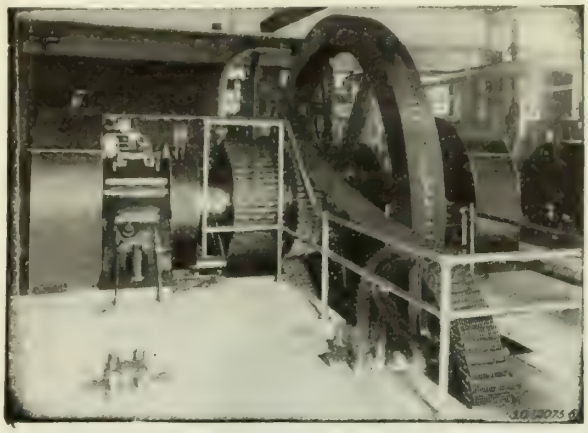
Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

Valuable suggestions appear in the advertising pages.



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(1000 and 500 H.P. Morse Silent Chain Drives from Engine to Lineshaft.)

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Flanged Ts., Bends, etc., made to any specification.

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3 inches to 60 inches diameter.
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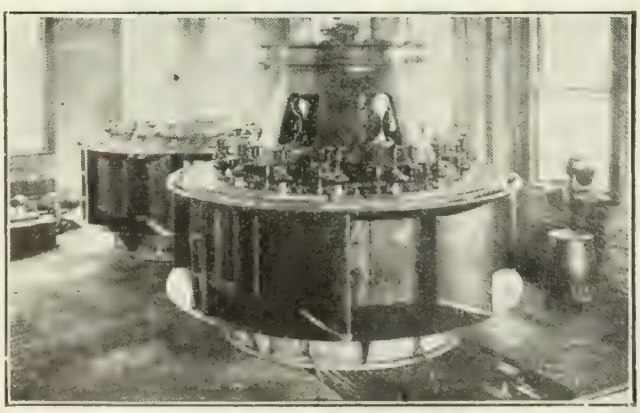

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CANADIAN DESIGN AND MANUFACTURE
HIGHEST EFFICIENCY.
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OUR HYDRAULIC TURBINES ENSURE A SOUND INVESTMENT.

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are made from a pure iron with copper content which gives the greatest resistance to all corrosive agents present in the soil or atmosphere. This material — TONCAN METAL — is of heavy gauge, deeply corrugated and thoroughly galvanized. Every year Pedlars' Culverts grow more popular with engineers for both highway and railway drainage. We also manufacture Steelcrete, Metal Lath, Metal Roofing and Siding, Rib Fabric, Floor Tyle, etc.

Write for Culvert Booklet "E.I."

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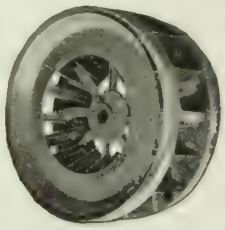

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that instantly and efficiently puts an end to your cinder troubles. The Sturtevant Cindervane Fan collects even the finest cinder particles before they are blown up the stack; at the same time affording an excellent induced draft.

Write for folder 610.

B. F. STURTEVANT CO.

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MONTREAL GALT TORONTO

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PUTS AIR TO WORK

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To obtain authorization for the utilization of water-powers in the Province of Quebec, application should be made to the Honourable Minister of Lands and Forests.

They are granted under emphyteutic leases, the conditions of which are upon the following lines:

1.—Duration of the lease, from 25 to 50 years, according to the importance of the water-power.

2.—Payment of a yearly rental which does not vary during the term of the lease.

3.—An additional yearly charge of 50c per HP developed.

4.—The above charge (Art. 3) is subject to revision, every 10 years.

5.—A delay of two years is granted for beginning works and of two further years for producing power.

6.—The lessee is under obligation to make a deposit in money or in securities, as a guarantee of good faith in the carrying out of the contract.

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Deputy-Minister: Elz. Miville Dechêne;

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For Alphabetical List of Advertisers see page 46

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B

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G

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H

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I

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J

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K

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L

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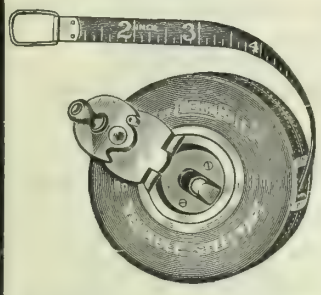

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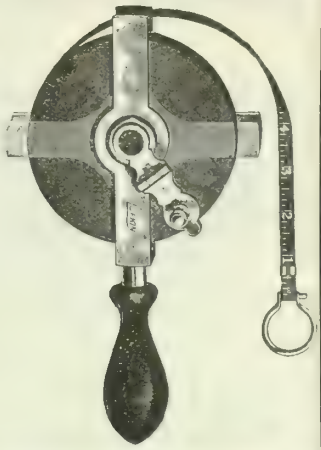

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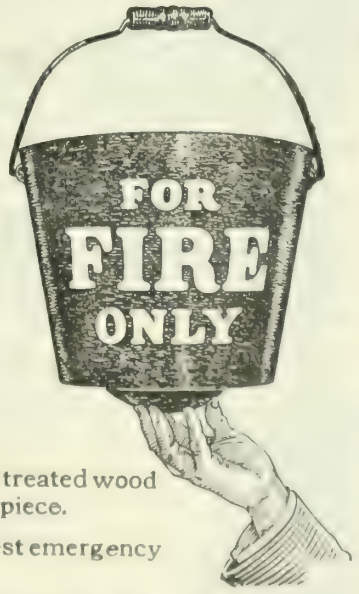

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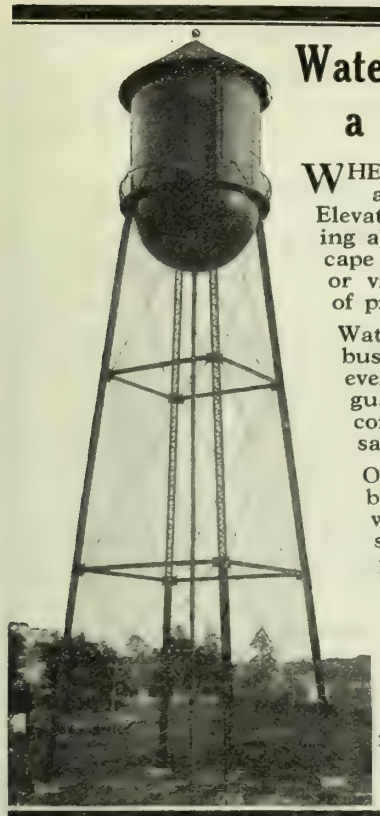

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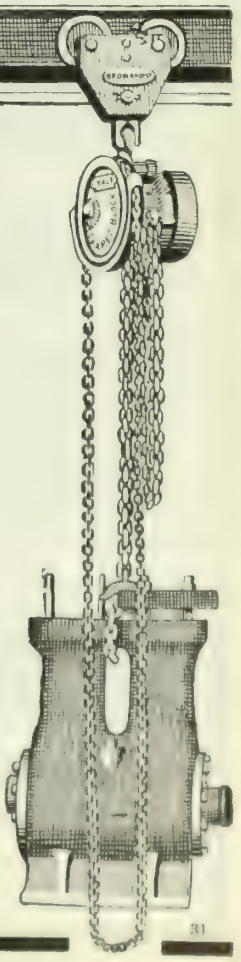

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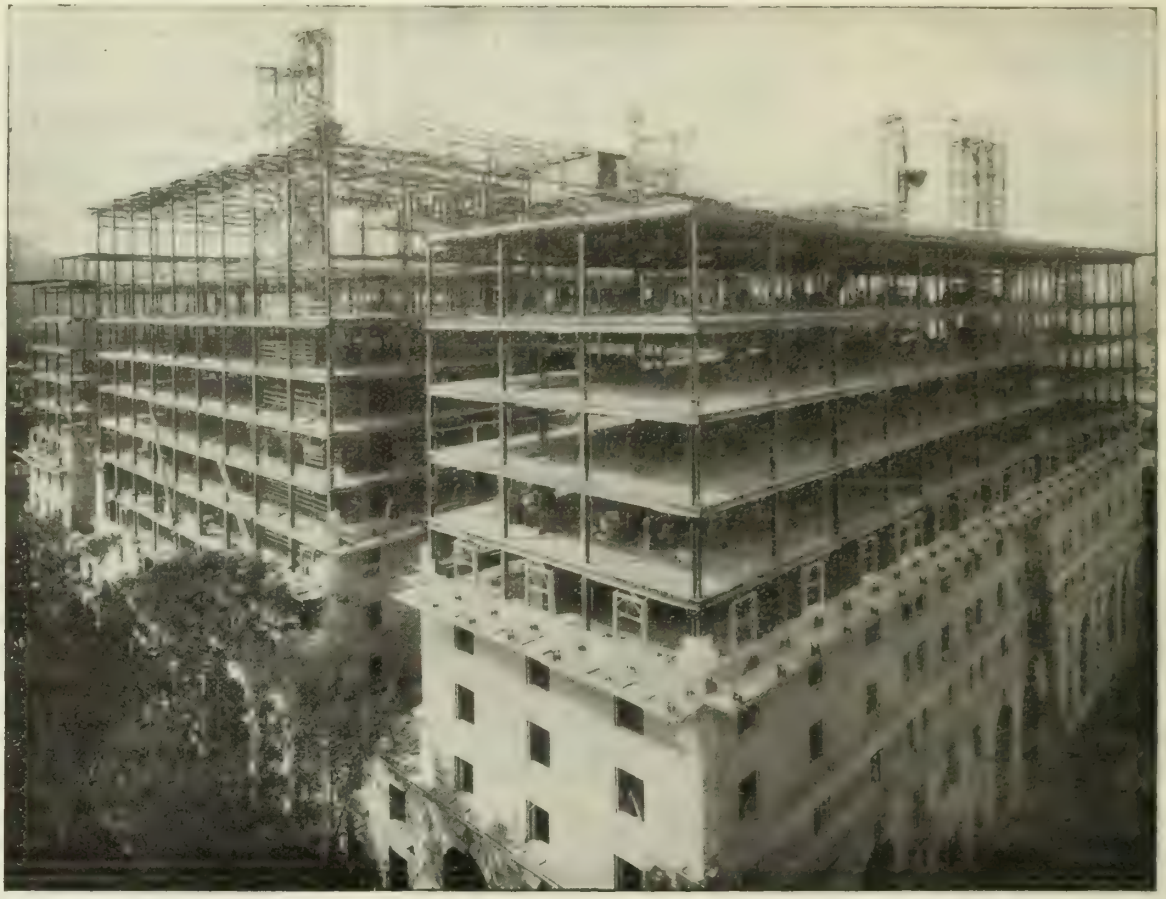

Mount Royal Hotel
Montreal

Architects—Ross & MacDonald
Contractors—Thompson-Starrett Co., Ltd.

Structural Steel Protected with SUPERIOR GRAPHITE PAINT

Architects and engineers the country over—and building owners as well—pin their faith on SUPERIOR GRAPHITE PAINT, because they know through experience and observation it can be used with definite assurance of service and satisfaction.

On this basis it is not surprising that SUPERIOR GRAPHITE PAINT was selected for the protection of the structural steel used in the Mount Royal Hotel. Its service record in many of the representative structures throughout the country was a determining factor in its selection.

SUPERIOR GRAPHITE PAINT is one of the DEGRACO line of dependable paints, which includes STA-WHITE—the light reflecting paint that stays white; DEGRACO-TONE-flat wall paint; Degraco Brick and Concrete Paints; Degraco House Paints and Varnish; Dampproof Coatings, Enamels—in fact, paints in all colors for all purposes.

DEGRACO PAINTS are sold through branch offices, with warehouse stocks in all principal cities. Their use eliminates the hazard of experiment.

Montreal
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DOMINION PAINT WORKS, LIMITED
WALKERVILLE, CANADA

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DEGRACO
All Colors for All Purposes

PAINTS
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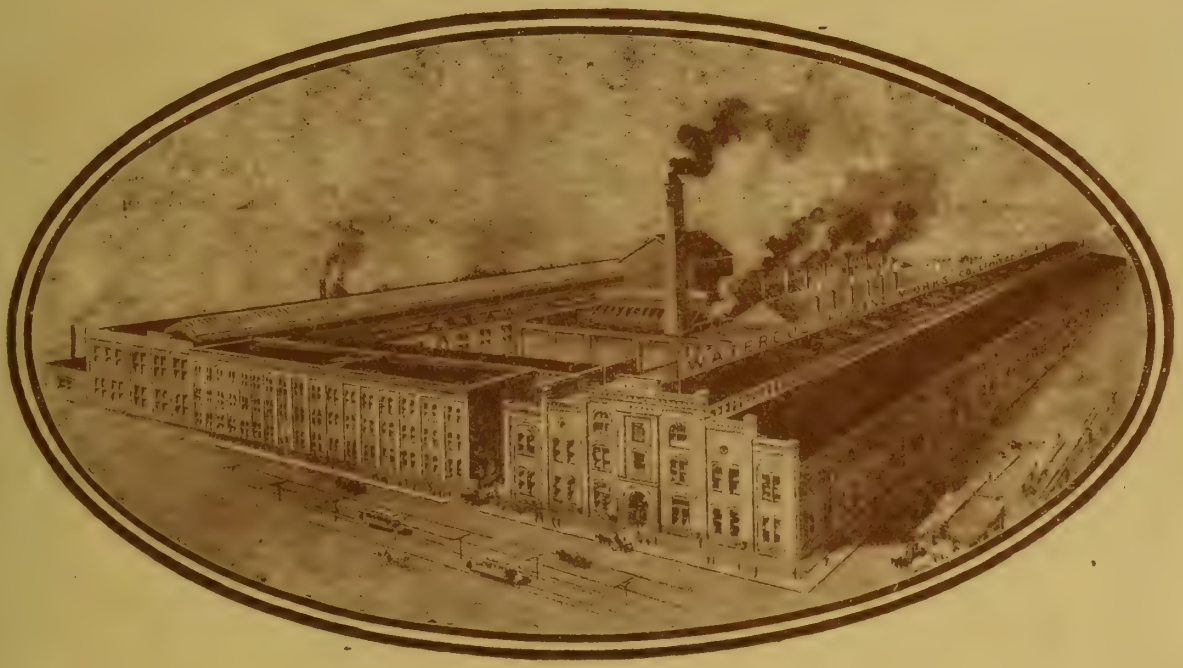
WATEROUS
PULPWOOD
MACHINERY



1844-1923

Let us help you with your Special Problems.

Waterous
BRANTFORD, ONTARIO, CANADA

Seal Your Macadam Roads

—with Imperial Liquid Asphalt

The problem of maintenance of good macadam and gravel roads is a serious one to many communities, but this problem may be successfully solved through the use of Imperial Liquid Asphalt. Last year, Granby, P.Q. used this type of Asphalt on their roads and they are now much better fitted to carry heavy traffic, while their maintenance is considerably simplified.

Imperial Liquid Asphalt seals the surface of macadam and gravel roads, thereby counteracting the disintegrating action of traffic, frost and rain. It also forms a traffic mat of pure Asphalt over the surface of the road which gives added strength and improves its tractive qualities. The net result is the prevention of dust, longer life to the road, easier maintenance and better conditions for both tourists and residents.

Imperial Liquid Asphalt is supplied in grades to suit local requirements. Easily and economically applied by pressure or gravity distributor. Shipments by tank car recommended, but delivery can also be made in wooden barrels if desired.

IMPERIAL
Asphalt
PRODUCTS

Paving Asphalts
Asphalt Binders
Liquid Asphalts
Asphalt Cold Patch

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto Canada

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

AUGUST 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

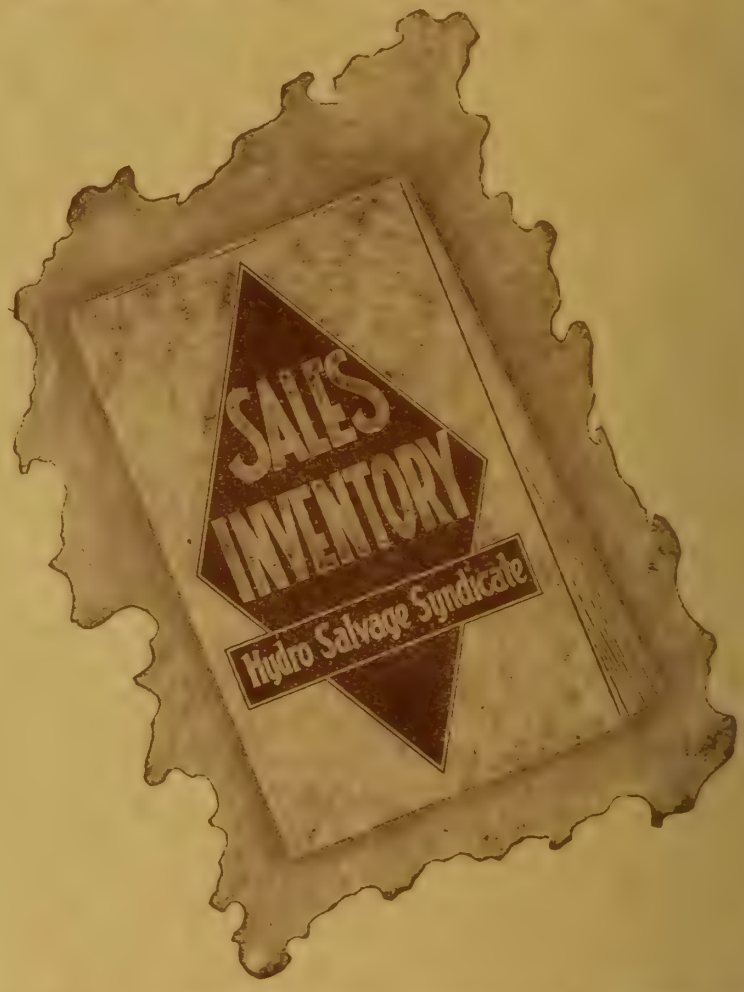
AT 176 MANSFIELD STREET, MONTREAL

Vol. VI No. 8

You should certainly have a copy

This "Sales Inventory" of the Construction Equipment, Accessories and Supplies, which can be released from the Queenston-Chippawa Development, has been specially prepared solely as a service to—

CONTRACTORS
ENGINEERS
MINES
QUARRIES
MUNICIPALITIES
BRIDGE BUILDERS
BRICK COMPANIES
SAND AND GRAVEL COMPANIES
RAILROADS, ETC.



There is every possibility that you can save not only Money but valuable Time, by simply referring to this "Sales Inventory."

Your copy is available at our nearest office.

Also, our experience is at your disposal, if you have problems to solve. We have about everything imaginable in Construction Equipment and Supplies at extremely reasonable prices consistent upon the excellent condition.

LET US PROVE TO YOU JUST WHAT WE CAN DO.

Hydro Salvage Syndicate

P.O. Box 109 Niagara Falls, Ont.

Operated by

Canadian Equipment Co. Limited
Montreal

and

F. H. Hopkins & Co., Limited
Toronto and Montreal

LABORATORY ACCURACY AT A TOOL ROOM PRICE

"It certainly is easy to build 'em up"

ANYONE who has ever used Hoke Gages appreciates their ease of handling. They can be assembled with the least fuss and trouble to form inside and outside calipers, external and internal gages, height gages, and measuring standards of infinite variety.

No cumbersome outside clamps are required but the gages and attachments are firmly held together by internal tierods which pass through the centre of the blocks.

This patented and exclusive feature of Hoke Gage design makes possible their rapid and convenient assembling into neat, self-contained units which present the maximum gaging surface and which in no way interfere with the work being measured. The wear and liability of injury, inseparable with the use of outside clamps are also avoided.

Hoke Gages are guaranteed accurate and within .000005 in. of marged size up to one-half inch size and within ten millionths per inch of length for all other sizes. They are sold at a price that brings them within the reach of every shop. Put up in sets to suit all requirements — an 81 block set is shown in the illustration — single blocks or any combination of standard blocks can be bought if desired.

PRATT & WHITNEY COMPANY OF CANADA
LIMITED
Works: Dundas, Ontario

MONTREAL
723 Drummond Bldg.
WALKERVILLE
103½ Sandwich St.
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WINNIPEG
1205 McArthur Bldg.
TORONTO
32 Front St. West
VANCOUVER
B. C. Equipment Co.

The booklet, handsomely illustrated, describes these gages thoroughly. We'll be glad to send it on the receipt of a postcard.

PRATT & WHITNEY
PRECISION GAGES
Laboratory Accuracy at a Toolroom Price

KOEHRING

Easy Flowing Concrete

EASY flowing, easy spouting concrete begins with the mixing action. The plasticity that means easy flowing without excess of water depends on the thorough coating of every fragment of stone and grain of sand with cement. Then cement acts as a lubricant—the concrete is plastic, easy flowing, easy to work—a real factor in lower costs.

The Koehring re-mixing action prevents segregation of aggregate according to size — sends every grain of sand and cement, every fragment of stone through the mixing process for re-mixing. The result is perfect uniformity of concrete from the first to last shovelful of every batch, and a plastic, free flowing concrete that spouts and "works" to great advantage.

This, together with the Koehring *"Heavy Duty"* construction which means long, trouble-free service life, gives the Koehring owner an extra profit margin on every season's work.

Write for Catalog C 35

KOERING COMPANY OF CANADA,
LIMITED.

105 Front St., East,
Toronto, Ont.
Phone Main 1498

616 Canada Cement Bldg.
Montreal, Que.
Phone Uptown 3026

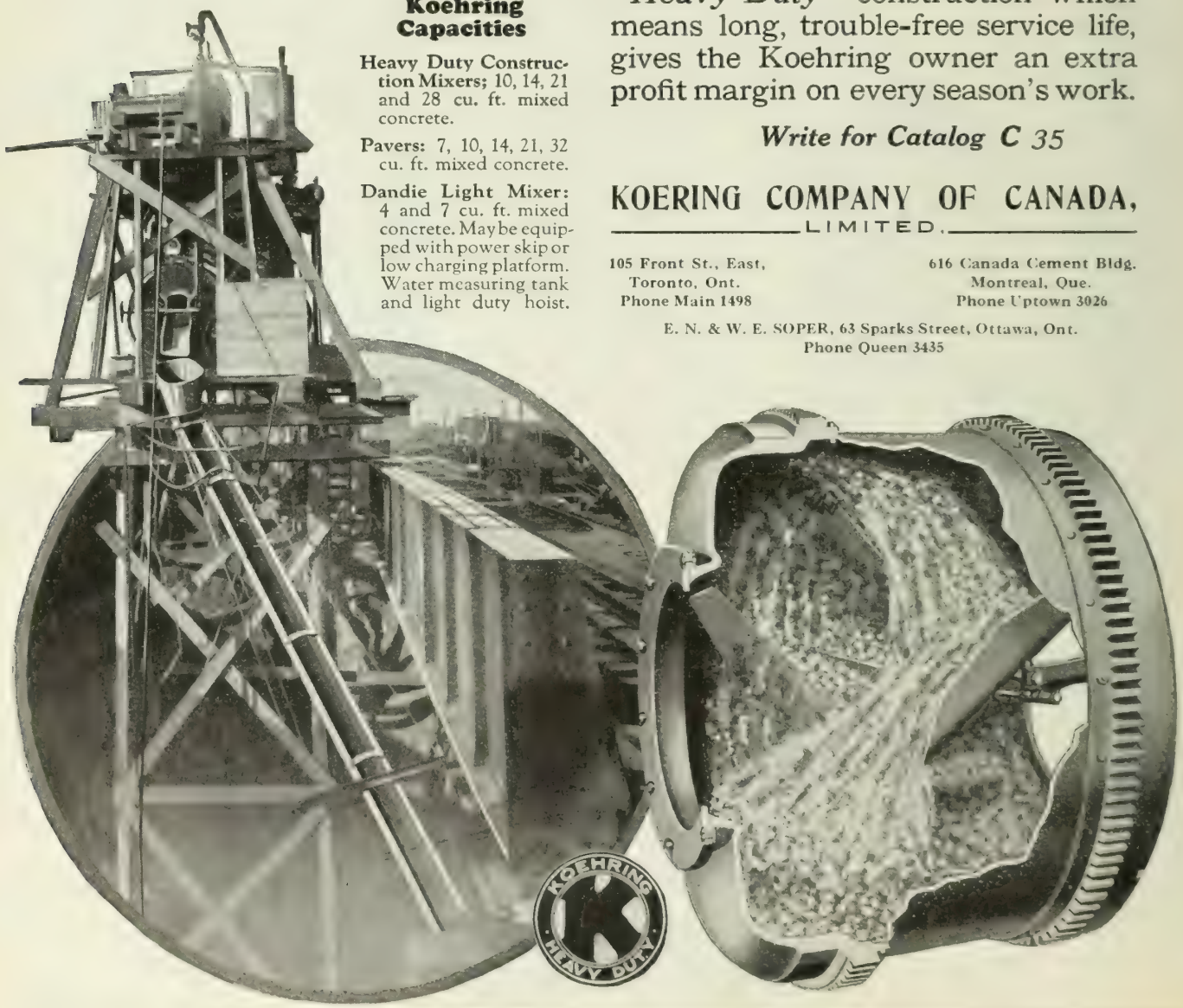
E. N. & W. E. SOPER, 63 Sparks Street, Ottawa, Ont.
Phone Queen 3435

Koehring Capacities

Heavy Duty Construction Mixers; 10, 14, 21 and 28 cu. ft. mixed concrete.

Pavers: 7, 10, 14, 21, 32 cu. ft. mixed concrete.

Dandie Light Mixer: 4 and 7 cu. ft. mixed concrete. May be equipped with power skip or low charging platform. Water measuring tank and light duty hoist.



Diamond Fibre Exhibit at the Canadian National Exhibition

Visit us at the Toronto "Ex"

You will find us at Booth 80a in the Industrial Building and also in the south-west section of the Machinery Building.

Besides a full display of Diamond-F products, we will, this year, be showing Condensite Celoron Silent Waterproof Gears and pinions and other fibre products in actual operation.

Our Representatives will be on hand every day to give visitors detailed information about Diamond Fibre and its uses.

The exhibit will be interesting and instructive—be sure to come.

-- TO OUR CUSTOMERS --

While in Toronto, make your business headquarters at our head offices, 235 Carlaw Avenue. You will be welcome.

Diamond-F

DIAMOND STATE FIBRE COMPANY OF CANADA, Ltd.

TORONTO

DIAMOND FIBRE

ST. EUSTACHE PARISH, QUEBEC.
DOMTAR-2 ON WATER BOUND
MACADAM, 1922.

Domtar

The
National
Bitumen

FOR PATCHING, SURFACING and PENETRATION CONSTRUCTION

For the solution of each of these serious Highway Problems, there is a **Domtar** *to fill your needs satisfactorily.*

Literature, etc. on request.

Dominion Tar & Chemical Company, Limited

SYDNEY, N.S. MONTREAL, QUE. TORONTO, ONT. SAULT STE. MARIE, ONT.

Every advertisement is a message to you.

McCRACKEN SEWER PIPE
Is Winning Canada's Favor

Ottawa Saves $8,000 on Sewer Pipe

Mr. A. F. McCallum, Commissioner of Works, Ottawa, Ont. replies to published criticism of the action of city council in adopting the McCallum recommendation for concrete pipe as against vitrified clay pipe. (See Ottawa Citizen, April 26th., 1923). Mr. McCallum's letter to the Board of Control reads

"It may be taken for granted that there are no acids in comparatively fresh sewage in this city to disintegrate concrete pipe made to our specifications under inspection and properly cured and tested regardless of the absurd statements made by the clay pipe people.

"Concrete pipe was easily made by small plants in a careless manner and as a consequence engineers have been prejudiced against it until recently when first class pipe in the smaller sizes has come on the market. For that reason we have not used it in this city for the sizes from 24 inches to 6 inches until recently, giving a monopoly practically to clay pipe.

"It is interesting to note then the difference in prices in 1921 (when there was no concrete pipe tender) with 1923.

Clay Pipe Tenders

	1921	1923
6 inch	32½	23
9 inch	.59	.41
12 inch	.91	.67
15 inch	1.20	.85
18 ineh	1.70	1 27
24 inch	3 10	2 15

"In other words if we had not allowed tenders from the concrete pipe people we would have had to pay about $25,000 instead of $17,000 for this year's supply of pipe."

Write for complete information and quotations.

Jno. E. Russell Co., Limited
General Sales Agents
Harbor Administration Building, TORONTO

McCRACKEN SEWER PIPE
"The Pipe That Endures"

McCracken Concrete Sewer Pipe is manufactured in accordance with Standard specifications issued by the American Society for Testing Materials for Cement Concrete Sewer Pipe, and Inspected by the Canadian Inspection and Testing Company, Limited.

Advertisements have an educational value. Read them carefully.

LT. COL. R. G. STEWART, PRESIDENT
E. A. LARMONTH, VICE PRESIDENT
E. O. LEAHEY, MAN. DIRECTOR
J. D. CUNNINGHAM, SECY. TRES.

E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:
OTTAWA,
Ont.

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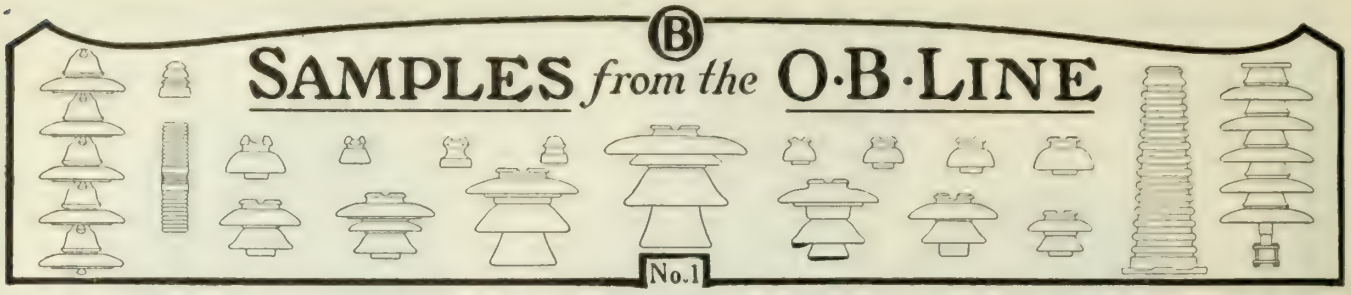


One-piece Insulators for distribution lines

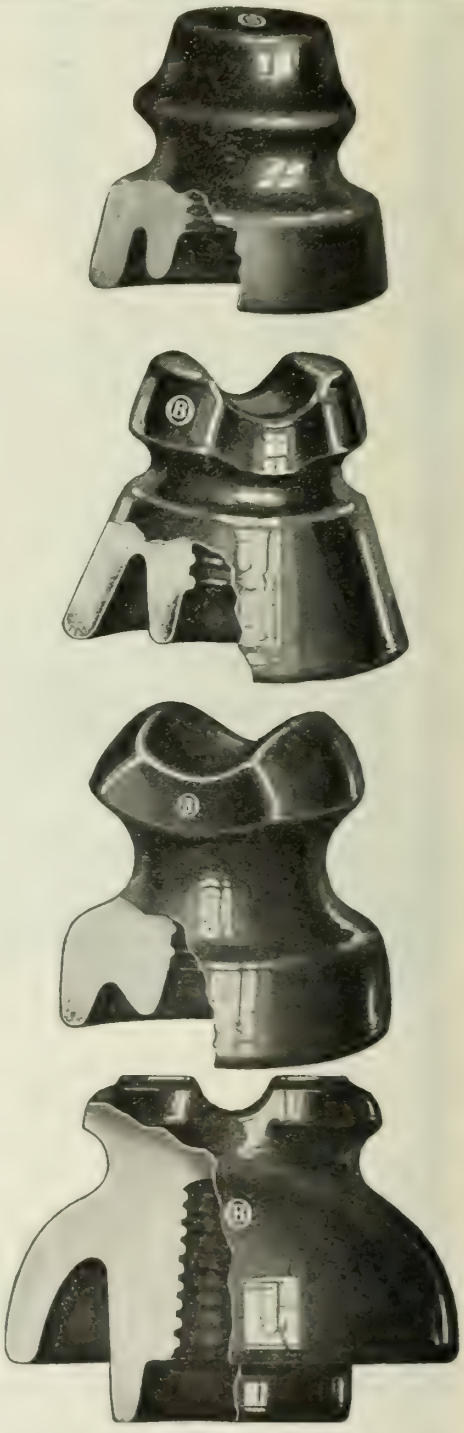
THE half-scale illustrations show a few of the smaller insulators from the O-B Line.

No. 10387, the unit shown at the top, has a voltage rating of 4000. It is 3¼ inches in diameter and weighs about 14 ounces.

Next below it is No. 9404, rated at 6600 volts. This is a popular insulator, and one on which we can ordinarily make prompt deliveries.

The third sample, No. 9953, also has a general rating of 6600 volts, but is designed primarily for carrying large cables.

The illustration at the foot of the page shows No. 12848, which has a general rating of 11,000 volts.



Every insulator receives the same care as large high-tension O-B Insulators

In Manufacture
Made of wet process porcelain by the same methods used for the larger insulators.

In Inspection
Each piece is carefully inspected to insure highest quality and uniformity.

In Packing
Special attention has been given to developing improved packing methods giving a maximum of protection to the insulator and a convenient package for store room and field use.

All of which means good insulators and best possible performance in an important service.

Dominion Insulator & Mfg. Co., Limited

(Manufacturing Ohio Brass Company Products in Canada)

Niagara Falls - - Ontario

STEEL BARS

for Concrete Reinforcement

COLD TWISTED SQUARES OR
PLAIN SQUARES AND ROUNDS

ROLLED FROM NEW OPEN
HEARTH STEEL BILLETS

THE STEEL COMPANY OF CANADA LIMITED

HAMILTON MONTREAL

23

Keeping the Wheels Turning

IDLE engines, idle ships and broken machines cause waste and loss. Dominion Service contributes largely to the repair work which keeps the wheels of mighty locomotives, marine engines and industrial machinery turning.

Dominion Service places an unlimited supply of pure oxygen and dissolved acetylene in safe, easily-handled cylinders, when and where it is needed for welding and cutting work. No matter where your plant or construction job is located, we can ship by the shortest route from any one of our ten plants and warehouses all the oxygen and dissolved acetylene you require, on telegraph notice.

This is our idea of service—let us tell you more about it. Our proposition will mean profit for you. A representative will call at your request.

DISTRIBUTION POINTS:

Hamilton, Merritton,
Montreal,
Oshawa, Quebec,
Shawinigan Falls,
Toronto, Welland,
Windsor, Winnipeg.

6

Dominion OXYGEN

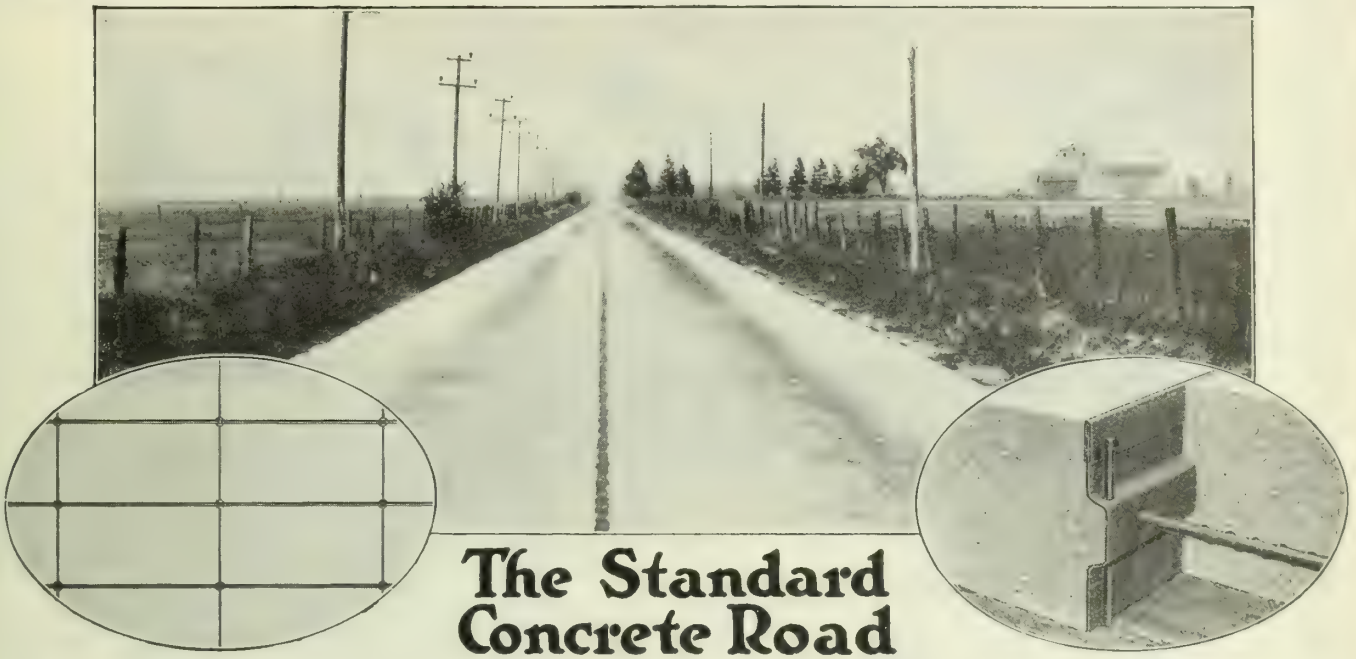
DOMINION OXYGEN COMPANY LIMITED.

Prest-O-Lite DISSOLVED ACETYLENE

General Offices:
80 Adelaide St. East,
Toronto.

Operating the Welding and Cutting Gas Division of
PREST-O-LITE COMPANY OF CANADA, LIMITED

Firms advertising in The Journal are considered as absolutely reputable.



The Standard Concrete Road

Reinforced with Flat Sheets of Truscon Wire Mesh

Truscon Wire Mesh, furnished in flat sheets cut to lenght, saves time and labor; no cutting, straightening, uncoiling, etc. Rigidly connected joints keep sheets true and flat. Weights and areas as desired.

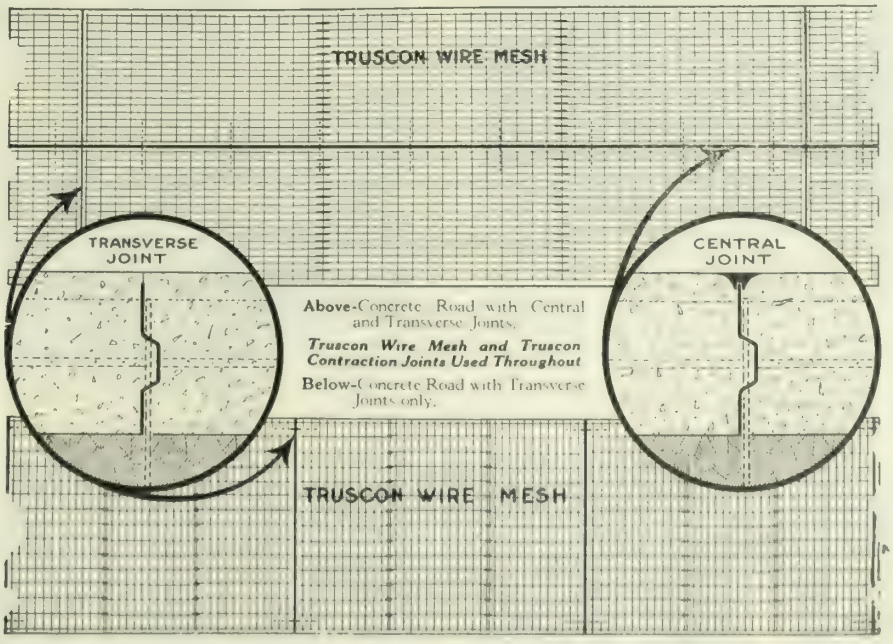
Contraction Joints Formed by Truscon Contraction Plates

Provide a definite plane of weakness in the pavement and thus form a straight regular crack for contraction and expansion. Used longitudinally, they offset lifting of pavement edges from the sub-grade and act as a permanent traffic marker. Truscon Contraction Plates are rigid, substantial, easy to install.

Trussed Concrete Steel Co. of Canada Limited

WALKERVILLE, ONTARIO

Branches: TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER

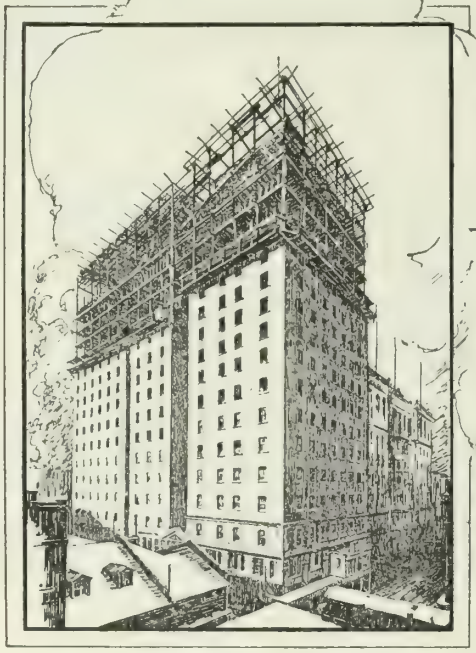


Truscon Wire Mesh and Contraction Joints

Valuable suggestions appear in the advertising pages.

The Backbone of Canada
is made of
"STRUCTURAL STEEL"

Buildings, bridges, tanks, etc. from east to west of Canada are built of Structural Steel. They are strong, safe & economical



King Edward Hotel

Surprise Creek Arch. Canadian Pacific R.R.

Build with STRUCTURAL STEEL

Issued by the
Structural Steel Association

P · A · X

Private Automatic Exchange

SPEED

The Automatic Telephone

To reach at will the operator in the Tower, the Engineer in the outlying Plant—turn the Dial. Result—instant connection. Think what this means in cases of emergency.

The P. A. X. is a reliable, economical, permanent and private method of talking to anyone, anywhere about the plant. Keeps the regular switchboard open for outside business.

"A Pair of Wires and a Dial" telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
QUEBEC LONDON REGINA VANCOUVER

"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
Fire Alarm Systems
Radio Sending and receiving Equipment

DISTRIBUTING
Construction Material
Illuminating Material
Power Apparatus
Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

ENGINEERS, MANUFACTURERS AND ERECTORS

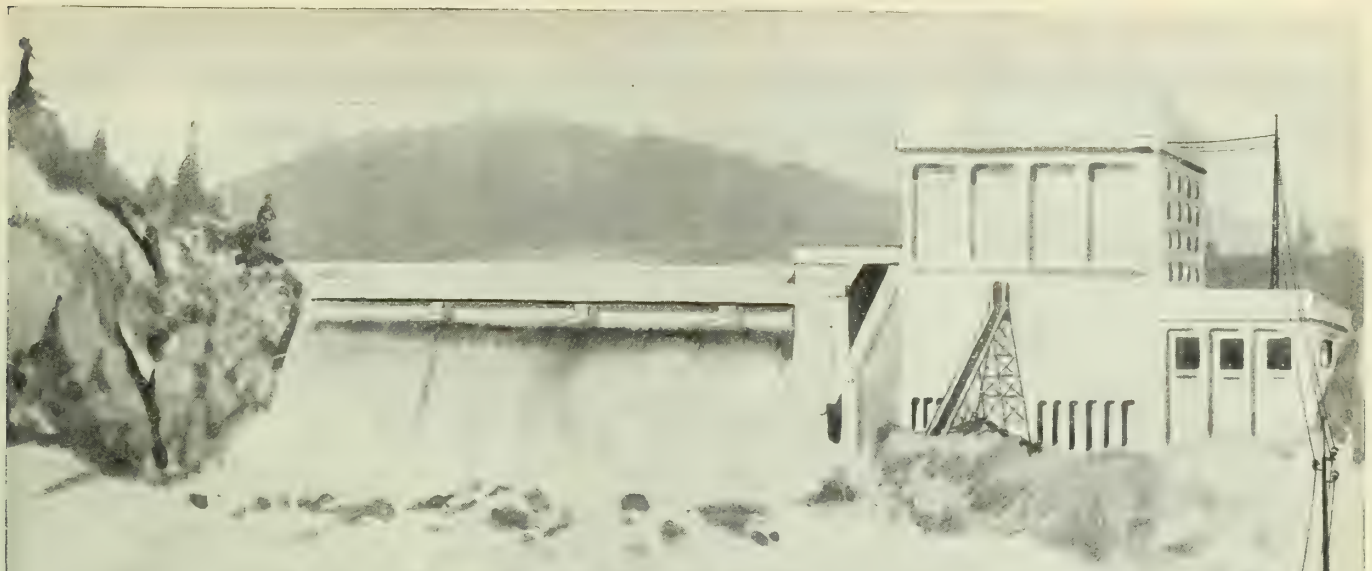
—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.

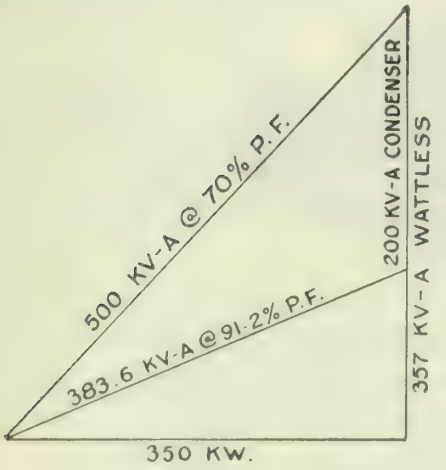
We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

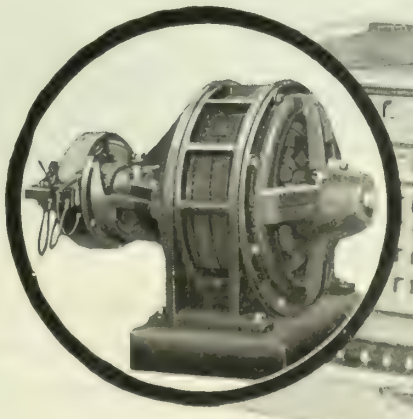


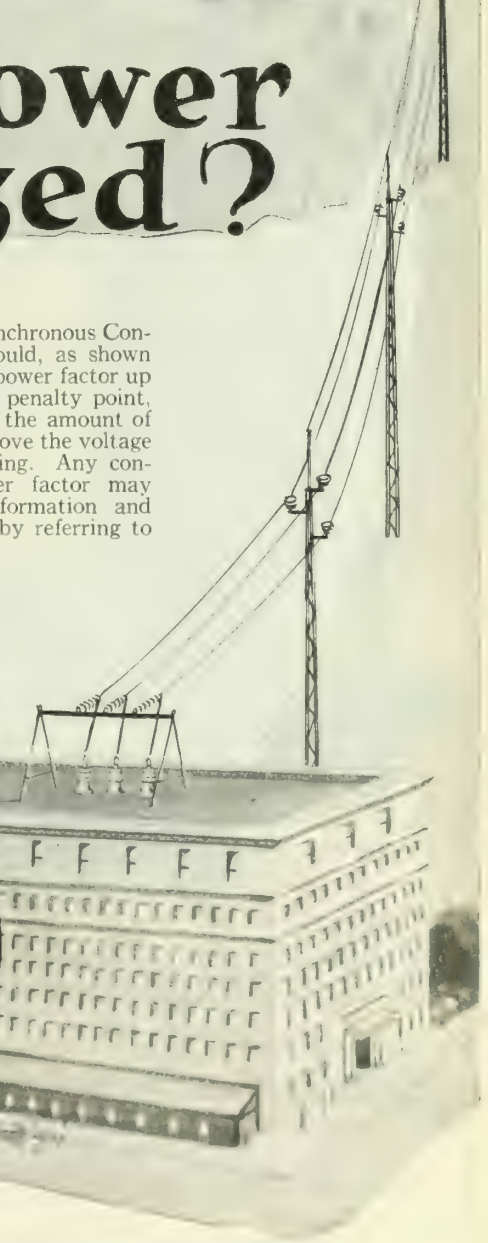
Why Is Low Power Factor Penalized?

A Factory load of 350 Kw. at 70% power factor requires station equipment and transmission line capacity, that at 100% power factor would deliver 500 Kw. To compensate the Central Station for the 150 Kw. of plant rendered unavailable for revenue by the low power factor the consumer is charged an amount, and properly so, in excess of his bill for energy used. This charge in excess of the power bill is in the nature of a penalty for low power factor and is a 100% loss to the consumer.

The installation of a C.G.E. Synchronous Condenser of 200 Kv-a. capacity would, as shown in the diagram below, bring the power factor up to above 91%, that is, above the penalty point, would reduce the power bill by the amount of the penalty and in addition improve the voltage regulation and the factory lighting. Any consumer penalized for low power factor may obtain reliable engineering information and data on matters of this nature by referring to our nearest sales branch.







"Made in Canada" by

Canadian General Electric Co., Limited

HEAD OFFICE TORONTO

Branch Offices: Halifax, Sydney, St. John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

Consult the advertiser, his information is valuable.

QUICK SHIPMENT

FROM STOCK

MARSH HOISTS

IN MONTREAL:

5 x 7 Double Cylinder, Single Drum, with Boiler.
6½ x 8 Double Cylinder, Double Drum, with Boiler.
6¾ x 10 Double Cylinder, Double Drum, with Boiler.
7 x 12 Double Cylinder, Double Drum, with Boiler.

IN WINNIPEG:

5 x 7 Double Cylinder, Single Drum, Reversing, with Boiler.
6½ x 8 Swinger, with Bull Ring and Guide Sheaves.

BOILERS PASS INSPECTION IN ANY PROVINCE.

ALL HOISTS GUARANTEED.

QUICK SHIPMENTS ON OTHER SIZES FROM BELLEVILLE.

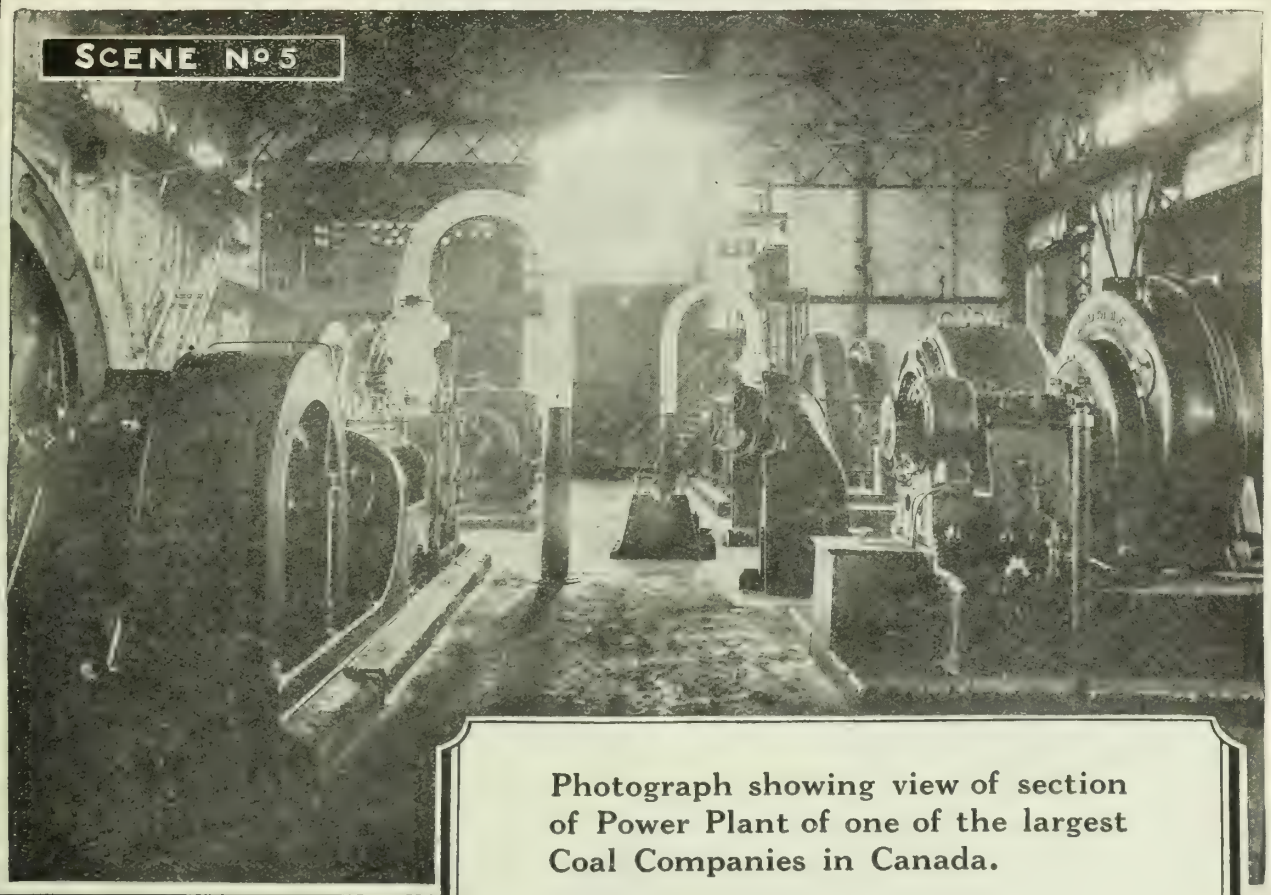
– Also –

DERRICK IRONS, CARS, BUCKETS, SKIPS, ETC.

BUCYRUS SHOVELS and DRAGLINES,
WESTERN CARS, SCRAPERS, GRADERS, PLOWS,
BARBER-GREENE BUCKET LOADERS and PORTABLE BELT CONVEYORS,
BYERS CRANES, SMITH MIXERS,
INSLEY CONCRETE CHUTING and TOWERS, ETC., ETC.

MUSSENS LIMITED

Montreal Toronto Winnipeg Vancouver



Photograph showing view of section of Power Plant of one of the largest Coal Companies in Canada.

All lubricants in use in this plant are supplied by Imperial Oil Limited.

IMPERIAL LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS

Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
Imperial Beaver Cylinder Oil

ENGINE AND MACHINE OILS

Imperial Solar Red Oil
Imperial Atlantic Red Oil
Imperial Renown Oil
Imperial Bayonne Engine Oil
Imperial Polar Machine Oil
Imperial Ario Compressor Oil
Imperial Turbine Oils
Imperial Eldorado Castor Machine Oil

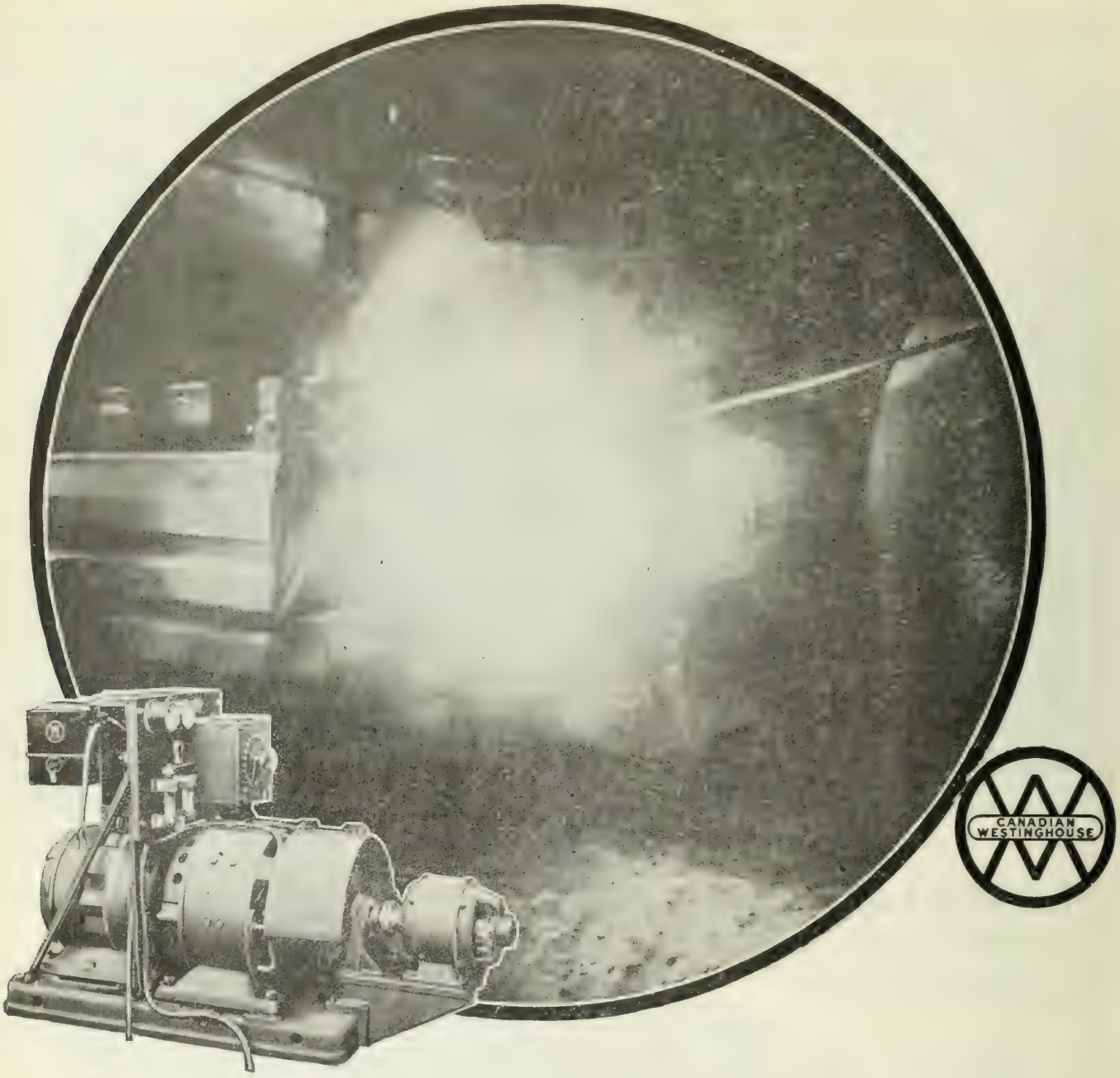
FOR VARIOUS INDUSTRIAL USES

Imperial Black Oils
Imperial Cutting Oils
Imperial Tempering Oils
Imperial Cordage Oils
Imperial Wool Oils
Imperial Ink Oils
Imperial Greases.

Imperial Lubricants are speeding up production and cutting down operating costs in practically every line of Canadian industry. Engineers all over the country specify these oils for the most exacting lubrication jobs because they know their long-time record for satisfaction and dependability.

There's an Imperial Lubricant suitable for every plant requirement. The service of an expert lubrication engineer is available on request at our nearest branch.

IMPERIAL OIL LIMITED



Cumulative Experience

Our experience as designers of electrical equipment dates back to the day when electric lights were a luxury and when electricity was struggling for a place in the sun. Westinghouse was a pioneer in electricity and its uses. Part of the knowledge accumulated during these years of experience is found in the design of Westinghouse Arc Welding Equipments.

There is a special scheme of field connections and a separate exciter that improves the stability, ease of striking the arc, and which assists the operator to consistently obtain sound welds.

The motor and generator used on these equipments are STANDARD. They are as reliable as the name Westinghouse in electrical design and construction.

Westinghouse Bulletin No. 7149 and No. 1826A describe this equipment in detail. Write our nearest office for them.

Canadian Westinghouse Co., Limited

HAMILTON, ONTARIO

Westinghouse

TURNBULL
PUSH BUTTON ELEVATORS

Two Types:

1—FULL SELECTIVE CONTROL—with a bank of buttons in the car numbered to correspond with the several floors, together with one push button outside of each landing doorway. A momentary pressure on a button starts the car which proceeds to the proper floor where it stops automatically.

2—UP and DOWN CONTROL—a simpler and less expensive control consisting of two push buttons in the car and two similar buttons at each landing. Pressing the up button starts the car going upwards and it continues to run while the button is pressed, stopping when the button is released. Similarly pressing the down button operates the car downward. The car stops, of course, automatically at the top and bottom landings.

Both controls are supplied with door or gate interlocks so that the car cannot be started while a door or gate is open and these cannot be opened except when the car is at the landing.

The
TURNBULL ELEVATOR COMPANY
LIMITED

HEAD OFFICE & WORKS:
John st. TORONTO.

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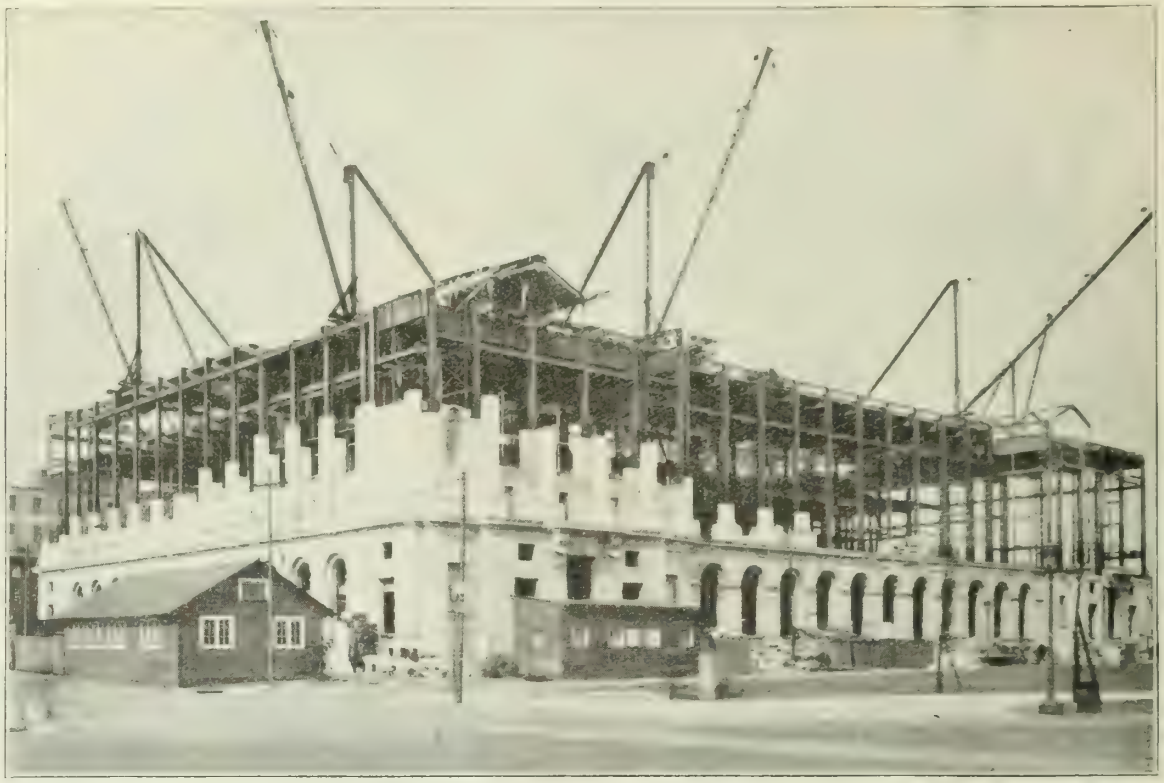

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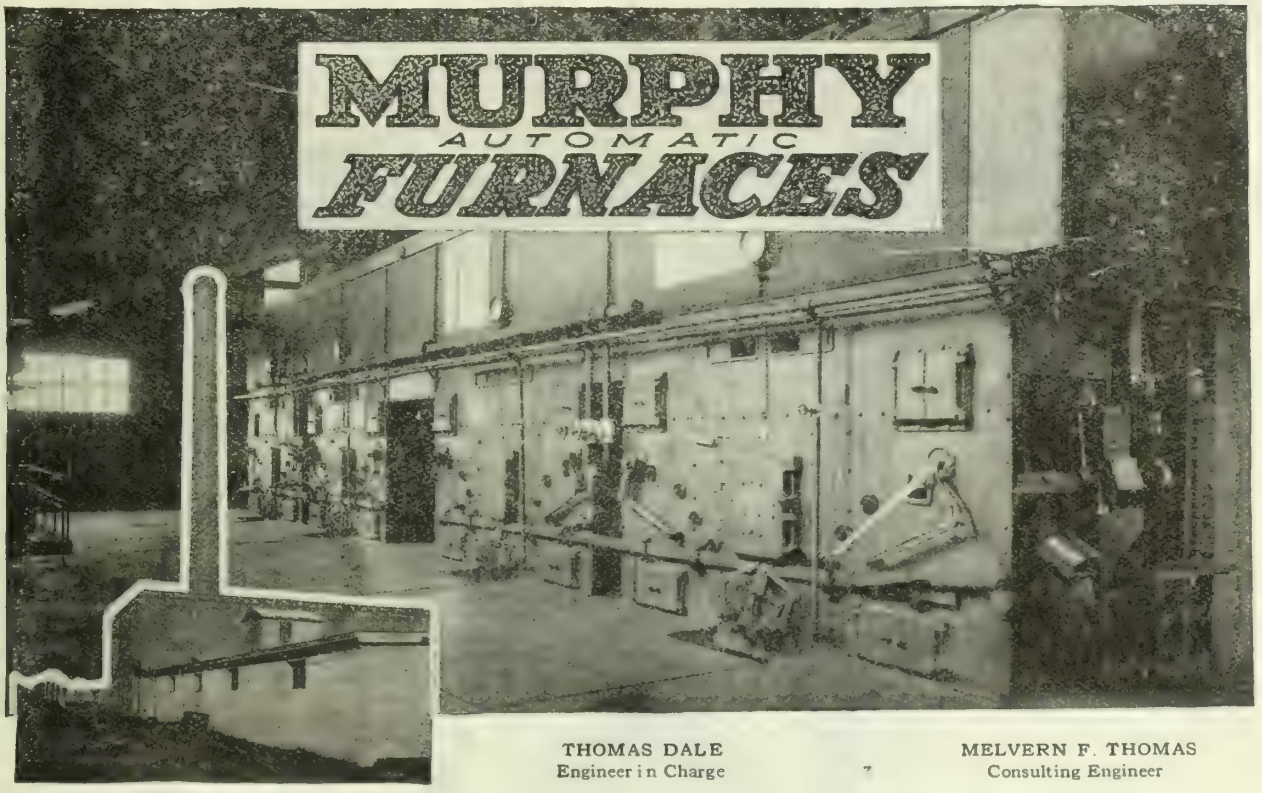

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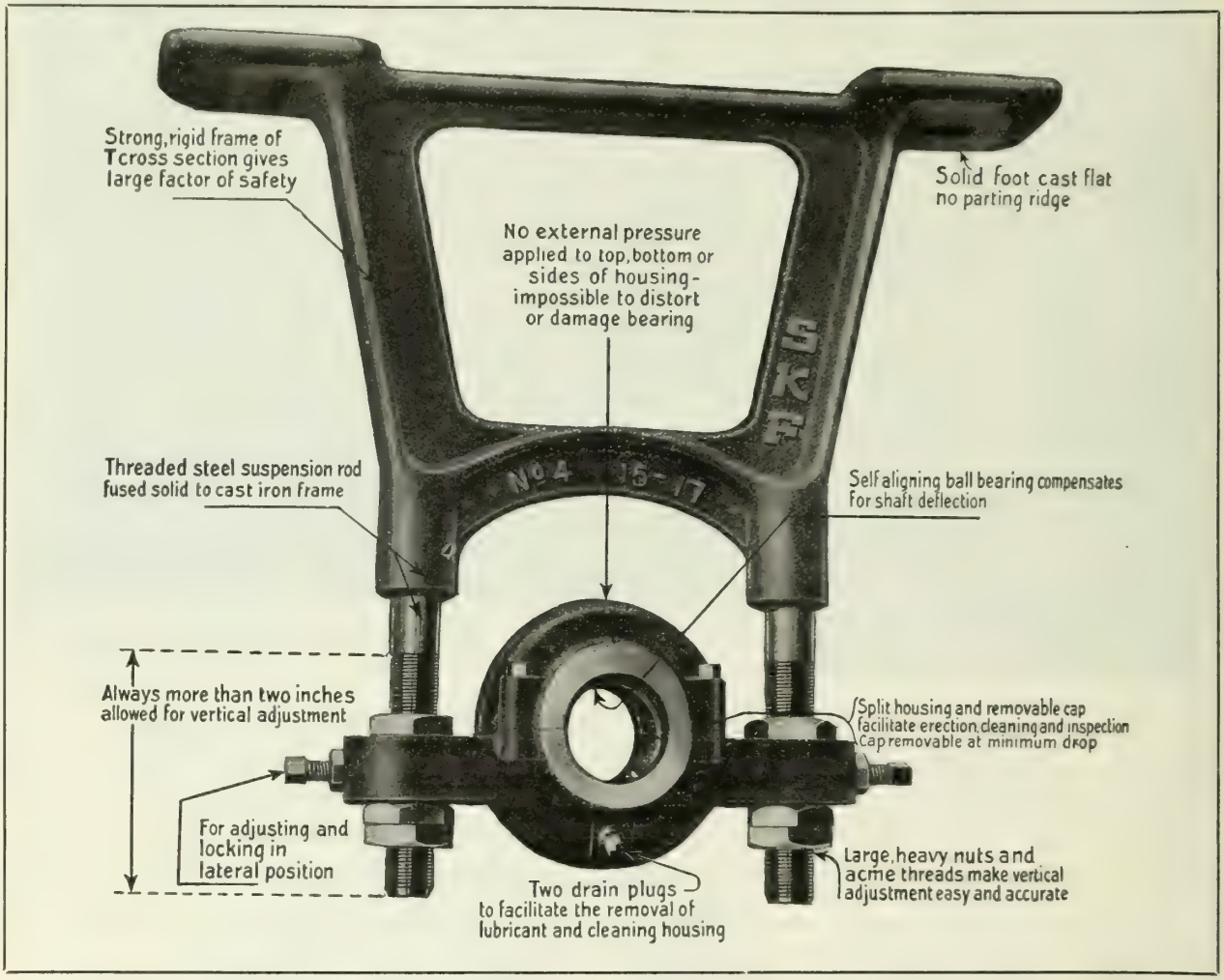

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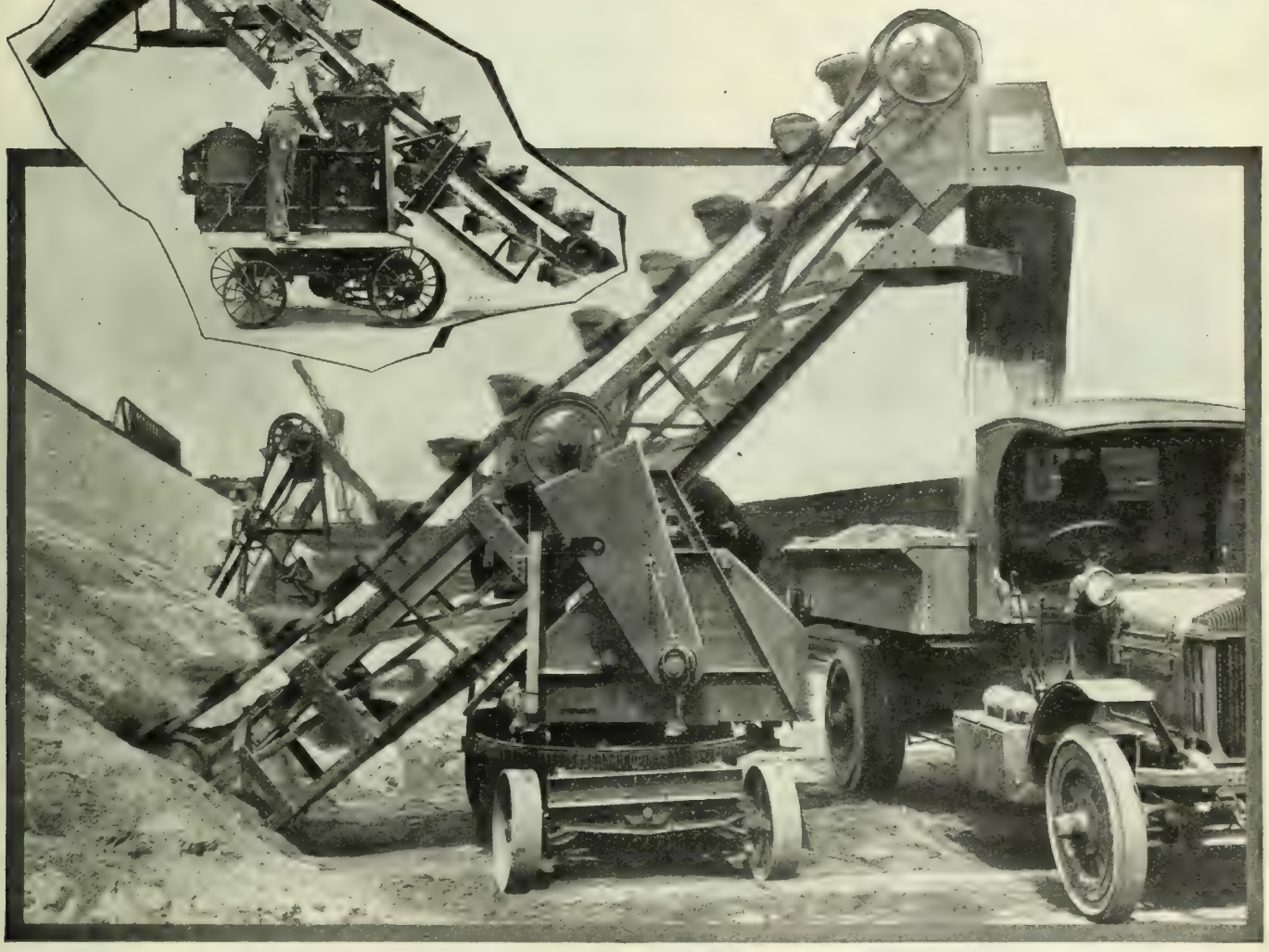

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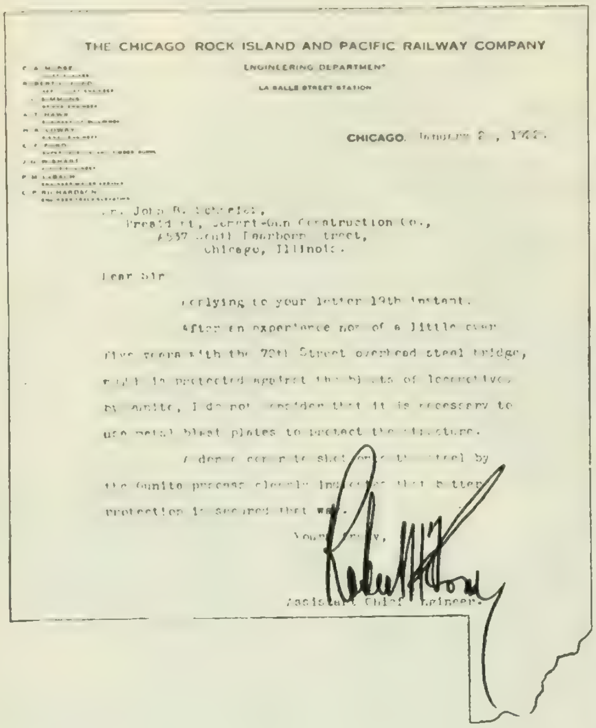

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LA SALLE STREET STATION

CHICAGO, [illegible]

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After an experience now of a little over five years with the 72nd Street overhead steel bridge, which is protected against the blasts of locomotives by gunite, I do not consider that it is necessary to use metal blast plates to protect the structure.

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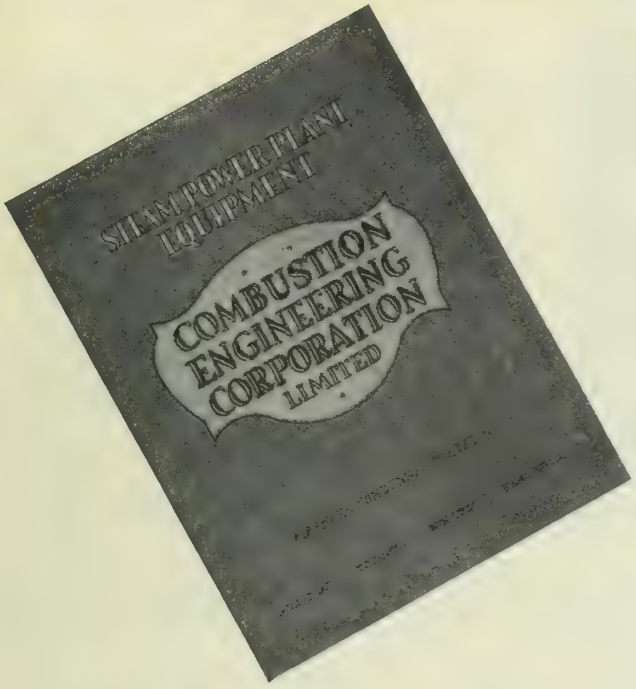

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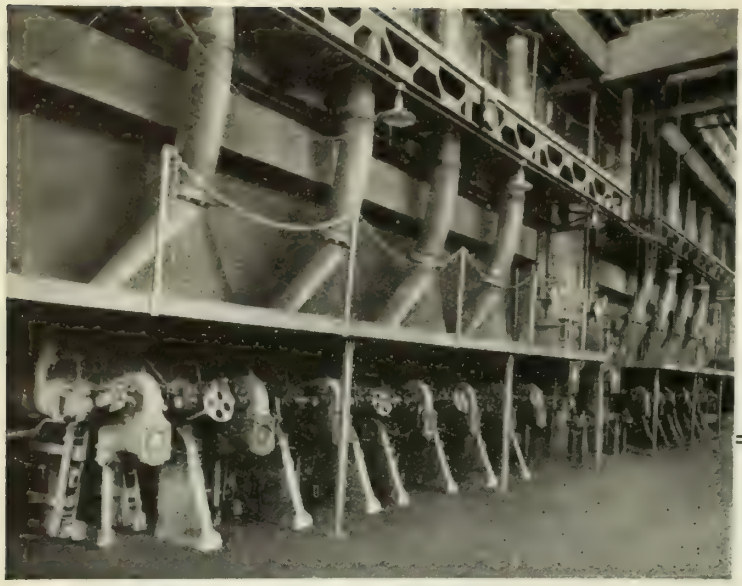

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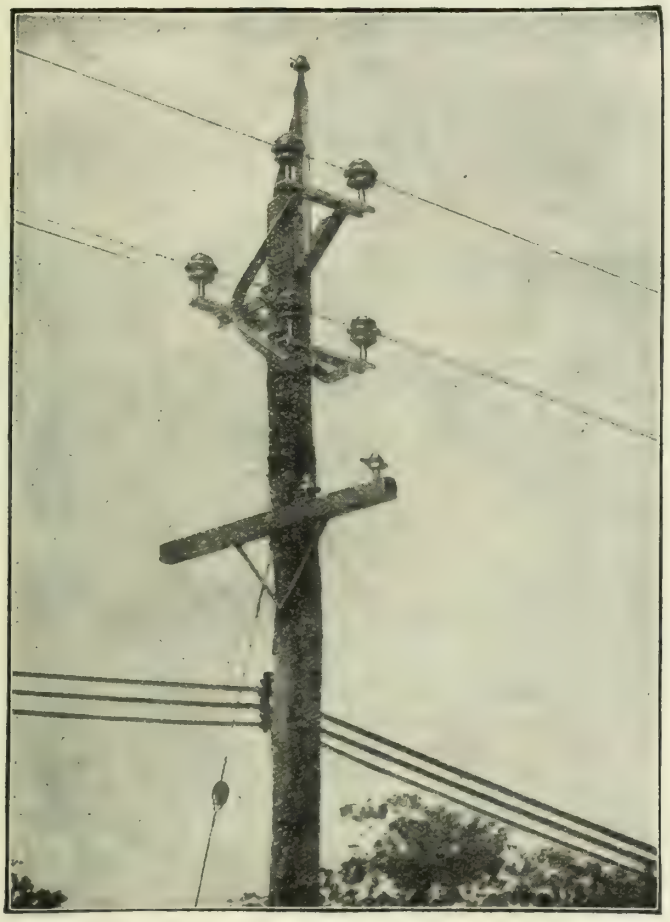

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THE JOURNAL OF
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OF CANADA

AUGUST 1923 Volume VI, No. 8

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The Operation of an Electrical Distribution System

Problems encountered in large Systems with particular reference to the Distribution System of the City of Winnipeg Hydro-Electric System.

C. A. Clendening, A.M.E.I.C.,
Operating Superintendent, City of Winnipeg Hydro-Electric System
and
H. G. Michell, A.M.E.I.C.,
Distribution Engineer, City of Winnipeg Hydro-Electric System.

Paper read before the Winnipeg Branch, The Engineering Institute of Canada, December 21st, 1922.

No attempt will be made within the limits of this paper to state general principles or give general data concerning the operation of electrical distribution systems, as the field is very large, embracing, as it does in the larger cities on this continent, practically every application of the use of electrical energy. The purpose of the paper is to show how electrical energy is distributed to the consumer from the point at which it is received from the generating station and how that distribution is controlled in the particular case of the City of Winnipeg Hydro-Electric System. The discussion is therefore narrowed down to alternating current systems and further to a system where electrical energy is not transmitted directly to the consumer from the generator bus bars but is carried through a number of distributing substations and from these to the points of utilization.

Growth of Load necessitates change of System.

Due to the very rapid increase in the use of electricity for domestic purposes some methods have been adopted to meet demands which are features not common to all systems of similar size and characteristics. The distribution system was originally (1910) built as a three-phase delta-connected system throughout, but due to the rapidly increasing demands made upon it, it is now in the process of being changed on the secondary side of the substation transformers to a four-wire, star-connected, "common neutral" system.

This rapid growth of load is due to four main causes; 1. increase of population, 2. increase in buildings erected, 3. decrease in the cost of the kw.hr., which made possible, 4. increase in the use of appliances.

Figures Nos. 1 and 2 show graphically the first three causes; figure No. 1 shows a rapid increase in population up to 1915 and from then to 1917 a heavy decline, due to the departure of soldiers for the front. However, the kw. peak, as shown in figure No. 3, did not follow this decline, but follows somewhat the "buildings erected" curve and shows a steady increase, although the rate of increase was smaller from the end of 1914 onward.

Effect of Increased use of Domestic Appliances.

In 1919 an active campaign was started for the sale of electric ranges and other domestic appliances and its effect is shown in figure No. 4, where the consumption in domestic heat doubled in one year. The steady increase in the kw. peak load is also very largely due to this campaign. The increased use of domestic appliances first affects the service transformers and secondaries and from here through the primary network and substations its effect is felt right back to the generating station. It is necessary to look some distance into the future in an attempt to anticipate the demand to be made on this part of the system, as the construction involved there is very much slower in accomplishment than any changes in the distribution system. No further reference will be made to changes in the generating station, as this has been fully covered in a previous paper by E. V. Caton, M.E.I.C., in the September, 1922, number of *The Engineering Journal.*

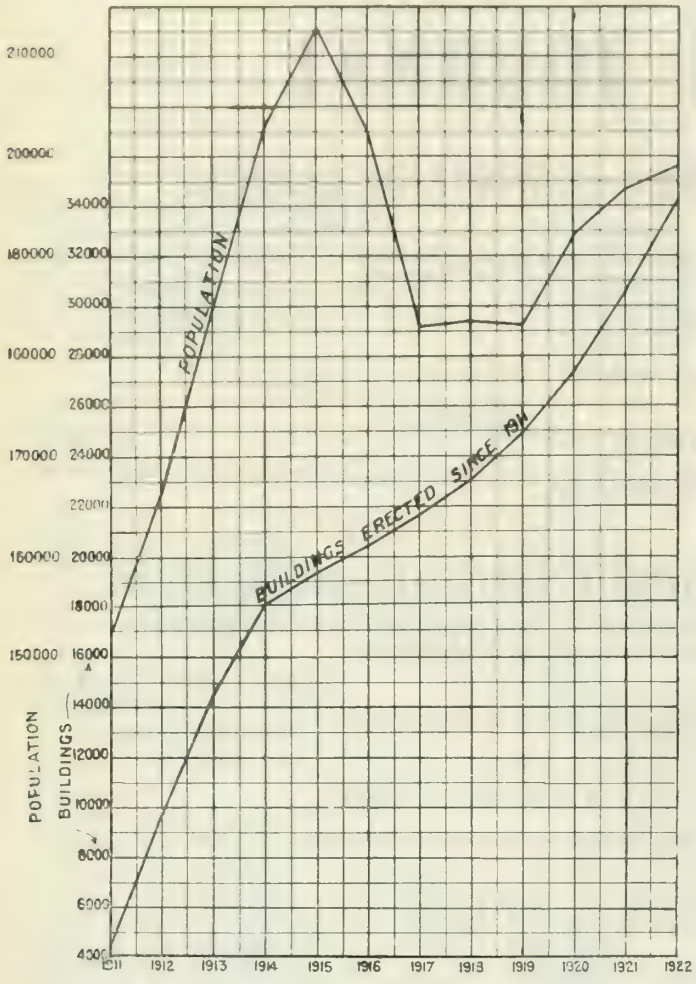

Figure No. 1. Curves showing buildings erected and population of the City of Winnipeg.

As regards the distribution system, the changes in the terminal station have been in the nature of extensions to the original layout of apparatus, but in the substations very radical changes have been necessary and stations originally designed for 3,000 kw., are now distributing 10,000 kw., and in addition one new substation with a present capacity of 6,000 kw., has been built and is now in operation.

Brief Description of System.

The demand on the substation secondary network has been already indicated. Before proceeding with a detailed description of the changes involved therein, a brief description of the whole system might be in order. Figure No. 5 shows the location of the terminal station and the various substations with their interconnecting feeders. At the terminal station energy is received at 60,000 v., 3-phase, 60-cycle, and is there stepped down to 12,000 v., and at this pressure transmitted in lead covered underground cable to the various substations. In the substations a further transformation to 2,400 v. is made and it is then transmitted (3-phase) by means of underground cables or overhead wires to the service transformers, where it is stepped down and distributed at 115-230 v., single-phase, to domestic consumers and at 220 v., or 550 v., 3-phase, to power consumers.

Two methods of meeting the demands on substations were adopted. In some cases, where the district was not so large as to entail the running of feeders of uneconomical size, additional transformers were installed in the substation; the feeder districts were then split up by the running of new feeders. In No. 1 substation this method was not applicable. Originally the district fed by No. 5 substation was served from No. 1, but as the latter's capacity became inadequate and the capital cost and losses on new feeders to serve the greatly enlarged area became prohibitive it was relieved of part of its load by the construction of No. 5 substation. At the time of placing in operation of No. 5 substation, No. 1 substation was carrying 9,100 kv.a., at the peak. No. 5 substation was started with a peak of 3,000 kv.a., at the end of 1919 and this has increased to 6,700 kv.a., at the end of 1922. The load on No. 1 substation has also increased and despite the fact that it was relieved of 3,000 kv.a. in 1919, at the end of 1922 it had a peak of 10,831 kv.a.

Conditions leading to adoption of Increased Voltage and Common Neutral System.

At this time (1919) a study of the distributing feeders indicated that other measures than the costly addition

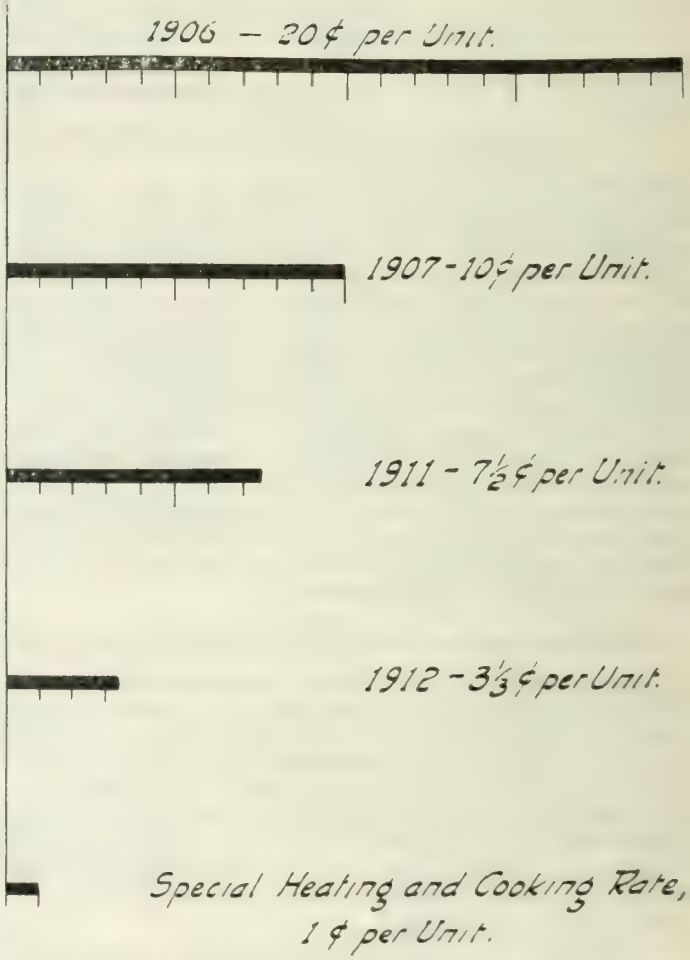

Figure No. 2. Comparative costs of electricity in Winnipeg, showing decrease in ten years.

of substations were necessary. The standard size of copper adopted for feeders was 2/0 B. & S., and the peak load on a feeder limited to 300 amperes. This amperage allowed of switching and regulating equipment of economical size. It limited the districts fed by any one feeder to a size that could readily be controlled. The decrease in resistance and reactance drop by changing to 4/0 does not compensate for the increase in the weight of copper. The density of load in feeder areas was increasing to a point where an unwieldy number of feeders was necessary. The districts also were enlarging and the density of load on the outskirts was low, so that the problem of regulation became increasingly difficult. It was finally decided to raise the distributing voltage to 4,000 v., and the "common neutral" system was adopted.

This system was first built and operated in a part of Philadelphia by S. B. Hood, now with the Northern States Power Company. He built such a system in Toronto, Ontario, and also in Minneapolis, Minnesota, and they have proved to be most satisfactory and economical. Within the past few years a large number of cities and towns both in Canada and the United States have adopted this type of construction.

The copper economy of a four wire, star system, with neutral half size of the outer, is 29.15 per cent (referred to 2-wire 1(|)); this applies to the feeders. In a common neutral system further economy is effected in mains by using a common primary and secondary neutral and the copper economy on this section on the primary wires is 50 per cent. The advantages of the system are very clearly set forth by Mr. Hood in his article in the January, 1923, issue of "Electric Light and Power".

The 4,000-v., primaries are laid out on the feeder and main system and from the point of distribution subprimaries, usually single-phase, are run out to feed service transformers. This applies to feeders where load is used largely for domestic purposes and not for motors. For the latter separate feeders are run on the tree system and in this way the fluctuating demands of induction apparatus do not interfere with the close regulation required for

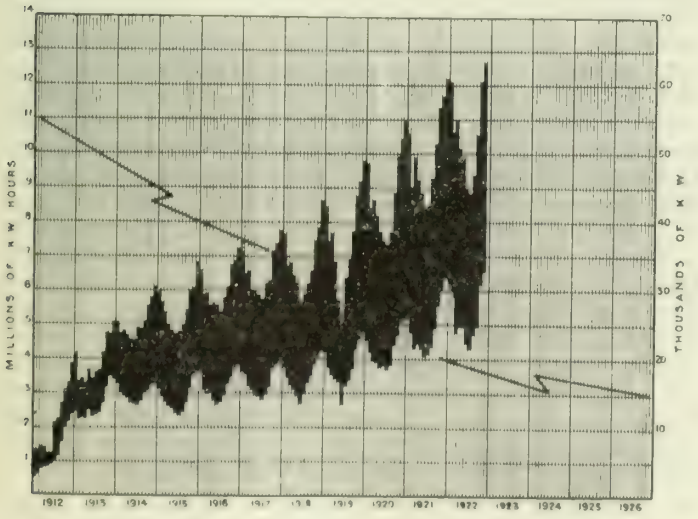

Figure No. 3. Monthly load from 1919 to date.

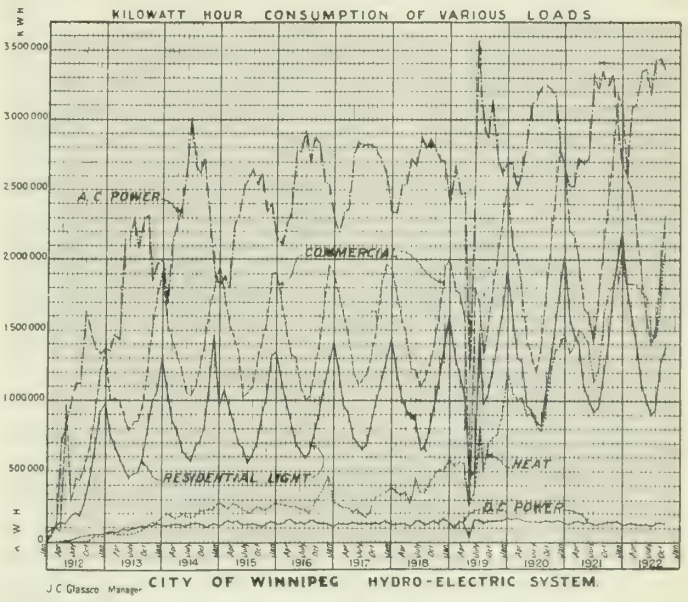

Figure No. 4. Kilowatt-Hour consumption of various loads.

illumination. In most cases each service transformer feeds its own section of secondary, the banking of transformers being restricted within easily controlled limits.

Method of Controlling Varying Conditions.

All the foregoing is a description of the system; the manner in which varying conditions are controlled will now be discussed.

The operating engineer is governed by two main considerations: — (a) service, (b) service at minimum cost, initial and ultimate.

The methods of distributing large blocks of power to substations or to individual consumers is well understood and relatively easily controlled. The ever increasing use of electricity in the home brings in new problems which are in the process of being solved. The habits of the community have an important bearing on the shape of the load curve and introduce varying or unexpected loads which are not so easily absorbed.

The Log Book.

The first and perhaps most important aid to control of the system is the *log book*. This is brought up to date each morning and submitted to the engineering and operating heads daily for inspection. It is compiled from the daily log sheets of each substation, the terminal and generating stations, and shows such details as the maximum kv.a., at each of the above mentioned points, voltage at time of peak load, the ampere load per phase on each bank of transformers and on each 2,300-v., or 4,000-v. feeder, interruptions to service on any part of the generating, transmission or substation systems for the twenty-four hours previous, if any, and various other details affecting the operation of the system.

Reports from the trouble department showing trouble on the distribution system for the past twenty-four hours are sent to the operating superintendent each morning.

Items requiring investigation or alteration to the system are then dealt with.

An inspection of the log book consequently gives a condensed summary of loads at any point on the system and the necessity for a change in capacity of any part of the system due to an increase in demand is thus indicated. From this log book also curves are plotted which show the daily net delivered kw.hr., the daily demand in kw., and kv.a., at the terminal station and power house. These curves give a graphic representation of daily load conditions and a study of them is made to forecast future requirements in increased capacity. This system of charts is also applied to substation and feeder loads, and a study of these and of the maps of feeders and secondaries also indicates required construction to meet future demands.

Regulation of Domestic and Heating Load Feeders.

All feeders serving domestic and heating loads are regulated. On delta connected feeders three-phase induction regulators are installed and on star connected feeders three single-phase regulators, which latter scheme allows very flexible regulation, each phase being entirely independent. Voltage conditions on a feeder are controlled in the following manner. At the centre of distribution of each feeder, voltage test stations are installed consisting of small service transformers whose primaries are connected directly to the feeder and whose secondaries are brought down to a box mounted on the pole. This box is supplied with outlets so that a recording voltmeter may be plugged into any phase desired. A check is made of each regulated feeder at least once a month and more frequently if necessary, and charts are obtained of each phase voltage. Any necessary corrections are then made to the regulator's compensator and contact-making voltmeter. Thus varying load conditions from month to month are met and dealt with.

Records of Distribution Transformers.

A check on distribution transformers is kept in the following manner. When the construction department installs a transformer a report is made giving all details such as its serial number, make, size, primary and secondary voltages, date and place of erection and consumers fed. This report is sent to the engineering office, where these particulars are entered on index cards and, in addition to the above, the street and house number of the premises served and the connected load, as obtained from the ledgers, after being checked by the meter installer, is also entered. If the transformer is changed or removed a new card is made out showing any additional details. This card system with its detailed record of connected load was at first used as a means of estimating the actual load on any transformer, by the use of a demand factor for any given class of service. In the past few years, however, in an attempt to definitely establish such a demand factor an extended series of tests was undertaken. A variety of test methods were used. The indicating ammeter and split-core type of current transformer was found satisfactory up to a point, but due to the extremely fluctuating character of the domestic range load it was found that more accurate results could be obtained by the use of graphic instruments. These, however, are costly and due to the size of the outfit testing is too slow.

During the past two years a type of maximum demand ammeter has been successfully used; this instrument is compact and easy to handle, and having a half hour time lag gives an integrated peak reading. By the use of these various methods a great number of tests have been made but all results go to show that the demand factor as applied to service transformers is by no means a constant. Results of some 500 tests give demand factors varying from 18 to 75 per cent. The average of all tests falls between 25 and 30 per cent, but the many and wide variations for no observable cause invite no confidence in the use of such a value. However, as a basis of loading a factor of 25 per cent is used, and, taking into account the short time overload temperature characteristic of 50 per cent, which is usual in all modern transformers, load is added until a connected load of 600 per cent of rating is reached. Tests are made on all transformers reaching this value of loading and if necessary a change is then made.

Possibility of Temperature Basis of Transformer Operation.

It was realized from the first that this method of loading transformers was by no means entirely satisfactory. If it were possible to operate distribution transformers on the same basis as, say, generators or station transformers, that is by keeping constant check on the temperature of the windings, no better method of loading could be desired. The possibilities of such a temperature basis of operation, and with the low winter ambient obtaining in this country, the certainty of being able to operate for short periods at considerable overloads was so attractive that an extended series of tests is now being carried out to determine whether it is possible to rely on the indications of some form of maximum temperature indicator. If these tests are successful, as a preliminary report would indicate, it is proposed to equip all transformers with such indicators and to load them until the maximum safe coil temperature is reached. This is not intended to supplant all previous methods of testing but it is felt that such a system of indicators will give control of this part of the system as never before.

System of Records.

As a distribution system is spread over a considerable area and involves a host of details and requires a series of varied and extensive investigations and tests it is necessary that records be kept in such a manner that each detail is easy of access and reference, and that such records be easily kept up to date. It is also necessary that the component parts of the system be co-ordinated in such a manner that the whole may be seen at a glance. A description of the system of recording transformers has been given above. In addition to this, maps are kept showing the location of the substations and their interconnecting 12,000-v. feeders, also other maps showing the routes of the 2,300-v., and 4,000-v., feeders and their system of mains and sub-primaries, sizes of wire and pin position. On these maps are also shown such details as the location and size of section fuses, transformers, etc. To avoid congestion separate maps of the secondary system, neutral ties and grounds are also kept, together with maps of the pole locations. Ordinary filing systems are used for recording test data, load curves, etc.

The same system of records is applied also to underground feeders, mains and transformers; underground

distribution has its own problems and due to the inherent nature of the material and apparatus different overload ratings must be used. More frequent inspections must also be made than on the overhead lines. Due mainly to the much higher proportionate cost, the growth of the underground system has been slower. Direct current is also distributed three-wire, 250/500-v., on the same poles and in the same ducts as the alternating current. The district supplied is limited and its use largely restricted to elevator motors and printing press motors. Street lighting wires also are carried on the same poles and in the same duct runs as the commercial a.c. and d.c. lines. Street lighting is controlled by another civic department and space is rented in the substations for arc tubs.

Referring again to the domestic appliance load, whose growth has been such a feature of this distribution system, it is felt that closer co-operation between the appliance manufacturers and the central station would result in better and more satisfactory service and would tend to reduce the manufacture and sale of certain types of appliance which, while throwing very heavy loads of short duration on the secondary lines, do not produce sufficient revenue to cover the cost of adequate service. The domestic appliance field in this city is far from the saturation point and in addition to the problem of adequately serving this load comes the proposal to heat not only the larger buildings but also dwelling houses by means of electrically generated steam. It is believed that if such a load can be taken at off peak periods, thus requiring no further addition to the existing distribution system, there should be no difficulty, provided only that adequate control is maintained. As load grows and regulation becomes more and more difficult, distribution voltages have steadily increased. The task of designing the system to care for expansion over a period of years is becoming a still greater problem and he would need to be a prophet indeed who could predict what the distribution system of the future will be.

Modern Tendencies in Engineering Education

An Historical Review of Engineering Education, Analyzing, the Curricula of Various Engineering Colleges.

H. W. McKiel, A.M.E.I.C.,
Professor of Engineering, Mt. Allison University

Paper read before The Moncton Branch, The Engineering Institute of Canada, February 9th, 1923.

(Continued from the July 1923 issue of "The Engineering Journal")

Ten Requirements for a Successful Engineer

Professor Dunlap, then, like a true engineer, draws up a set of specifications for what he considers the successful engineer should be. These specifications, ten in number, are as follows:—

1. Every engineer shall know his environment. This will require at least an elementary knowledge of history, sociology, economics, biology, geology, physics, chemistry and mathematics.
2. Every engineer shall know himself. Here is demanded some acquaintance with literature, music, art, philosophy, psychology, etc.
3. Every engineer shall think well.
4. Every engineer shall write well.
5. Every engineer shall speak well.
   In connection with these qualities he speaks very disparagingly of their development, as shown by his mail, while acting as secretary of Iowa State Engineering Society.
6. Every engineer shall know the sources of scientific information. According to some of the technology librarians of the United States there is much to be learned along this line yet.
7. Every engineer shall be skilled in the use and method of applied science, in the solution of engineering problems.
8. Every engineer should be thoroughly trained in costs and values, as an engineer has been defined as a man who can do for one dollar, what and one can do for two.
9. Every engineer shall prove himself to be an economic asset in his work, and shall understand the commercial and ethical aspects of professional practice.
10. Every engineer shall consider that oue of his chief functions in life is to serve his community.

Of these ten specifications, only number seven is well looked after by the modern course, and numbers 3, 4, 5, 6 and 8 in a rather haphazard fashion, the other specifications being ignored. Needless to say, with courses of the standard four-year length, constituted as at present, any other result is impossible. Hence Professor Dunlap's recommendation is for a five-or six-year course, the first three years of which shall be devoted to arts work, and which shall lead to the degree of B.S., upon completion of one year in engineering. Upon the completion of one or two years more of engineering, depending on the length of the course, a professional or advanced degree would be given.

Dean Cooley of Michigan, speaking along the same line makes the statement,—"The engineer of a generation ago was better prepared to do the work of his generation, than is the engineer of to-day to do the work of this generation". As a remedy he advocates a longer and more general course, with more attention to humanistic subjects. The American Institute of Electrical Engineers has recently adopted a resolution favouring a six-year course, two years of which shall be pure arts.

The View Point of Increased Specialization

Some complaints have also been made from the opposing point of view, namely that the courses are not specialized enough, and that the colleges do not train a man so that he may immediately fit into some particular niche in industry, and bear his full share in the process of production. This view, of course, represents the extreme of specialization, and while its accomplishment might have been possible thirty years ago. To-day it seems out of the questions. The profession has developed so many branches, and each branch has se many ramifications, that it is manifestly impossible for any school to so thoroughly train a student in the intricacies of practice in even one branch of engineering, that he is prepared to enter any phase of it, and immediately develope his full skill. The highly specialized type of training necessary to fulfil any such requirement, would present so many details that no time would be left for anything else, and the field of the graduate would be very limited. Such training belongs to the trade school rather than to a professional school.

The general concensus of opinion undoubtedly seems to be in favour of less, rather than more, specialization in the four-year course, leaving most of the highly technical training to industry itself, as the agency best able to give both the training and the point of view required. Such a scheme would provide for the average student a good sound education in fundamentals, upon which base subsequent experience might build a structure, limited only by the student's ability and opportunity. For the exceptional student or one who shows marked ability in some particular line, a fifth year of specialized training and research leading to an advanced degree might be provided, though this graduate training would in no way encroach upon industry's share in the education, but merely serve to make possible a fuller use of this period of apprenticeship for the student, fortunate enough to procure the extra year in college.

European Systems

If European experience furnishes a parallel, it should be largely from this latter class that leaders and executives are developed. The system used in France is similar to the one suggested, the French student continuing along in the secondary schools until he reaches what is equivalent to the end of our first year in college. Then he spends two more years on an intensive training in mathematics, physics and chemistry, etc., and writes the entrance examination to the school devoted to the phase of engineering in which he wishes to specialize. Here he takes three years, as a rule, to secure his engineer's diploma, which admits him to the highest class of the profession, the certificated engineer. The entrance examinations to these schools, however, are very severe and many more fail than succeed. The man who fails may try again, or he may enter engineering practice at once in some of the subordinate positions, and by a period of apprenticeship, may in the course of time secure a place of trust and responsibility, though never progressing as he would have, had he graduated from one of the professional schools. A somewhat similar plan is followed in Germany and Italy.

Action taken by University Authorities to remedy Defects

Having now made a cursory examination of the chief criticisms directed at our present system, and some of the suggested remedies, let us see what steps are being taken by those in authority in educational matters. I have already dealt with the courses given by Iowa State, Columbia, Dartmouth, Northwestern, and to some extent with the new regulations at Pittsburgh, all of which are designed to relieve the over specialization, and in some cases to produce an education of a broader and more humanistic nature.

A recent move along somewhat similar lines came in May 1922, when the engineering deans of a number of the colleges of the middle western states, met in Chicago to discuss the present course, and any desirable modifications which might suggest themselves. Among the colleges represented were the following: — Iowa, Minnesota, Ohio State, Purdue, Michigan, Illinois, Northwestern, Wisconsin, North Dakota, Nebraska, Washington and Colorado universities, and Michigan Agricultural and Iowa State colleges. After considerable discussion a series of resolutions were adopted for submission to the faculties of the various institutions. In June the deans again met, after submission of the resolutions to their respective faculties, and formally adopted a set of resolutions, which differ very slightly from the original set. They are as follows:—

> "In order to meet the constantly enlarging responsibilities of the engineering profession, we favour an advance in engineering education at this time, that shall provide five years of collegiate training for those engineering students whose aim is to become qualified to take positions among the creative leaders in the profession, and that such advance shall be made in substantial accordance with the following plan:
>
> 1. Include in the four-year engineering curricula a substantial proportion of fundamental and humanistic subjects, omitting, if necessary, a sufficient amount of the more advanced technical work. It is desirable that, so far as possible, the curricula in the different branches of engineering shall be sufficiently uniform to permit students to defer their final choice of a specialty, at least to the end of the second year.
>
> 2. A fifth year of advanced work, mostly or wholly technical, and specialized to such an extent as desired.
>
> 3. The first four years of work shall lead to a bachelor's degree, and the fifth year to an advanced degree in engineering."

As these colleges comprise practically the entire list of prominent engineering schools between the Appalachians and the Rockies, their action is significant and would seem to indicate, still further, the modern tendencies.

Co-operation between Industries and Engineering Colleges

Another comparatively recent phase of engineering education is worthy of note. This is the scheme of co-operation between school and industry. Most of the replies to a questionnaire sent out by one of the American

National engineering organizations indicated, as has been previously intimated, that the practising engineer seemed to be of the opinion that no amount of college training could do away with a period of apprenticeship in actual industry. While indirectly this furnishes another argument against the technically specialized course, and in favour of a more general course with greater attention to fundamentals, it is not in that connection that it will be referred to here, but rather as it touches upon the co-operative course.

As early as 1906, universities had begun to realize that their training left much to be desired from the practical view point and were looking around for some method of bettering it. Cincinnati hit upon the scheme of co-operation, and what is more important found some fifteen industries which were broad minded and public spirited enough to undertake their side of the plan, and look to the future for returns. These industries were in the field of chemistry, electricity and the mechanical trades, and the plan was put into operation along these lines at first. The original arrangement provided that students in these branches of engineering at Cincinnati, would spend five years, alternately in the class room and the shop.

The course is still five years in length, each year being eleven months long. A student registering for the first time reports at the shop, to which he is assigned in July, where he continues until September, at which time the class is divided into two equal parts, one half going to the class room for a period of two weeks, while the other remains in the shop. Thereafter every two weeks the groups change, until the next summer, when from the middle of August to the middle of September the university is closed. Each group takes two weeks holidays, alternately, so that there is no interruption in industry. The course given is quite broad and thorough, and to insure the full benefit of the co-operation, a department of co-ordination is maintained to look after the work of the student during his period in the shop, and to review it and discuss it by means of reports and criticisms during his period in the class room.

On the successful completion of the fifth year a professional degree is awarded. In 1909 the system was extended to include civil engineering, and to-day five courses are given in engineering and one in commerce. From 1906 to 1920 a regular non co-operative course, four years in length, was maintained for those who desired it, but in the latter year, this was discontinued owing to the very small number registered. In this period the number of students increased from twenty-seven to nine hundred and fifty, and what is more significant, the number of co-operating firms from fifteen to one hundred and fifty. Thus was the faith of the founders justified.

Successful Schemes of Industrial Co-operation

So successful was the scheme that in 1910 the University of Pittsburgh adopted a modification of it. According to this method each student spends nine months of each year in college and three months in some one of the ninety-three co-operating industries, for a period of four years, at the end of which time he receives the degree of B.S., in his particular branch. This scheme has worked out very satisfactorily, and greatly to the benefit of the students, of course. But also, with what could not be so confidently expected, a marked benefit to the co-operating industries, and even to the employees of those industries. Students are eagerly sought for during their terms in the shop, and so superior seems to be the graduate of this course, that in 1920, in spite of the dearth of engineering employment, not a single graduate was without one offer of permanent employment, and many had several. These graduates are, as a rule, snapped up by the industries with which they have been apprenticed during their course, and soon enter positions of executive responsibility and trust.

Another great example of this co-operative system is furnished by Massachusetts Institute of Technology which maintains a co-operative course in electrical engineering with the Lynn plant of the General Electric Company, and a semi co-operative course in chemical engineering with some five chemical plants scattered about New York and New England. In the electrical course the first two years are spent at the college after which the class is divided into two equal portions, both of which go to the Lynn shops for thirteen weeks in the summer following their sophomore year. On the completion of this period one division goes to the class room at the Institute for eleven weeks, while the other remains at Lynn for another thirteen weeks, after which the groups change places. This alternation is kept up for eleven terms, in every two of which each students gets two weeks holidays.

After the conclusion of the eleventh term, the co-operation having been pursued for one hundred and forty-three weeks, all the students return to the institute for nine weeks training, upon the successful completion of which they are admitted to the degree of M.S. During their time at the plant lectures are given by members of the technology staff and officials of the General Electric Company, covering the work under way at the time. In the chemical engineering course, four years are spent at the college and a degree of B.S., obtained. Students returning for a fifth year report in the summer and are given twenty-four weeks observation and research work in the co-operating plants, each of which is engaged in a different type of work. This is followed by two terms at the Institute, completing the requirements for a M.S. degree. According to both parties to these schemes it has been found that the supervised practical training received in the three and a half years of co-operation is equivalent to approximately five years of ordinary apprenticeship subsequent to graduation.

The success of these ventures has been so pronounced that in addition to the cases mentioned some form of co-operation has been adopted by Newark Technical Institute, Marquette University, Milwaukee, Lafayette College, Easton, Pa., and Harvard. It has recently been discussed at some length before the Society for the Promotion of Engineering Education, and from the opinions expressed it seems probable that it will be adopted by many other colleges in the near future.

Fundamental Purpose in attending College

In conclusion let me quote James Phinney Munroe, a Boston business man and member of the Corporation of Massachusetts Institute of Technology, on why a man comes to college. Mr. Munroe says, "A man does not come to college to learn to earn a living; he comes to

learn to live". If this be so, and I believe it should be, then, how is our present engineering course adapted for this purpose. Personally I am firmly of the opinion that its chief object has been to teach a man to earn a living, and that it was never designed to help him enjoy that living, once he gets it, nor was it intended to help him in his daily contact with his neighbours. That, to me, is the great reason for our lack of appreciation, as a profession, by the general public, and our inability to secure professional standing. Other professions are taught to deal with the human element in their daily practice, and hence can appreciate and help solve community and national problems. There is no man who should be so well fitted for this type of service as the engineer, but as a result of his attitude in the past he has not been invited, nor even expected, to take any part in public affairs, beyond the purely technical ones. In fact so little was he in the public eye, that in the latest edition of the Encyclopædia Britannica, published in 1911, he is dismissed with a quarter page, most of which is occupied by a recital of the constitution of the British Institution of Civil Engineers. In contrast there are more than twenty references to law, the subject matter of which fills many pages, while the references alone to medicine cover more than a column in the index.

The war and recent activities of individual engineers, such as Mr. Hoover and our own Sir Henry Thornton, have brought engineers out of the obscurity of the past and given them the opportunity to prove their worth in new and varied fields. It would seem then, that the present is an opportune time to revise our programme of technical education, to such an extent that the engineers of the future may be fitted to secure and maintain some measure of success in these fields opening up. I am inclined to agree with Mr. Burr that we must work from the inside out, and it seems to me that the best method of accomplishing this, for future generations, is by the adoption of a rather general four-year course, stressing fundamentals, to be followed by a fifth year of specialization, if desired. Such a scheme requires all engineering students to secure a much broader general education than is now the case, while at the same time it includes a sufficient amount of fundamental technical work to satisfy the requirements in most cases. It also furnishes the well organized technical work for special and advanced students which will encourage students of ability to thoroughly prepare themselves for research and special work of various kinds. On the whole it seems a better arrangement than the three- or four-year college course prior to admission to engineering, as it places the entire course under the control of the engineering faculty.

The committee recently appointed by *The Engineering Institute of Canada* to investigate the status of engineering education in Canada, is considering a much more liberal course than is now usual, in fact one somewhat along the lines I have indicated. Such a course in combination with some system of co-operation seems to me to be the best method of remedying the present unsatisfactory situation, and of elevating the standard of the engineering profession as a whole. We would not think of training a surgeon without the aid of the hospitals, nor a lawyer without the aid of the courts. Neither would we attempt to produce a specialist, in law or medicine in four years of restricted training. In these professions we demand a broad general training similar to the B.Sc. course outlined above, on which at will may be superimposed the advanced technical training of the specialist. I believe that the adoption of such a policy on our part will lead to the development of men of ability and initiative, rather than the automatic machines I feel we are now producing in some cases, and will, of itself, lead to the elevation of the calling to real professional dignity, and as a result bring about the attainment of the desired public recognition.

Combustion Problems and Furnace Design

Notes on a Field of Research for the Mechanical Engineer

Charles A. Robb, B.Sc., S.M., M.E.I.C.

Professor of Mechanical Engineering and Resident Engineer, University of Alberta.

Paper read before the Edmonton Branch, The Engineering Institute of Canada, March 14th, 1923.

In outlining a typical problem for which research as it affects the mechanical engineer would appear to be demanded, a few words may first be said on the economics of research. Faraday's discovery of the law of the electric dynamo in 1813, for which the apparatus cost less than five pounds, has made possible the whole electrical industry in which England alone had invested, in 1917, £600,000,000, and the United States in 1920 had invested no less than four billion dollars.

Newcomen's atmospheric engine of 1705, Watt's condensor of 1763, Watt's rotative-type engine of 1781 and his double-active engine with governor of 1782, paved the way for the application of power to the development of industry and revolutionized the whole economic structure of England. Out of this grew the demand for machinery to replace manual labour, the capital to secure the machinery, the great shops in which to make the machinery and the grouping of workers in these shops. This sequence gave rise to our modern system of finance and the organization of labour.

The discoveries of Pasteur gave to France in five years sufficient savings to pay the whole debt caused by the Franco-Prussian war. It would be interesting to know what percentage of the savings effected by research is actually turned back for further research.

Alberta Coal and its Natural Market

A typical problem for the mechanical engineer is that of combustion and furnace design. In Alberta there are vast quantities of coal and in great variety. Canada has a great fuel demand. Canadian sources of supply are limited to the maritime provinces and the

west. Middle Canada must therefore draw from the east, the west or import coal from the United States, and the latter is becoming increasingly difficult. Alberta has thus in Canada a natural market for her coal and combined efforts have established a firm hold on the Winnipeg market.

Credit is due to our trade commissioner, Mr. Stutchbury and his assistant Mr. Pratt, who have been very active in demonstrating the virtues and characteristics of Alberta coal. In 1920 a series of tests were carried out at the plant of the provincial government of Manitoba in Winnipeg and it was shown that Alberta had a number of coals which could be laid down at Winnipeg in competition with United States coals both as to quality and price.

Engineers who are coal consumers can, of course, choose from coals available the one best suited to their steam boiler furnaces as to variety, size and the method of firing. Our coals range in quality from the best grades of bituminous to the comparatively high moisture and high volatile so-called domestic or lignite coals. Most of the latter is mined during the winter months and the proportion of slack is very high. A few years ago this slack was considered a waste product and was placed on the dump. Furnaces and stokers have been devised which handle the slack successfully and very real economics have resulted in their use. This economy is very far reaching in that the coal operator gets a reasonable price for the slack and the operative engineer gets his coal for half or less of the cost of nut coal and with approximately the same boiler capacity and efficiency.

Every ton of the sub-bituminous coal burned locally makes the equivalent in bituminous coal available for export and with the latter the problem of storage through the summer months presents no difficulty while at the present state of our knowledge the tendency of the high moisture coal to slack makes storage difficult and expensive. The export of the bituminous coal insures a more equitable basis for freight and tends to stabilize the whole industry, leaving the domestic market to be served by the higher moisture coals.

The Problem for the Mechanical Engineer

The problem for the mechanical engineer is thus to devise improved methods for burning the domestic coal. That is to say, improved furnaces and methods of firing, and, having done that, to encourage the use of boiler furnaces best suited to the local coals. Broadly speaking this means a furnace with ample combustion space to take advantage of the high percentage of volatile constituents and to overcome the effect of the moisture. Some progress has been made and this field should prove very profitable.

In 1914 a special furnace supplied by Messrs Babcock and Wilcox was installed at the University of Alberta to permit the use of slack coal. This gives a satisfactory steam for dollar economy and the current annual saving amounts to approximately $20,000.00 or 50 per cent. The plant consists of four units of which three are equipped with stokers and the remaining furnace, which is hand-fired, is designed on liberal lines for the high moisture coal. The heating surface is 2,197 square feet per unit and the grate area 60 square feet for the chain grate stokers and 44 square feet for the Dutch oven, hand-fired furnace. In all units the boiler is placed well above the grate and in the stoker furnaces a heavy arch is provided to assist in the ignition of the green coal.

Other plants in the province of Alberta including the municipal plants at Edmonton and Calgary, now burn slack coal formerly wasted. The annual reclamation value from this source must now be little short of half a million dollars, while the saving in coal cost to the plants is large. It has been found that the high moisture coals will not ignite properly on the standard chain grate stokers as designed for bituminous coal and before the furnaces were re-arranged the practice was to mix in a portion of bituminous coal which was expensive.

Collation of Experimental Data Necessary

Present conditions leave us with a moderate efficiency for the boiler and furnace and the specific problem covers a study of the furnace to establish suitable proportions, arrangement of arches, draft for various thicknesses of fire, etc., and special characteristics applying to stokers. A comprehensive programme developed in co-operation with the superintendents of the larger plants in the province should lead to the accumulation of data covering the experimental work already accomplished and co-ordinating efforts in the future. Broad outlines could then be established for the guidance of engineers in the design of furnaces for steam boilers and higher efficiencies obtained.

A further point is that authoritative data covering furnace design should help to rectify the confirmed practice of installing furnaces suitable for bituminous coals only to serve large steam boilers and which give neither good boiler efficiency nor capacity.

Necessity for more liberal Combustion Space Recognized

Stoker manufacturers are recognizing the demand for more liberal combustion space as evidenced by their action at a convention last year in settling upon certain dimensions for various stokers. Experimental work has been carried out on lignite coals by the manufacturers of the B. & W., Jones, Green and Allan stokers. During the past ten months word comes of results on the Turbine stoker.

Investigations with a view to the solution of such problems is called *industrial research.* There is established in the province a *provincial research council* which exists as a department of the university with a staff of research engineers. In the organization of the provincial government the work of the research council is attached to the department of the provincial secretary. Laboratory accommodation and the general facilities of the university are utilized by the research council.

In regard to fuels the programme of the council includes screening and storage, house-heating furnace tests on coals. Boiler trials have been carried out on all the large samples also one on mixed coal. Fourteen trials in all have been made during the year. An experimental carbonizer for lignites is in operation, also a briquetting machine.

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Maritime Professional Meeting

Maritime Professional Meeting, St. John, New Brunswick, September 26th, 27th and 28th, 1923

Saguenay Branch Organization

The organization meeting of the Saguenay branch will be held in the Staff House at Kenogami, on August tenth, nineteen twenty-three, at eight o'clock P.M., daylight saving time. The contingent from Montreal is going by boat, to be joined by others at Quebec, it being anticipated, due to the interest of the members of the Institute in that district, that the Saguenay branch will commence its career in an enthusiastic manner.

Allocation of Branch Territory

At a meeting of Council held at headquarters, on Monday, July nineth, nineteen twenty-three, the new branch territories, in accordance with the recenly adopted by-laws of *The Institute*, were approved. Under the new by-laws all members resident within the Dominion shall be members of a branch, and the territory allocated to each branch is given below for the information of the members.

Maritime Provinces	*Counties*
Halifax Branch	Halifax, Lunenburg, Queens, Shelburne, Yarmouth, Digby, Annapolis, Kings, Hants, Colchester, Cumberland, Pictou.
Cape Breton Branch	Guysborough, Antigonish, Richmond, Inverness, Victoria, Cape Breton, and also Newfoundland.
St. John Branch	St. John, Charlotte, Kings, Queens, Sudbury, York, Carleton, Victoria, Madawaska.
Moncton Branch	Albert, Westmoreland, Kent, Northumberland, Restigouche, Gloucester, and the province of Prince Edward Island.

Quebec	*Counties*
Saguenay Branch	Saguenay, Chicoutimi, Lake St. John.
Quebec Branch	Gaspe, Bonaventure, Matane, Rimouski, Temiscouata, Kamouraska, L'Islet, Montmagny, Bellechasse, Dorchester, Beauce, Frontenac, Anticosti, Lotbiniere, Levis, Charlevoix, Montmorency, Quebec, Portneuf.
Montreal Branch	Compton, Stanstead, Sherbrooke, Richmond, Wolfe, Arthabaska, Megantic, Nicolet, Drummond, Yamaska, Richelieu, St. Hyacinthe, Bagot, Shefford, Rouville, Brome, Mississquoi, Iberville, St. Johns, Napierville, La Prairie, Chambly, Vercheres, Chateauguay, Huntingdon, Beauharnois, Jacques Cartier, Laval, Two Mountains, Terrebonne, L'Assomption, Montcalm, Joliette, Berthier, Champlain, St. Maurice, Maskinonge, Argenteuil, Vaudreuil, Soulanges. Also all other territory in Canada not allocated.

Ontario	*Counties and Districts*
Lakehead Branch	Kenora, Thunder Bay, Rainy River, Patricia.
Sault Ste. Marie Branch	Algoma, Cochrane, Nipissing (north of the Mattawa river), Sudbury, (including Manitoulin Island), Timiskaming, Ont., and the area in the United States within a radius of twenty-five miles of Sault Ste. Marie.

Border Cities Branch	Essex, Kent, Lambton, and the area in the United States within a radius of twenty-five miles of Windsor.
London Branch	Elgin, Middlesex, Oxford, Perth, Huron, Bruce.
Niagara Peninsula Branch	Lincoln, Welland, Haldimand, and the area in the United States within a radius of twenty-five miles of Niagara Falls, Ontario.
Hamilton Branch	Wentworth, Norfolk, Brant, Waterloo, Halton West (townships of Nelson and Nassagaweya), Wellington.
Toronto Branch	Ontario, York, Peel, Halton East (townships of Trafalgar and Esquesing), Dufferin, Grey, Simcoe, Muskoka, Parry Sound, Nipissing (south of Mattawa river).
Ottawa Branch	Grenville, Stormont, Dundas, Glengarry, Prescott, Russell, Carleton, Lanark, Renfrew, Labelle, Que., Ottawa, Que., Pontiac, Que., Timiskaming, Que., Yukon, and the Northwest Territories.
Peterborough Branch	Hastings, Northumberland, Peterborough, Haliburton, Victoria, Durham.
Kingston Branch	Prince Edward, Lennox, Addington, Frontenac, Leeds.
Manitoba	
Winnipeg Branch	The province of Manitoba.
Saskatchewan	
Saskatchewan Branch	The province of Saskatchewan.
Alberta	
Lethbridge Branch	The territory in Alberta and British Columbia included between the United States boundary from Saskatchewan to the 117th degree of longitude in British Columbia; north to the 50th parallel; east to the Alberta boundary; northerly on the interprovincial boundary to the north boundary of township thirteen in Alberta; east to the Saskatchewan boundary, and south on the interprovincial boundary to the United States boundary.
Calgary Branch	The territory in Alberta included between the north boundary of township thirteen from Saskatchewan to the British Columbia boundary; northerly on the interprovincial boundary to the north boundary of township forty-two; east to the east boundary of range twelve, (west of the fourth meridian); south to the north boundary of township thirty-seven; east on the north boundary of township thirty-seven to the Saskatchewan boundary, and south on the interprovincial boundary to township thirteen.
Edmonton Branch	All the province of Alberta north of the northern boundary of the Calgary Branch.
British Columbia	
Victoria Branch	Vancouver Island.
Vancouver Branch	The balance of British Columbia, except that allocated to the Lethbridge Branch.

The membership of each of the branches under the new territorial divisions, at the present time is:

Branch	*Corp.*	*Non-Corp.*	*Total*	*Branch*	*Corp.*	*Non-Corp.*	*Total*
Halifax	115	42	157	Niagara Peninsula.	106	34	140
Cape Breton.	47	17	64	Border Cities.	80	37	117
St. John	65	23	88	Sault Ste. Marie	72	25	97
Moncton	49	34	83	Lakehead	32	10	42
Saguenay	19	10	29	Winnipeg	231	70	301
Quebec	88	17	105	Saskatchewan.	107	19	126
Montreal	960	498	1458	Lethbridge	47	11	58
Ottawa	340	75	415	Edmonton	62	10	72
Peterborough.	66	28	94	Calgary	102	13	115
Kingston	39	68	107	Vancouver	176	36	212
Toronto	415	239	654	Victoria	73	6	79
Hamilton	94	51	145				
London	44	36	80				

Tentative Programme of the Maritime Professional Meeting

St. John N. B., September 26th, 27th and 28th, 1923.

Preliminary plans for the Maritime Professional Meeting provide for the following programme for the three days of the meeting,—

Wednesday, September, 26th.

10.00 a.m. Registration. Address of welcome. Business and papers.
1.00 p.m. Luncheon. Papers. — Adjourn 4.00 p.m.
4.00 p.m. Auto drive, or golf.
7.00 p.m. Dinner. — Riverside Golf and Country Club.

Thursday, September 27th.

10.00 a.m. Papers.
11.15 a.m. Visit to Dry Dock at Courtenay Bay.
1.30 p.m. Luncheon.
3.00 p.m. Boat trip on harbour.
8.00 p.m. Lecture.

Friday, September 28th.

10.00 a.m. Papers. Finishing business.

The papers to be presented at the meeting will include the following:—

F. A. Combe, M.E.I.C., Fuel Problem of Canada.

F. T. Kaelin, M.E.I.C., Hydro-Electric Development.

K. L. Dawson, A.M.E.I.C., assistant gas superintendent, Nova Scotia Tramways and Power Company, "A Lump of Coal".

A. P. Theuerkauf, M.E.I.C., Asst. Chief Engineer, The British Empire Steel Co., "Metallurgical Reheating Furnaces for Blooms, Billets and Slabs".

E. G. Cameron, A.M.E.I.C., chief engineer, St. John Dry Dock and Ship-building Company, Ltd., "St. John Dry Dock".

The complete programme will be published in the September issue of The Engineering Journal.

THIS MONTH'S CONTRIBUTORS

The Operation of an Electrical Distribution System

C. A. Clendening, A.M.E.I.C.

In this issue there appears a paper presented by C. A. Clendening, A.M.E.I.C., and H. G. Michell, A.M.E.I.C., in which the authors present a few of the problems to be met in large electrical distribution systems such as that of the City of Winnipeg Hydro-Electric System.

Mr. Clendening, who is operating superintendent for the system, was born in Walkerton, Ont., on March 8th, 1885. He received his preliminary education in the public and high schools of that town, and his technical education at School of Practical Science, University of Toronto. His early engineering experience was obtained in the machine shops of the Fensom Elevator Company, in the construction department of Toronto Street Railway Company, and, in western Canada, on land surveys and in overhead electrical distribution work. Early in 1909, he joined the staff of the power construction department of the city of Winnipeg under Messrs. Smith, Kerry and Chace, who were engaged in the building of a 100,000-h.p. hydro-electric plant on the Winnipeg river at Pointe du Bois. When construction was sufficiently advanced, Mr. Clendening joined the staff of the Canadian Westinghouse Company, engaged in installing the switching equipment and control boards in the power house. After completion of this work, when the plant was placed in operation in October, 1911, he was appointed to the operating staff of the Winnipeg Hydro-Electric System, first as sales engineer and later as distribution engineer. From 1915 until 1919 he served with the Canadian Infantry, returning from France in 1919, when he resumed his former position of distribution engineer, and in September, 1922, was made operating superintendent, in charge of the operation of the entire system.

Mr. Clendening was elected an Associate Member of *The Institute* on March 23, 1920. He is a member of the Lions' Club, and is on the executive of the Manitoba Electrical Association.

H. G. Michell, A.M.E.I.C.

H. G. Michell, A.M.E.I.C., who with C. A. Clendening, A.M.E.I.C., has contributed this interesting paper on "The Operation of an Electrical Distribution System", was born in Manitoba in 1894, but went to England in 1900 and there received his primary education at Dulwich College, near London, returning to Winnipeg in 1908. He attended St. Johns College and entered the engineering course of the University of Manitoba in 1913. During vacations he was employed at various works on electrical construction and station operation. In 1916 he left for overseas and after three years in France and Belgium returned in 1919 to complete his engineering course, graduating in 1920 with the degree of B.Sc., in electrical engineering, and immediately entering the engineering department of the City of Winnipeg Hydro-Electric System as assistant to the distribution engineer. He has been intimately concerned with the extremely rapid growth of the system during the last few years, and in 1922 was appointed distribution engineer and has been responsible for the changing of the city's distribution lines to the 3-phase, 4,000-volt, common neutral system, and for the establishing of a complete set of distribution records.

Mr. Michell was elected a student in *The Institute* on November 4th, 1919, and was transferred to the grade of Junior on December 21st, 1920, and to Associate Member on February 16th, 1923. He is also an Associate in the American Institute of Electrical Engineers and a Member of the Manitoba Association of Professional Engineers.

Modern Tendencies in Engineering Education

Prof. H. W. McKiel, A.M.E.I.C.

In the July issue of *The Engineering Journal* is published the first part of the paper read by Professor H. W. McKiel, A.M.E.I.C., before the Moncton Branch on February 19th, 1923, entitled "Modern Tendencies in Engineering Education". The last part of this paper appears in this number. Professor McKiel has given to the profession the results of a long and thorough study of this subject, and in the last half of his paper he enumerates ten requirements of a successful engineer and deals at some length with the plan of co-operation between industries and engineering colleges in connection with which he quotes a number of instances where this co-operation has been most successful.

Combustion Problems and Furnace Design

Prof. C. A. Robb, M.E.I.C.

Professor Charles A. Robb, M.E.I.C., has contributed a most interesting paper entitled "Combustion Problems and Furnace Design", which appears in this issue of *The Engineering Journal.*

Prof. Robb was born at Amherst, Nova Scotia, in 1888. He spent two years in Applied Science at Mount Allison, 1905 to 1907, graduated from McGill University with degree of B.Sc., in mechanical engineering, 1909; and received his M.Sc., in mechanical engineering from Massechutes Institute of Technology 1910.

His early shop experience was with the Robb Engineering Works at Amherst and, after graduation, with Allis Chalmers, West Allis works. During 1911 and 1912 he was assistant in mechanical engineering with Prof. E. F. Miller, at the Massechutes Institute of Technology, and to date with the University of Alberta in capacities varying from lecturer in mechanical engineering to professor of mechanical engineering and resident engineer.

During the war period he was employed by the Imperial Munitions Board, Ottawa, as superintendent of gauge production during 1916 and 1917, and as technical assistant to the United States representative, Imperial Munitions Board at Washington during 1918.

He joined *The Engineering Institute of Canada* in 1908 as a Student and was transferred to the grade of Member in 1923. He is a member of *The Institute* fuel committee for 1923; Associate Member of the American Society of Mechanical Engineers; member of the Alberta Association of Professional Engineers and president of that association for 1923.

During the past three seasons he has been engaged for the Air Research Committee of the Honorary Advisory Council for Scientific and Industrial Research on behalf of the Air Board, upon the investigation of problems involved in the operation of aero engines at low temperatures, including starting, lubrication, performance of the carburetor and anti-freeze mixtures, having been elected an Associate of the committee in 1921.

Since 1920 he has conducted steaming trials on various Alberta Coals as part of the programme of the Alberta Provincial Research Council, by whom he was, in 1923, constituted a committee and authorized to consult with the principal combustion engineers of the province to deal with the problem of combustion of coal for the generation of power, with special reference to Alberta coals.

In 1923 he contributed a paper to the Royal Society of Canada entitled "A Physical Test of a Natural (Methane) Gas Well".

OBITUARIES

Lennox T. Bray, A.M.E.I.C.

Lennox T. Bray, A.M.E.I.C., O.L.S., D.L.S., died in Amherstburg, Ont., on May 10th, 1923. The late Mr. Bray was born in Caledonia in 1877, moving to Amherstburg shortly afterwards where he received his public and high school education. In 1900 he graduated from the School of Practical Science and in 1902 he qualified for his D.L.S. For four years he was engaged on engineering work in western Ontario, attaching himself in 1904 to the staff of the Dominion Government on surveys in the three prairie provinces where he remained until 1908. From then until 1918 he was associated with the Provincial Government staff in Alberta. Never particularly robust, he was compelled in 1919 to come east on account of valvular heart trouble, when he became resident engineer for the town of Amherstburg and the townships of Anderdon and Malden. He joined *The Institute* as a Student on April 25th, 1901, and was transferred to the grade of Associate Member on May 21st, 1903. He has been a faithful member of the Border Cities Branch of *The Engineering Institute*, rarely missing a meeting. A man of the highest ideals, conscientious in the performance of his duty, the profession in him has lost an able son. He is survived by his wife and widowed mother.

William Latta, A.M.E.I.C.

William Latta, A.M.E.I.C., for a number of years on the drawing office staff of the Dominion Bridge Company, Limited, Lachine, Quebec, died of pleurisy on January 24th, 1923, after an illness of six weeks. The late Mr. Latta was born in Edinburgh, Scotland, in 1884, and received his education at the Dumbarton School of Science and Art, and the Glasgow and West of Scotland Technical College and was then apprenticed as draughtsman in the engineering department and testing laboratory of the William Denny and Bros., Leven shipyard, Dumbarton, Scotland. In 1905 he was assistant works engineer with Argyll Motors, Limited, Alexandria, Scotland, and the following year was in the draughting office of Messrs. Mechan and Sons.

Mr. Latta first came to Canada in 1906 and was with the Dominion Bridge Company, at Lachine, for two years until he returned to Scotland, early in 1908. His second trip to Canada was in 1909 and for the next year was with the Brown Machine Company, New Glasgow, N.S. From July 1910 to April 1911, he was draughtsman with the Cleveland Bridge Company, Montreal. For the following two years he was with the Canada Foundry Company, Toronto, returning to Montreal in March 1913, when he joined the staff of the National Bridge Company. The next four years were spent in Scotland, where he returned to take charge of the engineering department and physical testing laboratory of the firm with which he had been apprenticed. He then returned to Canada, accepting a position with the Dominion Bridge Company. at Lachine, where he was employed at the time of his death.

Mr. Latta was elected an Associate Member of *The Institute* on August 12th, 1921.

J. G. Legrand, M.E.I.C.

Sincere regret is expressed at the death of J. G. Legrand, M.E.I.C., which occurred in Winnipeg on July 3rd, 1923. At the time of his death, Mr. Legrand was in his sixty-second year. He was a native of France, coming to Canada from that country in 1891. His engineering education was received at scientific schools in Rheims and Paris between the years 1872 and 1881. Subsequently he was engaged for six years in railway surveying and draughting and from 1887 to 1889 as contracting manager on fortification work in France. He was later mining engineer with the Hafria Mining and Smelting Company, Limited, in North Wales. On coming to Canada in 1891 the late Mr. Legrand was located in Montreal on various engineering work until appointed bridge engineer with the Grand Trunk Pacific Railway in 1906, when he went to the west, later performing the same duties for the Canadian National Railways.

The late Mr. Legrand has been connected with *The Institute* since admitted as an Associate Member on February 17th, 1898, and has been a Member since March 12th, 1908.

Rudolph Hering, D.Sc., M.E.I.C.

Doctor Rudolph Hering, M.E.I.C., one of *The Institute's* earliest members, and a former councillor, died at his home in New York, on May thirtieth, nineteen twenty-three in his seventy-seventh year. The late Doctor Hering, has been referred to as the dean of the sanitary engineering profession in America and for over forty years has been a foremost figure in matters of public health.

Born in 1847 in Philadelphia, Pa., Doctor Hering graduated from the Royal Polytechnique school of Dresden, Germany, in 1867. His work from the first has been in the interest of municipal sanitation and the numerous reports, papers and discussions which he contributed to professional journals bear evidence of his deep interest in the fundamental sciences which underlaid his calling. In 1881 he prepared for the National Board of Health of the United States, a comprehensive report on the sewerage of European cities. Work of this kind, repeated many times, and with never failing regard for the highest ideals of his profession, did much to place him at the forefront of the sanitary engineers of two continents and of two generations. In 1907 the University of Pennsylvania, conferred upon him the honorary degree of D.Sc., in recognition of his scientific attainments.

Doctor Hering was elected a member of the Canadian Society of Civil Engineers on May twenty-third, eighteen eighty-nine and was a member of Council during the years nineteen hundred and nineteen hundred and one. He was also president of the American Public Health Association in nineteen thirteen and nineteen fourteen.

PERSONALS

Alfred LaRocque, A.M.E.I.C., has been transferred from the Quebec Streams Commission, to the Dominion Water Power Branch, 50 Bishop Street, Montreal, Que.

A. G. MacLachlan, S.E.I.C., is assistant engineer on hydro-electric power development with the Bancroft Power Company, at Bancroft, Ont.

Peter Emslie, A.M.E.I.C., has recently been appointed by Currie and Company, Limited, of Edinburgh, Scotland, Manager of their Kirkcaldy and Dumfermlime branches.

M. Polet, A.M.E.I.C., is at present located with Messrs. Stewart and McDonnell, Takocadi Harbour Works, Seccondee, Gold Coast, West Africa.

V. H. Todd, A.M.E.I.C., is resident engineer for the Portland Railway, Light and Power Company at Estacada, Oregon.

A. W. Peters, S.E.I.C., is on the engineering staff of the Shawinigan Water and Power Company, at Shawinigan Falls, Que. Mr. Peters graduated this spring, in electrical engineering, from McGill University.

J. G. Inglis, S.E.I.C., who graduated in electrical engineering from the University of Toronto this year, is taking the students' engineering course with the Westinghouse Company, at Wilkinsburg, Pa.

Douglas Simpkin, S.E.I.C., of Maple Creek, Sask., who has until recently been located in Pittsburgh, Pa., has accepted a position with the Braden Copper Company of Rancagua, Chile.

P. C. Ahern, S.E.I.C., is with the Canadian Westinghouse Company, at Hamilton, Ont., where he was appointed to the engineering staff following his graduation in electrical engineering from McGill University this year.

L. Kirk Greene, Jr.E.I.C., graduate of McGill University of the class of '20, is assistant engineer with MacDonald and MacCorquodale, consulting engineers of London, England.

A. S. Mansbridge, A.M.E.I.C., has been transferred by the Trussed Concrete Steel Company of Canada, Limited, from the head office at Walkerville, Ontario, to the Vancouver office.

Brian R. Perry, A.M.E.I.C., has resigned from the staff of Peter Lyall & Son Construction Company to become the Montreal representative of the MacKinnon Steel Company, Limited.

D. O. Robinson, S.E.I.C., is foreman with the Dominion Construction Company on the new yard extension for the Michigan Central Railway in St. Thomas, Ontario. Mr. Robinson completed his course at Queen's University this year graduating with the degree of B.Sc.

J. A. MacGillivray, A.M.E.I.C., is resident engineer for Kerry and Chace, Limited, on the Island Portage development, for the Hollinger Consolidated Gold Mines. Mr. MacGillivray was formerly on the staff of the City of Winnipeg Hydro-Electric System.

Frank M. Waddell, S.E.I.C., of Brantford, Ont., has accepted a position, with the Truscon Steel Company, at Youngstown, Ohio, on concrete design. Mr. Waddell graduated from the University of Toronto with the degree of B.A.Sc., and became an Ontario Land Surveyor in 1922.

J. D. Craig, M.E.I.C., is in charge of the expedition which left Quebec on July 7th, on the C.G.S. Arctic. Included in the party are a number of engineers, surveyors and naturalists who will carry on various investigations in the far north.

F. T. Ames, A.M.E.I.C., has been in India for the last eleven months as temporary civil engineer on reclamation survey work with the Gyaing-Attaran Surveys Division, P.W.D., Moulmein, Burma, India. Mr. Ames will remain in India for a period of three years.

P. W. Greene, A.M.E.I.C., has left for Hong Kong, where he will be engaged in general civil engineering work with Messrs. Little, Adams and Wood. Mr. Greene graduated from the University of Toronto in 1908, and is a Dominion Land Surveyor.

C. J. Oliver, S.E.I.C., who received his degree of B.Sc., from McGill University this year, has been appointed to the engineering staff of the Canadian National Railways, Central Region, Toronto, in the mechanical and electrical engineering department.

Thos. C. Jepson, A.M.E.I.C., has been appointed honorary correspondent in Canada for the Royal Society of Arts of London. Mr. Jepson was born at West Hampstead, London, England, in 1892 and received his degree of B.Sc., from Cambridge University in 1911.

D. S. McPhail, Jr.E.I.C., has been transferred by the United Fruit Company to the Guatemala Division, Puerto Barrios, where he is engaged on foundation work, etc., for a new wireless station, the towers of which are to be about four hundred and forty feet high and one thousand and fifty feet between centres.

Ewart G. Horne, M.E.I.C., has resigned as vice-president and manager of Lockwood Greene & Company of Canada, Limited, and has opened an office at 10 Cathcart St. Montreal as consulting engineer. Mr. Horne is associated with several specialists in industrial engineering.

R. H. Montgomery, M.E.I.C., is a member of the party, which recently left Quebec on the C.G.S. Arctic. Mr. Montgomery will leave the ship Arctic at Hamilton's Inlet, Labrador, where he will remain with his party to carry on the work for the Geodetic Survey until the ship returns in the fall.

K. E. Whitman, A.M.E.I.C., who has been with the Nova Scotia Power Commission at Kochaber Mines, N.S., accepted a position with the Avon River Power Company, Limited, at Windsor, N.S. Mr. Whitman is a graduate of Nova Scotia Technical College of the class of '14, in civil engineering.

George F. Dalton, A.M.E.I.C., of the Geodetic Survey of Canada is located for the season on the British Columbia coast engaged in primary and secondary triangulation. Mr. Dalton has been on the precise levelling work of the survey for a number of years and has this year transferred to the triangulation division, which is under the supervision of J. L. Rannie, M.E.I.C.

J. Arthur Tilston, A.M.E.I.C., of Toronto, has been appointed assistant chief engineer of the N.S. & T. Railway, with headquarters at St. Catharines, Ontario, and is engaged on the surveying of new lines and the design of bridges. Mr. Tilston is a graduate in civil engineering of the University of Toronto and received his degree in 1914.

M. S. Sutherland, A.M.E.I.C., is resident engineer for the Nipissing Central Railway at Larder Lake. Mr. Sutherland is a native of Ardrossan, Scotland, and since coming to Canada he has been connected with several railroads in various capacities and previous to his present appointment was resident engineer for the James Bay extension for the Timiskaming and Northern Ontario Railway.

T. A. McElhanney, A.M.E.I.C., who has been for some time past connected with the Topographical Surveys Branch at Ottawa, has been appointed acting superintendent, of the Vancouver laboratory of the Forest Products Laboratories of Canada. After graduating in civil engineering from the University of Toronto in 1912, he was connected with the British Columbia government on survey work, and from 1913 to 1917 he was a partner of the firm of McElhanney Brothers, surveyors and engineers.

Seth W. Crowell, A.M.E.I.C., resigned his position with the Nova Scotia Highways Board, to enter private practice, at Wolfville, N.S., in municipal engineering, surveying and general civil engineering work. Mr. Crowell is a graduate of Dalhousie University, where he received his degree of B.A. in 1909. He is also a Nova Scotia Land Surveyor, and in addition to railway and highway construction experience he was for a number of years town engineer of Yarmouth, N.S.

J. J. Macdonald, M.E.I.C., of London, England, has within the last few months joined the staff of the Consolidated Construction Company, Limited, as construction engineer. The company which is an amalgamation of the construction departments of the J. G. White & Company, Ltd., and the Dick Kerr and Company, Ltd., is at present handling a large amount of engineering work both in Great Britain and South America, including the mammoth London powers station. Mr. Macdonald received his education at McGill University, graduating with the class of '11, later taking a post graduate course in advanced theory of structures. He was for two years connected with the firm of Waddell and Hanington, Kansas City, Mo., as detailer, checker and designer on steel bridges and later held the position of office engineer with charge of designing, detailing and preparation of plans for the Halifax Terminals. He was then appointed resident engineer on the installation of sewerage and water systems in connection with the terminals. In 1919 he left Canada to accept the position of chief engineer of design for W. Alban Richards, engineers and contractors, London and Paris.

Recvives Appointment at Lake St. John

H. G. Cochrane, A.M.E.I.C., is with the Quebec Development Company, Limited, at St. Joseph d'Alma, Lake St. John, Quebec, having recently been appointed to the engineering work of this company. Mr. Cochrane was, prior to coming east, engineer in charge of design and construction of the structural work for the Lethbridge Northern Irrigation District under H. B. Muckleston, M.E.I.C.

Previous to the war Mr. Cochrane was superintendent with Messrs. Janse Brothers, Boomer and Hughes, Calgary, Alberta, from 1913-14, and for three years prior to that was assistant engineer with the Natural Resources Department, of the Canadian Pacific Railway at Calgary and Brooks, Alberta. Mr. Cochrane was a member of the executive of the Lethbridge Branch for the year 1922-23.

Unveiling of Tablet to Canadian "Buffs".

Major-General Garnet B. Hughes, C.B., C.M.G., D.S.O., M.E.I.C., officiated at the unveiling of the memorial tablet to the Canadian "Buffs" who fell in the Great War. The ceremony took place at the Canterbury Cathedral recently, and in a short address General Hughes said that the gallant Canadian gentlemen, whose memory they were honouring that day, were inspired by their affiliation to that fine old regiment, the Buffs. No memorial was needed to keep these heroes in the hearts and minds of their own people, but that tablet in the Warriors' Chapel would remind the children of another day how the gallant Canadians crossed the ocean to stand under the banner of the Mother Country for the defence of the rights and liberties for which England had always stood.

R. W. Mitchell, A.M.E.I.C., enters Consulting Practice

R. W. Mitchell, A.M.E.I.C., has, following his recovery from a serious illness, opened an office at 416 Phillips Place, Montreal, as consulting engineer and quantity surveyor, specializing in reinforced concrete work, water and filtration works, sewerage works, bridges and dams and the investigation of centrifugally cast concrete pipe and coal handling problems. Mr. Mitchell received his training in the office of Messrs. Crouch and Hogg, Glasgow, Scotland, where he served an apprenticeship of five years. On coming to Canada in 1911 he joined the staff of the resident engineer on maintenance of the Grand Trunk Railway, in Montreal. He has had extensive experience in filtration, canal and bridge works, on which he has been continuously engaged, with the exception of the war period, since 1911. In August of that year he was on the staff of the resident engineer of the Montreal filtration works and later in the capacity of chief assistant supervising the work. In 1913 when the Montreal main water supply conduit burst, he designed and supervised the construction of the emergency works from the Lachine canal. Since returning from overseas in 1920 until last year Mr. Mitchell was designing engineer with the Montreal Water Board. His service overseas dated from September 1914 when he enlisted with the Royal Engineers as a sapper. He was commissioned in the field and retired with the rank of major.

ELECTIONS AND TRANSFERS

At the meeting of Council held on July 9th, 1923, the following elections and transfers were effected:—

Member

BROWNE, James Edward, topographical engineer, (officer in charge of topography), Surveys Division, Militia Headquarters, Ottawa, Ont.

Associate Members

ARMSON, Harold Percival, asst. engr., Walter J. Francis & Company, Toronto, Ont.

BURGESS, George James, dftsman., Canadian Bridge Company, Windsor, Ont.

DICKSON, George Leslie, M.A. (Acadia Univ.), elec. and signal engr., Atlantic region, C.N.R., Moncton, N.B.

GARTER, Ernest Linwood, E.E. (Polytech. Inst., Brooklyn, N.Y.), manager, Canadian General Electric Company, Sydney, N.S.

MACFARLANE, Athol Herridge, M.C., asst. director of irrigation, Baghdad, Mesopotamia.

MACKLIN, Frederick Charles Arthur, res. engr., Interprovincial & James Bay Rly., extension of C.P.R., Fabre, Que.

RAINBOTH, George Louis, dfting. etc., Department of the Interior, Ottawa, Ont.

VENNES, Harold J., B.A. (Univ. of Man.), transmission engr., Northern Electric Company, Montreal, Que.

Juniors

MERTON, Harold A., instr'man. and asst. to engr., London & Port Stanley Rly., London, Ont.

WALSH, Michael, B.E. (National Univ., Ireland), asst. city engr., St. John's, Nfld.

Transferred from the class of Associate Member to that of Member

FRIEDMAN, Ferdinand J., B.Sc. (Mass. Inst. Tech.), consltg. engr. and partner, McDougall, Pease and Friedman, Montreal, Que.

GRIEVE, John, (Heriot Watt Coll.), director and manager of sales, Dominion Paint Works, Montreal, Que.

MACDONALD, James Campbell, B.A., B.E. (Dalhousie Univ.), Dept. of Lands, Government of British Columbia, Kelowna, B.C.

SHUPE, Stanley, B.A. (Univ. of Toronto), city engr., Kitchener, Ont.

Transferred from the class of Student to that of Member

SCOTT, Morris Alexander, Lieut.-Col., D.S.O., Croix-de-Guerre, (Grad. R.M.C., Kingston), engr. in charge constrn. aqueduct enlargement, Montreal Water Board, Montreal, Que.

Transferred from the class of Student to that of Associate Member

CREALOCK, Archie Burgess, B.A.Sc. (Univ. of Toronto), bridge engr., provincial highways, Ontario Department of Highways, Toronto, Ont.

Transferred from the class of Student to that of Junior

ALLEN, Wilfrid Joseph, assistant engr., Dept. of Roads, Quebec, Que.

MACLACHLAN, Alexander Grant, B.Sc. (Queen's Univ.), Bancroft Power Company, Bancroft, Ont.

PRENDERGAST, Ralph Macauley, B.A.Sc. (Univ. of Toronto), 24 Dundonald Street, Toronto, Ont.

The following Students were admitted:—

EDWARDS, Charles Bryson, Nova Scotia Technical College, Halifax, N.S.

FINCH, Gordon H., of Winnipeg, Man.

MAXWELL, Harold J., B.Sc. (C.E.), (Univ. of New Brunswick), 232 Old Orchard Avenue, Montreal, Que.

VERNOT, George Edward, 293 St. George Street, Montreal, Que.

LANGLOIS, William Lawrence, 542 Dovercourt Road, Toronto, Ont.

EMPLOYMENT BUREAU

Situations Wanted

Civil Engineer

Experienced civil engineer, A.M.E.I.C., wishes to change his position. Has had experience in constructing, railway and sales engineering work. Apply Box No. 109-W.

Civil Engineer

Civil engineer, A.M.E.I.C., with seven years experience in railway, reinforced concrete and highway construction desires position with an engineering firm or industrial corporation preferably in Ontario. Apply Box No. 110-W.

Civil Engineer

Civil engineer, experienced in contracting, railway and salesmanship, desires to change position. Apply Box No. 111-W

Civil Engineer

Civil engineer with experience in municipal work, engineering office practice, and building construction desires a position on municipal engineering staff or firm of contractors. Location immaterial. Apply Box No. 112-W

Situations Vacant

Engineering Salesman

Two or three openings are available for engineering salesmen, preferably with mining experience, to undertake the sale of explosives. Give full particulars in application. Apply Box No. 41-V

Transmission Tower Designer

A well known firm of engineers in Toronto desire the services of a competent man experienced in the design, location and construction of high voltage steel transmission tower lines. Applications should contain full details of qualifications. Apply Box No. 42-V

Mechanical Draughtsman

A graduate mechanical draughtsman desired with four or five years experience on pulp and paper mill layouts by one of the largest mills in Canada. Reply stating education, experience, salary required, and so forth. Apply Box 43-V

Charles Walmsley & Co. (Canada) Ltd., require the services of a well qualified sales manager to handle the sale of their Pulp & Paper Equipment. Apply by letter stating qualifications, experience and salary required to Charles Walmsley & Co. (Canada) Ltd., 809 Drummond Building, Montreal.

University of Manitoba

Appointment in Civil Engineering

The Board of Governors will proceed shortly to appoint an Assistant Professor of Civil Engineering, having regard especially to his qualifications in Applied Mechanics and Structural Design. Initial salary, $2,800. The successful applicant will be expected to enter upon his duties on or about September 1st, 1923. Letters of application and testimonials should be in the hands of the Board of Governors on or before August 10th, 1923.

The Secretary,
Board of Governors,
University of Manitoba,
Winnipeg, Canada.

Members' Exchange

Transit

One Buff and Buff transit, number 5407, six and three-quarter inch (6¾″) horizontal circle, one hundred and eighty degree vertical arc; complete with tripod, mahogany case, plumb bob, sunshade, etc. This transit is in perfect condition; price two hundred and twenty-five dollars. Apply Box No. 4-E.

Level

One Stanley Dumpy level, number 105224, inverting image, three screw, fifteen and one half inches (15½″) long closed, eighteen inches (18″) long extended; complete with mahogany case and tripod. This instrument is in excellent condition; price fifty dollars. Apply Box No. 5-E.

Trade Publications

De Laval Steam Turbine Company, of Trenton, N.J., have issued two new leaflets, of their series, describing and illustrating the use of their equipment in various industries and engineering projects. One of these "De Laval Equipment in a Textile Mill", describes a turbine of special design supplying low-pressure steam for process purposes. The other "De Laval Pumps for Irrigation", describes the pumping and water distributing system of the Lindsay-Strathmore irrigation project in Talare county, California. These leaflets may be secured on request.

Rail Steel Reinforcement. — Burlington Steel Company Ltd., Hamilton, Ont., has published an attractively printed and illustrated volume of 84 pages on rail steel for concrete reinforcement. Information is given as to the source and manufacture of steel bars, both from rail steel and billets, the various grades of reinforcing steel and the properties peculiar to each. It is the aim of the publication, by presenting a full description of the manufacture, physical properties and use of rail-steel bars to answer attacks on this product made by distributors of billet bars. The text, however, is technical, not controversial, among the topics discussed being a comparison of the different grades of steel, with particular reference to crystallization, uniformity, brittleness and bending. The latter portion of the volume is devoted mainly to photographs of structures reinforced with rail steel bars, The text concludes with specifications for concrete reinforcement bars. The Company will be pleased to forward a copy of this booklet to any interested party on request.

Combustion Engineering Corporation, Limited, has prepared for distribution an advanced condensed bulletin on Steam Power Plant Equipment, illustrating and describing the various lines of power plant manufactured by that company.

This may be secured upon application to the Toronto Office of the Company.

Report on the Strength of Steel I-Beams Haunched with Concrete.

This investigation was conducted under the direction of F. P. Shearwood, M.E.I.C., Chief Engineer of the Dominion Bridge Company; this company bearing the cost of the undertaking.

H. M. MacKay, M.E.I.C.,
Professor of Civil Engineering, McGill University.
Peter Gillespie, M.E.I.C.,
Professor of Civil Engineering, University of Toronto.
C. Leluau, M.E.I.C.,
Professor of Strength of Materials and Bridges, University of Montreal.

The object of the investigation described in the following pages was to study the strength and behaviour of steel I-beams supporting a reinforced concrete slab and haunched with, or encased with concrete, for the purpose of protecting the steel from fire, or corrosion. While such beams have hitherto been designed on the assumption that the entire load, including the weight of the encasing concrete, is carried by the steel, it was thought that the steel and concrete might really act together so as to form a composite beam, and that it might be practicable to arrive at some rational basis for design analogous to that employed in the case of reinforced concrete T-beams.

With this object in view, two identical floor panels were built in the erecting shop of the Dominion Bridge Company's plant at Lachine. Each panel consisted of a reinforced concrete slab 10 feet by 16 feet, and 4 inches thick, reinforced by wire mesh. This slab was supported by two 10-inch I-beams, weighing 22.25 lbs. per lineal foot (Carnegie B. 67), and 16 feet long. The beams were spaced 5 feet centre to centre and were connected at their ends, by means of standard connections, to girders consisting of 24-inch I-beams 15 feet long. The latter rested on concrete pedestals placed about 13 feet centre to centre. Ten-inch channels, parallel to the floor beams, connected the ends of the girders and served to hold them in place. Further, in order to provide convenient bridges for measuring the deflections of the floor beams, two 5-inch I-beams were provided, attached to the main girders, some eight inches away from the beams. Inasmuch as these small beams were connected at each end to lugs on the girders by a single machine bolt, and the heavier channel connections were 4 feet 8 inches, away from the floor beams, it will be seen that the girders were practically free to accommodate themselves to the deflections of the floor beams, and that the latter were therefore subjected to very little end restraint.

The top flanges of the floor beams projected one inch into the concrete slab, while the concrete haunching, projecting two inches below the bottom of the lower flange, and varying in width from 9½ inches at that point to 11½ inches at its junction with the slab, gave a minimum protection of 2 inches to the steel. For a length of two feet, however, at the centre of each beam, the concrete was removed from the lower flange in order to make it accessible for attaching extensometers and other measuring instruments. The construction of the panels is shown in Figure No. 1.

Programme of Tests

The programme of tests originally outlined was as follows:—

(a) Establish points for strain gauge readings on the bottom flanges of the floor beams before erection.

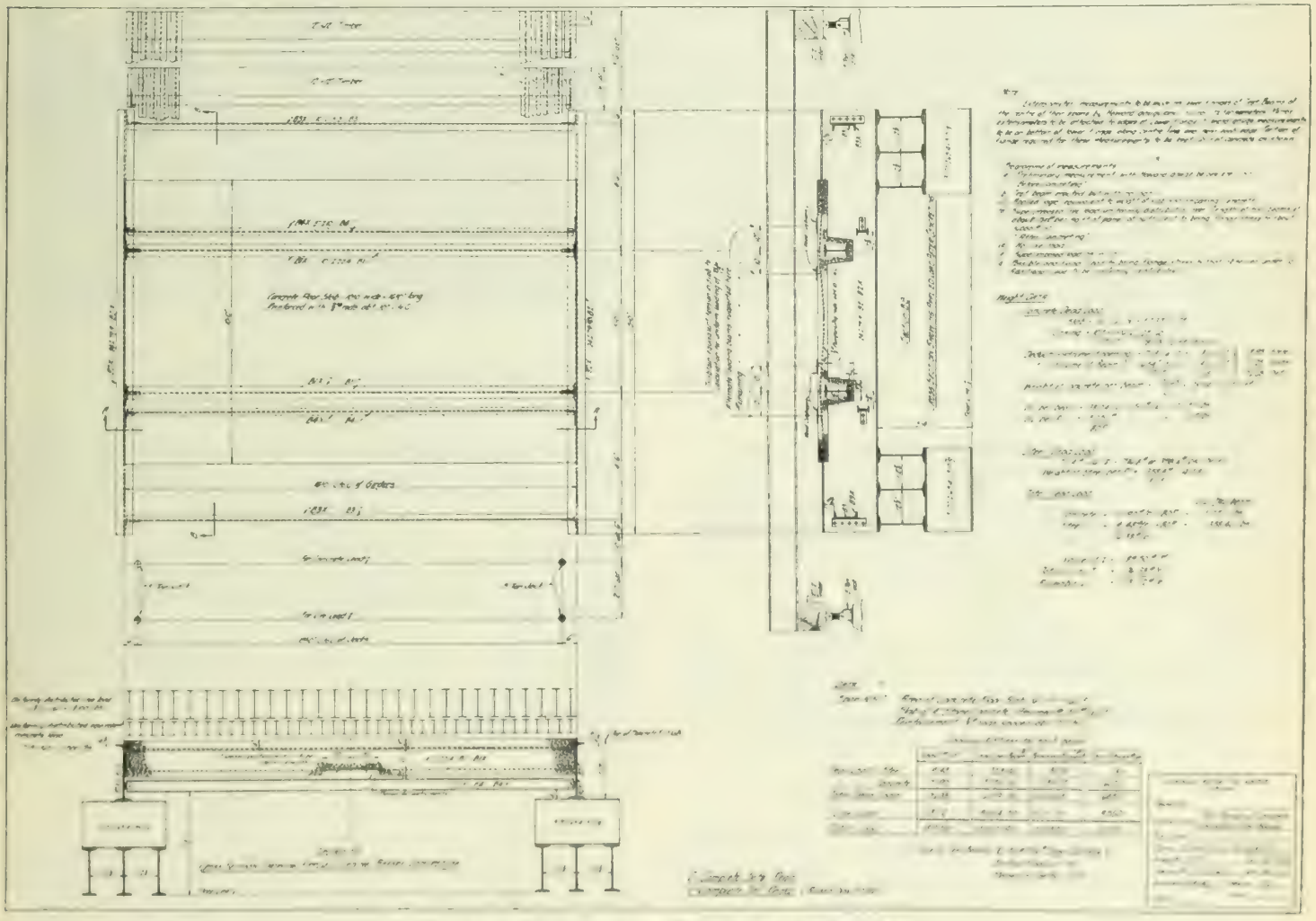


Figure No. 1. Design and Details of Test Panels.

(b) Take strain gauge readings at these points after erection, but before any additional load is applied.
(c) Apply a uniformly distributed load equivalent to that of the concrete to be placed subsequently, and measure the deflections and flange stresses.
(d) Apply a further uniformly distributed load sufficient to bring the flange stresses to about 16,000 lbs. per square inch, and measure the deflections and flange stresses.
(e) After the concrete is poured and cured, measure the flange stresses due to the weight of the concrete.
f Apply the same uniformly distributed load as in (d) and repeat the measurements of flange stress and deflection.
(g) Apply additional load, if required, to bring the flange stress to 16,000 lbs. per square inch.

After the first six items of this programme were completed, the resistance of the composite beams proved so high that it was thought advisable to extend it considerably.

Method of Loading

All loads applied were made up of structural steel shapes, which had been previously weighed. So far as possible uniform sizes were used for each load increment, the units in this case being uniformly distributed. When uniform sizes were not available, the shapes used were placed according to a predetermined plan so as to maintain practically the same relations between the resulting bending and shearing forces as would be due to a uniformly distributed load. The equivalent uniform load was calculated in such cases with reference to the bending moments produced at the centre of the span. Great care was taken at all stages to avoid the possibility of any arching effect. Furthermore, the beams in the bottom layer were placed on blocks offset alternately 10 inches on each side of the centre lines of the floor beams, so as to cause a negative bending moment in the slab over the beams practically the same as that which would be caused by a load uniformly distributed over the entire surface of the slab.

Before application, the shapes were placed in correct position on timbers jacked up on either side of the test panel. Loads were then readily applied and removed by raising and lowering the jacks.

Measuring Apparatus

Deflections were measured by an ordinary micrometer caliper. For flange stresses, mirror extensometers of the Martens type covering 4-inch gauge lengths were placed on each edge of each flange. These instruments read to hundred thousandths of an inch, and experience shows that, when used with the proper precautions, they are unsurpassed for sensitiveness and reliability. A 10-inch Howard gauge was used as a check, and also solely, to measure the stresses due to the weight of concrete, for which purpose mirror extensometers could not be used. For the use of the Howard gauge three parallel lines of measurement were established on each bottom flange at the centre of the beam. These two methods checked each other very satisfactorily, as will be seen from the comparison given in table No. 2. The stresses indicated by the mirror extensometers were, however, adopted as likely to be more accurate. In reducing extensometer and strain gauge readings, the modulus of elasticity (E) was assumed to be 30,000,000 lbs. per square inch.

Observations on the beams before concreting were made on November 25th, 1922. The loads and calculated stresses and deflections are shown in table No. 1.

Table No. 1 — Loads, Calculated Stresses and Deflections.

Stage of loading	Loads — lbs.		Bending moment	Flange stress	Deflections
	Per sq. ft. of slab	Per beam	In—lbs.	lbs. per sq. in.	Ins.
Panel No. 1					
b. I-beams	4.48	358	8,590	380	....
c. Concrete equivalent	75.4	6,030	144,720	6,370	0.167
d. Live load	106.8	8,550	205,200	9,030	0.237
Total applied load	182.2	14,580	349,920	15,400	0.404
Total load	186.68	14,940	358,510	15,780	....
Panel No. 2					
b. I-beams	4.48	358	8,590	380	....
c. Concrete equivalent	74.8	5,990	143,760	6,320	0.166
d. Live load	110.75	8,860	212,640	9,360	0.245
Total applied load	185.55	14,850	356,400	15,680	0.141
Total load	190.0	15,210	364,990	16,060	....

The resulting stresses and deflections as observed are given in table No. 2.

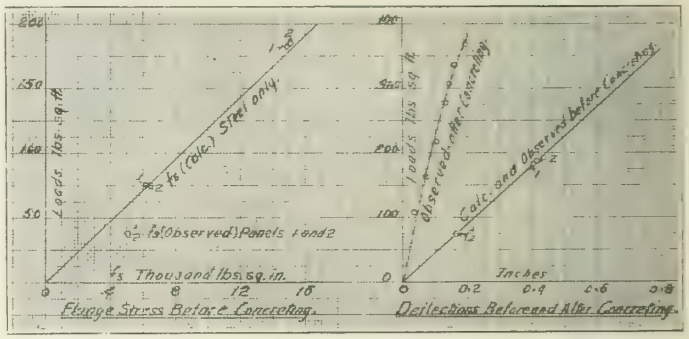
Table No. 2 — Stresses before Concreting

Stage of loading	Calculated flange stress lbs. per sq. in.	Observed flange stress				Deflections		
		Mirror Extens.		Howard Gauge		Calculated ins.	Observed ins.	%
		Stress	%	Stress	%			
Panel No. 1								
c. 75.4	6,370	6,210	97.6	6,525	102	0.167	0.162	97.0
d. 106.8	9,030	8,610	95.5	8,800	97.5	0.237	0.233	98.3
182.2	15,400	14,820	96.5	15,325	99.5	0.404	0.395	98.0
Panel No. 2								
c. 74.8	6,320	6,450	102	6,250	99	0.166	0.166	100
d. 110.75	9,360	8,625	92	8,400	89.8	0.245	0.227	92.6
185.55	15,680	15,075	96.1	14,650	93.5	0.411	0.393	95.7

The discrepancies between the calculated and observed stresses may be due to any one or more of the following causes: — (a) Variation in section of steel from nominal section. (b) Variation in modulus of elasticity of the steel from assumed value. (c) Errors in observation. (d) End restraint. (e) Errors in estimating and placing the load.

As regards the above results the largest discrepancy between observed and calculated values is in the case of the live load of 110.75 lbs. per square foot in panel No. 2. As all other results are very consistent and well within the limits of error which might be expected, it seems probable that the live load on panel No. 2 was really a little less than estimated.

The above results are shown graphically in figure No. 2.



Figures Nos. 2 and 3. Flange Stresses before Concreting; and Deflections before and after Concreting.

Tests of Concrete

The concrete was poured by the Foundation Company Ltd., of Montreal. Three-quarter inch run of crusher limestone, and local river sand were used. The mix was 1: 2: 4. The cement was furnished by the Canada Cement Company. The concrete for panel No. 2 gave a slump test of about 4½ inches but that for panel No. 1 was somewhat wetter. The instructions were to make a good ordinary commercial grade of concrete, without taking any special precautions. The mixing, however, was probably rather better than is usual. Panel No. 2 was poured on December 4th, and panel No. 1 on December 5th. Four cylinders 6 inches by 12 inches were moulded from concrete taken from the mixer, as used in panel No. 2, and cured alongside of the panels, and under the same conditions. Cylinders Nos. 1 and 2 were tested at McGill University on January 6th and cylinders Nos. 3 and 4 at the University of Toronto on January 13th. The results of these tests were as follows:—

Cylinder No.	1	ultimate strength		3,800	lbs. per	sq. in.
"	2	"	"	3,100	"	"
"	3	"	"	3,630	"	"
"	4	"	"	3,400	"	"
		Average		3,480	"	"

All cylinders were crushed between squares of commercial beaver board without other preparation. The forms were suspended from the floor beams, so that the dead weight of the concrete, forms, and excess water, if any, was carried by the steel beams. The slight deflections due to the weight of the forms, etc., would not be fully

recovered after the removal of the latter when the concrete was set. The permanent dead load flange stress in the beams was therefore likely to be slightly greater than that due to the weight of the concrete alone, and the results given below indicate that this was the case. On the other hand, the concrete would be free from dead load stress, a favourable condition, so far as the concrete is concerned, for taking care of live loads. There would also be no appreciable bond stress developed by the dead load.

After the concrete had set for about three weeks, Howard gauge readings were taken on the bottom flanges for the purpose of measuring the flange stress due to the weight of the concrete. The results were as follows:—

Stress due to weight of concrete panel No. 1 — 7,050 lbs. per sq. in.
Stress due to weight of concrete panel No. 2 — 6,450 lbs. per sq. in.

Average 6,750 lbs. per sq. in.

As may be seen from table No. 2, this is about 400 lbs. per square inch greater than either the estimated or observed stresses due to the "equivalent concrete load". Inasmuch as the concrete in place was actually weighed and found to agree practically with that estimated, the discrepancy may be due in part to lack of precision in the Howard gauge measurements, but probably in a greater degree to the considerations mentioned in the preceding paragraph. It is believed that the average value, 6,750 lbs. per square inch, is a close approximation to the truth, and is adopted in tabulating and plotting the results.

Live Loads Applied

On December 28th, when the concrete in panels No. 1 and No. 2 were respectively 23 and 24 days old, live loads were applied and stresses and deflections measured as before at each stage. The results are given in table No. 3, stages "e" to "h", in which the dead load stress and deflections are taken as zero.

Table No. 3 — Stresses and Deflections after Concreting.

Live load lbs. per sq. ft.	Flange stress lbs. per sq. in.: Calc. steel only acting	Observed: Extensometer	Observed: Per cent	Observed: Howard gauge	Deflections: Calc. steel only acting	Deflections: Observed	Deflections: Per cent
Panel No. 1							
e. dead load	0	0		0	0	0	
f. 106.8	9,030	2,830	31	3,090	0.237	0.042	18
g. 161.8	13,700	5,125	37	....	0.358	0.071	20
h. 216.8	18,350	7,670	42	....	0.482	0.103	21
k. 272.2	23,100	9,650	42	....	0.605	0.133	22
l. 304.9	25,800	10,980	43	....	0.678	0.144	21
m. 333.4	28,200	12,465	44	....	0.741	0.162	22
n. 365.3	30,800	14,755	48	....	0.812	0.191	24
Panel No. 2							
e. dead load	0	0		0	0	0	
f. 110.75	9,360	2,190	23	2,610	0.245	0.035	14

A few hair marks, in the concrete, which were first visible at stage "g", extended at stage "h" to about 5 inches above the bottom flanges of the I-beams. Each load was applied and removed several times. A permanent set of about 0.01 inches in the deflection first appeared after stage "h", the extensometers giving a corresponding indication. Panel No. 2 was loaded only to stage "f" showing, as indicated, lower flange stresses and deflections than panel No. 1.

Vibration Test

As it was thought advisable to try the effect of vibration, a concrete mixer, weighing (with its charge of 500 lbs., of stone) 10,400 lbs., was next placed on slab No. 1 and run for two days at a good speed, compressed air being used in the cylinders. The load was concentrated on a length of 3 feet 9 inches, over each beam, giving a bending moment at the centre of the beam of 18,400 foot-pounds, which corresponds to a uniformly distributed load of 115 lbs. per square foot. Howard gauge and deflection readings taken before and after the running of the mixer, checked the weight of the latter, but gave no other result. The hair cracks previously noted showed no further extensions, although the amount of vibration produced would have been quite excessive in a building. On account of the short duration of this test, however, it must be regarded as inconclusive.

The live load of stage "h", 216.8 lbs. per square foot, was then replaced on panel No. 1 where it remained for five days. During this time, a few hair cracks in the haunching extended about 3 inches further, or to about one inch from the bottom of the slab. On February 12th additional loads were applied, and the usual observations made. The results are given in table No. 3, stages "k" to "n", the stresses and deflections due to the dead load stage "e" being again taken as zero.

The calculated and observed stresses due to dead and live loads combined are given in table No. 4.

Table No. 4 — Summary of Observed and Calculated Stresses, Panel No. 1.

Stage of loading	Load lbs. per sq. ft.: Inc.	Load: Total	Flange stress lbs. per sq. in.: Calc. for steel only: Inc.	Calc. for steel only: Total	Observed: Inc.	Observed: Total	Per cent Obs. Calc.
a. On skids	0	0	0	0	0	0	
b. Erected	4.5	4.5	380	380	380	380*	
c. Concrete Equiv.	75.4	79.9	6,370	6,750	6,210	6,590	97.5
d. Live load	106.8	186.7	9,030	15,780	8,610	15,200	96.5
b. Erected		4.5		380		380*	
c. Concreted	75.4	79.9	6,370	6,750	6,750	7,130	105.2
f. Live load	106.8	186.7	9,030	15,780	2,830	9,960	63.2
g. Live load	55.0	241.7	4,650	20,430	2,295	12,255	59.8
h. Live load	55.0	296.7	4,650	25,080	2,545	14,800	59.1
k. Live load	55.4	352.1	4,680	29,780	1,980	16,780	56.5
l. Live load	32.7	384.8	2,760	32,520	1,330	18,110	55.8
m. Live load	29.8	414.6	2,520	35,040	1,485	19,595	56.0
n. Live load	32.0	446.6	2,720	37,760	2,290	21,885	58.0

* Not observed.

As it was impracticable to apply more load satisfactorily, the test was discontinued. No further cracking was perceptible, nor sign of approaching failure, other than the fact that the flange stresses were increasing slightly more rapidly than the load.

The above tests indicated, we believe, that the steel and concrete in the form of construction tested act together so as to produce a composite beam. The marked similarity in behaviour to that of a reinforced concrete beam was quite striking to those having experience in testing the latter.

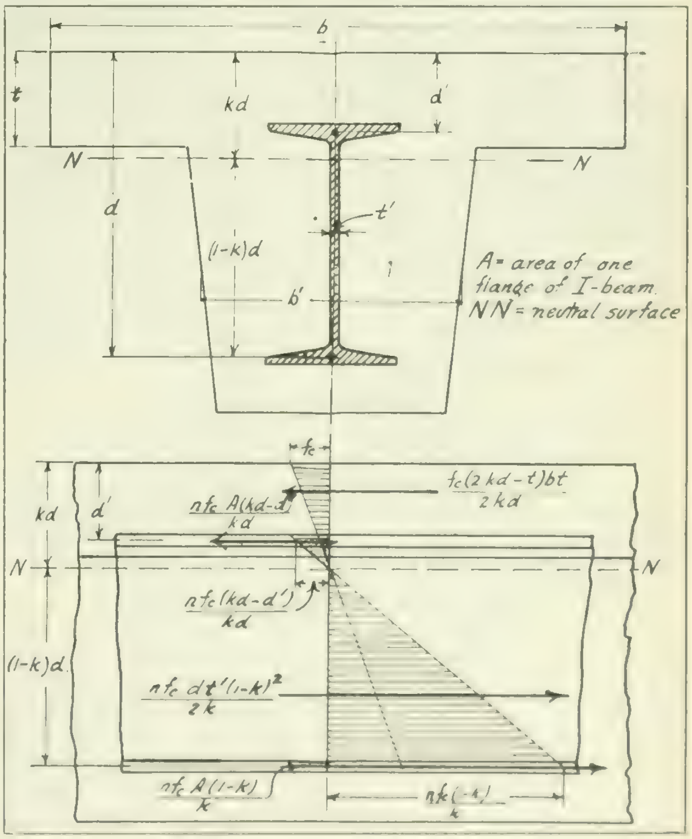


Figure No. 4. Analysis of Beams.

Notation — b = Effective width of slab. t = Thickness of slab. d = Distance from top of slab to C. G. bottom flange. kd = Distance from top of slab to neutral axis. d' = Distance from top of slab to C. G. of top flange. t' = Thickness of web of I-beams. b' = Average width of haunching [illegible] fc = Fibre stress in concrete, top of slab. [illegible] stress top flange. [illegible] A = Area of one flange of I-beam. [illegible] area of I-beam = 2A + d t' [illegible] approx. [illegible] Moment of inertia of I-beam. [illegible] Moment of inertia equivalent concrete [illegible]

Analysis of Composite Beams

The following analysis has been made in order to throw further light on this action. The beams are analyxed on the assumption, — (1) that tension in the concrete is unimpaired down to the bottom flange of the I-beam, and (2) that there is no tension in the concrete. The first assumption represents conditions at the earlier stages of loading. Conservative design would of course be based on the second.

In determining the position of the neutral axis, the following assumptions and approximations are also made:—

(a) Stresses in the flanges of the I-beams are concentrated at the centres of gravity.
(b) The proportions are such that the neutral axis does not lie in the slab.
(c) Compression in the upper part of the I-beam web, and haunching is neglected.
(d) The web of the I-beam extends to the C.G. of the bottom flange.

Case I. Tension in Concrete

Since the horizontal force acting across any vertical section in the beam is zero we have, (figure No. 4);—

$$\frac{fc\,(2kd-t)\,bt}{2kd}+\frac{fc\,An\,(kd-d')}{kd}=\frac{fc\,b'\,d\,(1-k)^2}{2k}+\frac{fc\,ndt'\,(1-k)^2}{2k}+\frac{nfcA\,9(1-k)}{k}$$

whence:

$$k^2-2\,\frac{(bt+2An+d\,(b'+nt')\,k}{d\,(b'+nt')}+\frac{bt^2+2An(d+d')+d^2(b'+nt')}{d^2\,(b'+nt')}=0$$

It is better to introduce numerical values at this point. Considering one floor beam and the half slab supported by it as a unit we have:—

b = 60 ins.; b′ = 10.5 ins.; t = 4 ins.; t = 0.252 ins.
A = 2.14 sq. ins.; d = 12.8 ins.; d′ = 3.2 ins.; n = 10.

This value of the modular ratio is chosen to represent, as nearly as may be, the actual condition believed to exist. Considering the excellent quality of the concrete, Ec is likely to be as high as 3,000,000 lbs. per square inch, or possibly even higher, and n is therefore likely to be as low as 10.

Then:—bt = 60×4 = 240; bt² = 240×4 = 960.
2An = 2×2.14×10 = 42.8; 2An (d+d′) = 42.8×16 = 684.8
d (b′+nt′) = (12.8 (10.5+2.52) = 166.6; d² (b′+nt′) = 166.6×12.8 = 2132.5
449.4 3777.3

Therefore $k^2-\frac{898.8k}{166.6}+\frac{3777.3}{2132.5}=0$; $k^2-5.41k+1.771=0$; k = 0.35;

kd = 12.8×0.35 = 4.48.

$$I=\frac{1}{12}bt^3+bt\,(kd-\frac{t}{2})^2+\frac{1}{12}(d-t)^3\,b'+b'\,(d-t)\,(\frac{d+t}{2}-kd)^2+(n-1)\left(Is+As\,(\frac{d+d'}{2}-kd)^2\right)$$

It may therefore be conveniently calculated as follows:—

Slab:	$\frac{60\times4^3}{12}$	= 320 ins.⁴
	240×2.48^2	= 1,480 "
Haunching	$\frac{10.5\times8.8^3}{12}$	= 596 "
	$10.5\times8.8\times3.92^2$	= 1,420 "
I-beam	9×113.6	= 1,022 "
	$9\times6.54\times3.52^2$	= 729 "
	Total	= 5,567 "

Tension in the concrete could not be expected to remain unimpaired beyond loading stage "f", for which the live load bending moment (table No. 1) is 205,200 in.—lbs.

For this load,

$$fc=\frac{205200\times4.48}{5567}=165 \text{ lbs. per sq. in.}$$

and

$$fs=\frac{10\times205200\times8.32}{5567}=3065 \text{ lbs. per sq. in.}$$

which agrees sufficiently well, all things considered with the observed values, shown in table No. 3, 2,830 lbs. per square inch, as observed by the extensometers and 3,090 as observed by the Howard gauge. The observed stresses in panel No. 2 at this stage were considerably lower. As stated previously the live load was probably lower than estimated. It is also probable that, owing to the smaller amount of water in the concrete, the value of Ec was higher, so that the value of n might well have been as low as 8. For n = 8, kd = 4.36 ins., I = 5,154 ins.⁴, and $fs=\frac{8\times205200\times8.44}{5154}=2,690$ lbs. per square inch.

For any bending moment M acting at any part of the beam it is clear (figure No. 4) that $fc=\frac{M\,k\,d}{I}$. Now if C is the total compression in the slab, $C=\frac{fc\,(2\,k\,d-t)\,bt}{2\,k\,d}=M\,\frac{(2\,k\,d-t)\,bt}{2I}=M\times$ a constant for any given beam. For the beam in question the value of this constant is $\frac{(2\times4.48-4)\,60\times4}{2\times5,567}=0.107$, therefore C = 0.107M.

If △ M is the increment of bending moment in any short length △X, then △C the corresponding increment in the total slab stress = $0.107\,\frac{\triangle M}{\triangle X}$, and $\frac{\triangle C}{\triangle X}=0.107\,\frac{\triangle M}{\triangle X}=0.107$ V, where V is the total shear at the point considered. A certain portion of the above increment of stress △C will no doubt be carried into the slab by shearing forces developed in the concrete between the haunching and the slab. It will be on the side of safety, however, to assume that it is all carried into the slab by means of the bond stress developed between the top flange of the I-beam and the surrounding concrete. The surface of this top flange is about 11 square inches per inch of length. If, then, △x is taken as one inch, we have, at the end of the beam, where the live load shear, (panel No. 1), is 8,550÷2 = 4,275 lbs.; bond stress $fb=\frac{0.107\times4,275}{11}=42$ lbs. per square inch.

Case II. No tension in Concrete

This assumption should of course be used in designing the composite beam. In order to conform to the prevailing practice as regards the design of reinforced concrete T-beams, it will be proper to take the modular ratio n as 15, and to assume, further, that the effective width of the slab is equal to the width of the haunching at the lower side of the slab plus eight times the thickness of the slab.

Equating the sum of the normal forces acting on any vertical section to zero, we have, $-\frac{fc\,(2kd-t)\,bt}{2\,kd}+\frac{fc\,An\,(kd-d')}{kd}=\frac{n\,fc\,dt'\,(1-k^2)}{2k}+\frac{fc\,An\,(1-k)}{k}$ whence $k^2-\frac{2\,(bt+2\,An+ndt')\,k}{ndt'}+\frac{bt^2+2\,An\,(d+d')+nd^2\,t'}{nd2\,t'}=0$.

Inserting numerical values:

b = 11.5+8×4 = 43.5 ins.; t = 4 ins.; t′ = 0.25 in.; A = 2.14 sq. ins.; n = 15; d = 12.8 ins.; d′ = 3.2 ins.

bt = 43.5×4 = 174; bt² = 174×4 = 696
2An = 2×2.14×15 = 64.2; 2An (d+d′) = 64.2×16 = 1027.2
ndt′ = 15×12.8×0.25 = 48.0; nd²t′ = 48×12.8 = 614.4
286.2 2,337.6

Therefore $k^2-\frac{572.4k}{48}+\frac{2337.6}{614.4}=0$, or $k^2-11.92k+3.804=0$

k = 0.328; kd = 12.8×0.328 = 4.20 ins.

$$I=\frac{1}{12}bt^3+bt(kd-\frac{t}{2})^2+n\left\{Is+As(\frac{d+d'}{2}-kd)^2.\right\}$$

$\frac{1}{12}\times43.5\times4^3$	=	232 ins.⁴
174×2.2^2	=	842 "
15×113.6	=	1,704 "
$15\times6.5\times3.8^2$	=	1,416 "
I	=	4,194 "

For loadings tage "f" as above M = 205,200 in.-lbs. Therefore, $fc=\frac{205,200\times4.2}{4,194}=205$ lbs. per sq. in.

$$fs=\frac{15\times205,200\times8.6}{4,194}=6,310 \text{ lbs. per sq. in.}$$

As in case 1, the total compressive stress in the slab is, —

$$\frac{M\,(2\,k\,d-t)\,bt}{2\,I}=M\,\frac{(8.4-4)\,43.5\times4}{2\times4,194}=0.091\,M.$$

and at the end of the beam for loading stage "f"

$$fb=\frac{0.091\times4,275}{11}=35 \text{ lbs. per sq. in.}$$

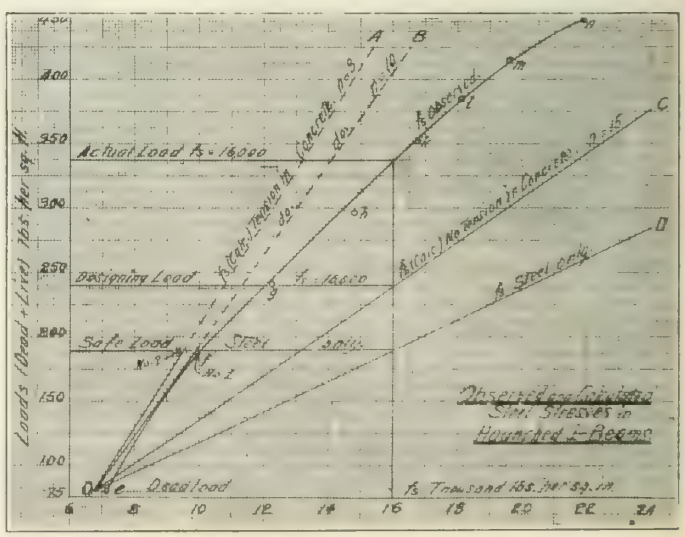


Figure No. 5. Observed and Calculated Stresses in Haunched I-Beams.

The flange stress in the beam due to the dead load (tables Nos. 3 and 4) as observed, has been taken as 7,130 lbs. per square inch. There is therefore available for live load 16,000 − 7,130 = 8,870 lbs. per square inch. On the above basis of design this would take care of a bending moment equal to $\frac{205,200 \times 8,870}{6,310} = 288,400$ in.-lbs., or a live load some 40 per cent greater than that applied. The bond stress under this increased load would rise to $35 \times 1.4 = 49$ lbs. per square inch, a moderate value.

The principal results of the foregoing are shown graphically in figures Nos. 5 and 6. Figure No. 5 shows more especially the observed and calculated stresses after concreting. In figure No. 6 the results for the dead load as well are incorporated. The line OA (figure No. 5) shows the flange stress for different loads, calculated on the assumption that the tension in the concrete is unimpaired, for a modular ratio of 8; OB in both diagrams, the same for a modular ratio of 10. OC shows the flange stress assuming no tension in the concrete, a modular ratio of 15, and an effective slab width limited in accordance with the usual specification for reinforced concrete T-beams. OD is for steel only. It will be seen that in the earlier stages of loading, up to about 107 lbs. per square foot, of live load (187 total load) the observed stresses in panel 1 closely follow the line OB, while those in panel 2 are smaller than given by OA. As the load increased, cracks developed slowly, and the steel stress increased more rapidly than the load, until the live load attained a value in excess of 217 lbs. per square foot (297 lbs. total load). Before further load was applied some cracks extended nearly to the neutral axis, and the rate of transfer of stress from the concrete in tension to the steel was not so rapid as before. As the live load increased beyond 300 lbs. per sq. ft., (380 lbs. total load), however, the steel stress again increased more rapidly than the load. At this point the bond stress would be about 120 lbs. per square inch, and the compressive stress in the concrete, nominally over 600 lbs. per square inch. On the whole, the behaviour was rational, well in accord with theory, and strikingly similar to that of a reinforced concrete beam.

Figure No. 7 exhibits the behaviour of a number of reinforced concrete beams tested by Professor Ernest Brown, of McGill University. The data are taken at random from his notable paper on Reinforced Concrete Beams (Trans. Can. Soc. C.E. Vol. XXII, 1908). The results are exhibited in the same form as is used in figure No. 5 for the haunched I-beams.

OA represents the steel stresses calculated for various loads, assuming tension in concrete unimpaired and n = 10; OB, similarly the calculated stresses assuming no tension in the concrete and n = 15. The observed stresses for five different beams at four different loads are plotted, as well as the average values for all the beams. A comparison of figures Nos. 5 and 7 shows the similarity of action, the principal difference being that the haunched I-beams show a larger reserve of strength over the designing values as regards loads applied after concreting, than do the reinforced concrete beams. The lower quality of the concrete in the latter may, however, be a factor in producing this result, as the average crushing strength (tested in cubes) was

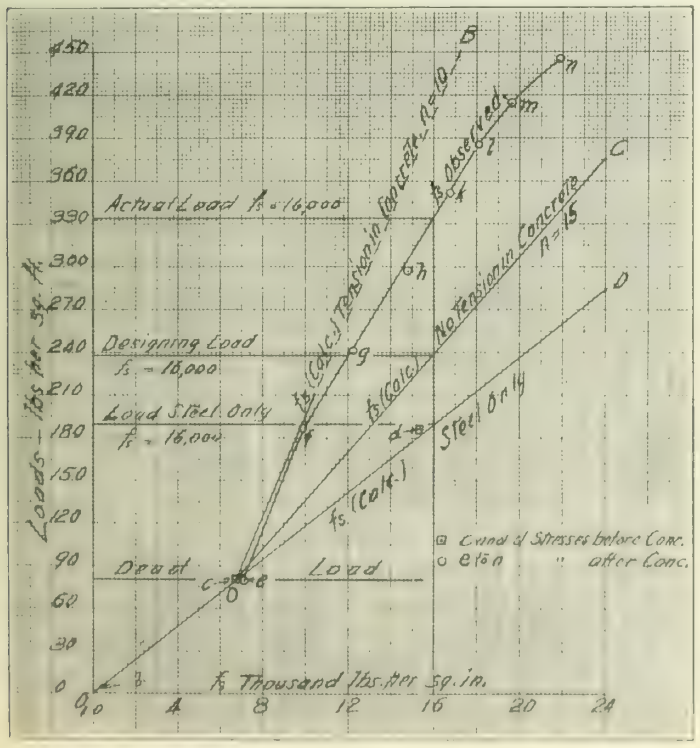


Figure No. 6. Observed and Calculated Stresses before and after Concreting.

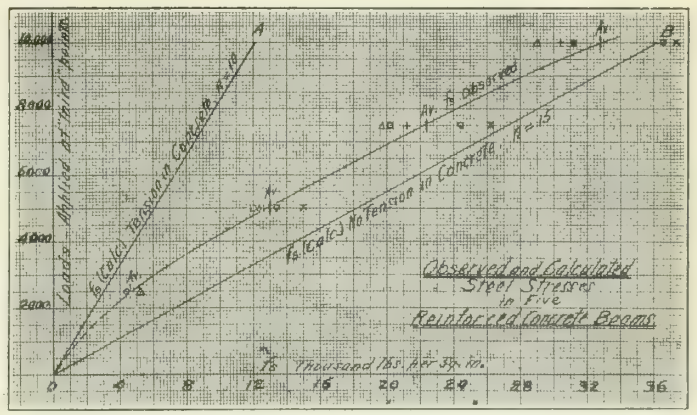


Figure No. 7. Observed and Calculated Steel Stresses in five Reinforced Concrete Beams.

about 2,200 lbs. per square inch, the modulus of elasticity (to a range of 650 lbs. per square inch) being about 3,000,000 lbs. per square inch.

It has been pointed out that, under the usual method of construction, namely, suspending the forms for the concrete, the steel beams carry permanently the entire weight of the concrete and probably a little more. Under these conditions, therefore, the economy resulting from the joint action of concrete and steel applies only to loads added after the concrete has set or broadly to the live loads. The magnitude of the advantage so obtained has been determined only for the structure tested, but could readily be calculated for any other. It will be seen from figure No. 4 that with a nominal fibre stress in the steel due to dead and live loads combined of 16,000 lbs. per square inch, the total load carried is about 238 lbs. per square foot, of which 158 lbs., is live load. The total load carried by the steel acting alone and with the same fibre stress is 187 lbs. per square foot, the live load being 107 lbs. On the basis of design given above, the capacity of the composite beam as regards live load is, therefore, some 48 per cent greater than that of the steel alone. The actual observed stress under the said load is only about 12,000 lbs. per square inch, but it is not to be supposed that this extra margin of safety would be maintained with inferior grades of concrete. On the other hand, due to the fact that concrete stresses are not developed by the dead load, it is probable that the margin between the actual steel stress and that used in design would be at least as great as in reinforced concrete beams, given a similar grade of material and workmanship. It is obvious that economy in the haunched beams will be greater, the greater the ratio of the live load to the weight of concrete and steel; the live load being defined as that applied after the concrete has set.

It would seem that a measure of continuity in the beams could readily be secured by inserting tension reinforcement in the slab, over girders to take care of the negative bending moment at such points, thus securing a further economy.

Conclusions

From the preceding tests and studies it appears:

1. That in the type of construction considered the concrete and steel act together to form a composite beam.
2. That within practical limits the composite beam conforms to theory and may be designed by methods analogous to those used in the case of reinforced T-beams.
3. That a considerable economy in the support of live loads may be obtained by utilizing the joint action of the concrete and steel.
4. That a further economy can probably be obtained by modifying the construction so as to provide for a measure of continuity at the ends of the beams.
5. That the absence of stress on the concrete, and of bond stress, due to the dead load, is advantageous to the haunched beams as compared with reinforced concrete beams.
6. That the nature of the shear reinforcement provided by the webs of the steel I-beams would probably eliminate failure due to diagonal tension.
7. That the stability and endurance of this form of construction depend upon the bond between the concrete and the steel, more especially at the top flange of the I-beams. The safe limits of the bond stress have not yet been determined.

It is therefore recommended that further tests be undertaken, to determine the endurance under arduous service, the safe limit of the bond stress, the effect of variation in the quality of the concrete, and the effect of differences in design. It is suggested that endurance can be best investigated by an actual service test, such as placing a lightly designed panel under heavy traffic for several months, at some convenient point, and noting the results. It is believed that the other factors can be most advantageously studied by a series of carefully planned laboratory tests on individual T-beams, inasmuch as conditions are much more favourable in the laboratory than in the field for controlling the relevant factors and for making observations.

The Strength of Short Concrete Beams

J. B. Macphail, B.A., B.Sc., A.M.E.I.C.
The Shawinigan Engineering Company Limited.

The design of reinforced concrete beams, loaded on spans of less than four times their depths, has received little attention either theoretically or experimentally, and the experiments herein described were undertaken in the hope that they might furnish some information that might be of use to designers.

Beams Tested

The elements of the beams tested are given in table No. 1. The beams were all 6 inches in breadth and 6 inches longer than the spans listed. All rods had hooked ends and were made from ordinary commercial round bars; in every case three rods were placed with their centres 1½ inch from the bottom and 1½ inch from centre to centre and from the sides of the beam. When five rods were used, the additional two were placed with their centres 3 inches from the bottom and covered the spaces in the lower layer. The sand used had a fineness modulus of 2.68; 93 per cent passed a No. 14 sieve; 34 per cent passed a No. 28 sieve and 6 per cent passed a No. 48 sieve. The aggregate was ¾ inch limestone chips containing some dust. The concrete was hand-mixed in proportions of 2:4:6 with sufficient water to give a slump of four to six inches in a 6 inch x 12 inch cylinder. Water was poured over beams and test cylinders once a day from the fourth to the twenty-eighth day after mixing.

TABLE No. 1.

Mark	Reinf.	Depth inches	Span inches	W1.	v.	u.
A	5 x 9/16	10¼	17	16,250	205	139
B	3 x ⅝	10¼	27	10,600	121	124
C	3 x ½	10¼	36	7,080	78	100
D	3 x ½	10¼	45	5,660	63	80
F	3 x 9/16	12	33	11,250	105	119
G	3 x ½	12	44	7,630	70	90
H	5 x ½	16	28	23,300	164	125
K	3 x ½	16	43	11,000	72	91

Using unit stresses of 750 pounds per square inch on concrete and 16,000 pounds per square inch in the steel, values of *W1*, the safe central concentrated loads, were calculated. In order to keep bond stresses down to reasonable values all but beams *G* and *K* were over-reinforced; so that in these two the resisting moment of the steel was less than that of the concrete; in the others, the concrete resisting moment governs. For these loads the unit shear *v* and the bond stress *u* were calculated.

The beams were tested at an age of 56 days under a central concentrated load on the Emery testing machine in the strength of materials laboratory at McGill University.

Results of Test

The observed ultimate loads *W3* are given in table No. 2 together with safe loads *W2* based on a unit shear of 56 pounds per square inch, a usual value for beams without web reinforcement. $W3 \div W1$ give factors of safety *F1* and $W3 \div W2$ give factors of safety *F2*. This method of presenting results is due to Dr. Oscar Faber.

Results obtained by using the loads observed at the first drop of the indicator of the testing machine gave figures of the same character as those tabulated.

In general failure occurred through diagonal cracks starting at or near the supports and running up to a point beneath the load; sometimes by vertical cracks below the load.

TABLE No. 2.

Mark	W2 lbs.	W3 lbs.	F1.	F2.
A	4,430	56,000	3.4	12.6
B	4,880	44,400	4.2	9.1
C	5,060	25,600	3.6	5.1
D	5,060	17,600	3.1	3.5
F	6,000	39,600	3.5	6.6
G	6,070	31,000	4.1	5.1
H	7,950	98,300	4.2	12.4
K	8,570	33,800	3.1	3.9
		Mean	3.65	7.3

The observed ultimate compressive strength of four 6-inch x 12-inch test cylinders at 8 weeks averaged 3080 pounds per square inch so the observed average factor of safety requires a reduction to the basis of an ultimate strength of 1875 pounds per square inch at 4 weeks, 40 per cent of which was taken as the working stress. To form a rough estimate, assume that the ultimate load carried by a beam is proportional to the ultimate strength of the concrete of which it is made. The ultimate loads for the weaker concrete would then be $W3 \times \frac{1875}{3080}$ and the observed factors of safety *F1* would be reduced in the same ratio or $F3 = F1 \times \frac{1875}{3080} = 2.22$ average, which agrees fairly well with the assumed factor of safety of $\frac{1875}{750} = 2.50$. Further, the value of the denominator 3080 in the above expressions should be reduced slightly to bring it to its value at 28 days. A value of 2740 pounds per square inch as the ultimate strength of the test cylinders at 28 days would give a factor of safety *F3* of 2.50 and an increase of 11 per cent gives 3040 pounds per square inch. The probability is that the increase in a further 28 days is more than 11 per cent so the true strength at 28 days is probably lower than 2740 pounds per square inch. This would slightly increase the factor of safety from 2.50. It may be mentioned that the tentative report of the Commission du Béton Armé de l'Association Belge de Standardisation contemplates an increase in strength of 50 per cent between 28 and 90 days.* In any case the reduced factor of safety *F3* is not far from the value of 2.50 assumed.

This revision of concrete stress is applicable also to the factors of safety *F2*, but this would not alter the fact that the values of *F2* vary over a much wider range than values of *F1*.

The small variation in factors of safety *F1* for the design loads in which bending and bond stresses only were considered and the high values of the unit shear neglected, show that the concrete was economically used, whereas a design based on a maximum unit shear of 56 pounds per square inch would waste concrete in some cases, as shown by the unnecessarily high factors of safety *F2*, though a little steel might be saved.

Shear Stresses

To explain the action of the shear stresses reference may be made to the works of Dr. Oscar Faber who has developed a theory of the existence in a loaded reinforced concrete beam of a series of direct and indirect inclined compressions which, together with the steel, resist the shear. This theory is given briefly in "Reinforced Concrete Design" by Faber and Bowie, vol. 1, p. 79 ff., and at greater length in his paper "The Shearing Resistance of Reinforced Concrete Beams"** read before the Concrete Institute in London in May 1916.

The application of Dr. Faber's methods to this particular type of beam and loading gives safe loads, based on shearing stresses, that are identical with those determined from considerations of bending, and the uniformity of the factors of safety *F1* confirm his deduction that in a simple beam having reinforcement with sufficiently hooked ends running the whole length at a distance from the bottom not less than ⅓ kd, failure will not occur until the full moment of resistance has been reached, and that if the safe bending stresses are not exceeded, the safe stresses elsewhere will not be exceeded.

It may be argued that the use of a greater amount of steel, to reduce bond stresses, than would be required to resist the applied bending moment caused the ultimate loads on the beams so treated to be higher than they would have been if the bond requirements could have been met by steel of a smaller total area, because of the smaller unit stress and the consequent smaller deformation of the steel. This can be positively decided only by experiment, but the theory does not indicate such a result and practical considerations of bar spacing and construction would doubtless prevent much alteration in this direction where short spans are concerned.

It may be concluded then that short beams simply supported, if designed for safe moment and bond stresses, do not require web reinforcement.

Grateful acknowledgement is tendered to McGill University for facilities for testing the specimens; to Professor Ernest Brown, M.E.I.C., and S.D. MacNabb, A.M.E.I.C. for making the tests, and to J.A. McCrory, A.M.E.I.C. for facilities for making the specimens and for assistance in testing them.

*"Pratique du Calcul du Béton Armé" by G. Magnel, p. 128. Published by Van Rysselberghe & Rombaut, Ghent, Belgium.

**This paper was published in "Concrete and Constructional Engineering" in England in May 1916 and subsequent numbers. Copies of the paper can possibly be obtained from the secretary of the Concrete Institute, at 296 Vauxhall Bridge Road, London, S.W., England.

Publications

Report of the Fuel Research Board for the years 1922-1923. The Department of Scientific and Industrial Research, 16 Old Queen Street, Westminster, London, S.W.I., has issued the first section of the report of the Fuel Research Board for the years 1922 and 1923, which deals with the production of air-dried peat.

Building and Engineering Catalogue, 1923 Edition. Specification Data, Limited, have issued their 1923 edition of this catalogue.

BRANCH NEWS

Saskatchewan Branch

D. A. R. McCannel, A.M.E.I.C., Secretary-Treasurer

Annual Summer Meeting

On account of several unavoidable circumstances which would materially reduce the attendance at the coming annual Summer meeting at Estevan, the committee in charge have considered it advisable to postpone the meeting until Friday and Saturday, August 17th and 18th.

The committee at Estevan have received the whole-hearted support of several local and district organizations and together they have arranged for an exceedingly profitable and enjoyable two days. Every member who can possibly arrange to attend is urged to do so as the meeting offers an excellent opportunity to secure first-hand information concerning the extensive natural resources of this section of Saskatchewan.

The following is a summary of the programme which has been arranged for:

FRIDAY, AUG. 17th — 9 a.m. Leave Estevan by motor for Western Dominion Collieries near Bienfait, Sask.
12.00 a.m. Luncheon as guests of the Western Dominion and M. & S. Mines.
2.00 p.m. Inspection of Briquetting Plant of the Lignite Utilization Board.
4.00 p.m. Return to Estevan by way of Roche Percee, taking in several places of geological interest.
7.30 p.m. Dinner and joint meeting with the Southern Saskatchewan Branch Canadian Institute of Mining and Metallurgy. Paper by J. B. Hamilton, A.M.E.I.C., town engineer, Estevan, on Use of Southern Saskatchewan Coal for Boiler and Domestic Fuel Purposes.
SATURDAY, AUG. 18th — 9.00 a.m.: Inspection Anderson Mine and Estevan Brick Plant.
12.00 a.m. Luncheon, guests of Estevan Board of Trade.
2.00 p.m. Visit Prairie Nurseries, Ltd. (the largest in Western Canada).

Regina and Northern Saskatchewan members are arranging to motor from Regina, leaving Regina Thursday 1 p.m., August 16th.

Ottawa Branch

F. C. C. Lynch, Affiliate E.I.C., Secretary-Treasurer.

British Empire Forestry Conference

Of particular interest to the engineering profession during July and August is the meeting in Canada of the British Empire Forestry Conference. This country has reached such a condition of forest development as to attract the attention of the world. Canada's pulp and paper production has grown to a world position second only to the United States and is rapidly overcoming that country's present lead. The enormous water-power developments, pulp and paper mills, transportation interests, etc., are, however, entirely dependent upon a continuous supply of raw materials from the forest. This industry is one that has been made possible through the work of some of Canada's most notable engineers, and the plants stand as monuments to their ability.

The maintenance of the forest resources of the Empire is one of the paramount functions of the Empire Forestry Conference, which aims to discover ways and means of making the Empire self-sustaining in its timber supply. A careful stock-taking of the forest resources and the classification of all matter of information in regard thereto, and the promotion of the Empire's trade in forest production — these are a few of the chief objects in view. A serious endeavour is being made to make known the actual conditions of the Empire's forests and their management.

The Forestry Branch of the Department of the Interior are acting as hosts to the Empire Conference, E. H. Finlayson, A.M.E.I.C., acting director of forestry, and D. Roy Cameron, A.M.E.I.C., chief of the forest protection service, personally looking after the comfort and pleasure of those attending.

The conference assembles on July 25th at Ottawa and will proceed thence to the St. Maurice, St. John and Chicoutimi Districts. Continuing eastwardly, the forests of New Brunswick and Nova Scotia will be visited, and minute inspection will be made of the Bathurst-Chatham peninsula, where the spruce bud-worm has made serious inroads.

After returning to Ottawa, where a series of meetings will be held during the first week in August, the conference will proceed to the Provincial Tree Nursery at St. Williams, Norfolk County, Ontario, and thence northerly, visiting the forest reserves at Timagami and Algonquin Park, and the pulp and paper industries at Iroquois Falls. Thence proceeding west the conference will visit various tree nurseries on the plains and after a short visit to the national parks of British Columbia, will study the forest conditions prevailing on the Pacific slope and Vancouver Island. The conference will terminate at Victoria about September 7th.

The chairman of the conference is Major-General Lord Lovat, K.T., K.C.M.G., D.S.O., and he is ably supported by the United Kingdom delegates, including Sir James Calder, R. L. Robinson, O.B.E., Professor Troup of Oxford University, Dr. A. W. Borthwick, Fraser Story, head of the Intelligence Service, Dr. J. W. Munro, forest entomologist, and a goodly number of representatives from various parts of the British Empire.

Many of the members of *The Institute* will have an opportunity of meeting those attending the conference when visits are paid to some of the larger pulp and paper plants throughout Canada.

Drainage Conference

Drainage in the provinces of Saskatchewan and Alberta was the subject of important conferences in June at Regina and Edmonton, between officers of the various governments concerned. Saskatchewan was represented by H. S. Carpenter, A.M.E.I.C., deputy minister of the department of highways, and M. B. Weekes, M.E.I.C., director of surveys; Alberta by L. C. Charlesworth, M.E.I.C., chairman of the Irrigation Council; and the Dominion by J. B. Challies, M.E.I.C., acting director of reclamation, J. S. Tempest, M.E.I.C., and H. R. Cram, A.M.E.I.C., of the Reclamation Service; also R. B. Matheson, assistant to the Commissioner of Dominion Lands.

It is understood that a satisfactory modus operandi was agreed upon under which drainage schemes approved of by the province shall be authorized and facilitated by the Dominion.

At the Western Canada Irrigation Convention held at Penticton, the Dominion Government was represented by E. F. Drake, Affiliate E.I.C., consultant to the Reclamation Service; J. S. Tempest, M.E.I.C., and P. J. Jennings, M.E.I.C., of the Reclamation Service, Calgary; and O. H. Hoover, A.M.E.I.C., of the Hydrometric Survey, Calgary; also R. G. Swan, A.M.E.I.C., district chief engineer of the Dominion Water Power Branch, Vancouver.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
W. St. J. Miller, A.M.E.I.C., Branch Editor.

A fuel committee of the Calgary Branch has recently been selected from the members. The names are as follows: — W. A. Davidson, M.E.I.C., chairman; C. C. Richards, M.E.I.C. and F. E. Emery, A.M.E.I.C. The matter of fuel supply has become one of paramount importance, especially during the last few winters, and it was thought the presence of an expert committee would be of considerable advantage in any future discussions that are certain to arise regarding the subject.

We notice that S. H. Hawkins, A.M.E.I.C., has again changed his occupation. It was only recently that he left the staff of the Department of the Interior and joined forces with the Department of Natural Resources, C.P.R., Calgary. Now we find he has joined the noble order of Benedicts, and allied himself (shall we say, resigned himself) to a more serious occupation, i.e. matrimony. Miss M. Young of Banff is no more, for she is now Mrs. S. H. Hawkins. *Congratulations.*

The Banff-Windermere road was officially opened on June 30th. Immense numbers of cars and visitors took part in the celebration arriving from many parts of Canada and the States. The presence of a large party of newspaper men argues well for some additional publicity that is bound to result from their visit. The Lieut.-Governors of British Columbia and Alberta, severed the ribbon, thereby christening the new highway.

A serious washout, due to several cloudbursts, occurred between Banff and Calgary on the C.P.R. tracks, which held up many trainloads of returning holiday makers over the first week-end in July. Having licked the proverbial platters clean at the small town of Cochrane, most of the passengers had to be returned to Banff to appease the inner man apparently. The trouble (washout!) lasted some forty-eight hours during which time the work of pile-driving and erection of trestles had to be rushed to completion.

J. B. Challies, M.E.I.C., spent a week in Calgary towards the end of June, renewing acquaintances and meeting members of the Calgary staff of the Reclamation Service, Department of the Interior, since his recent appointment as acting director of this branch of the service. H. R. Cram, A.M.E.I.C., accompanied the director on his western trip.

Annual Convention of Irrigation Association

The 17th annual convention of the Western Canada Irrigation Association is being held at Penticton, B.C., from the 11th to 13th of July inclusive. Any detailed reference to this must be deferred till a later date. P. J. Jennings, M.E.I.C., has been delegated from *The Institute* and R. S. Stockton, M.E.I.C., and W. H. Snelgrove, A.M.E.I.C., are representing the Calgary Branch. Professor R. S. L. Wilson, A.M.E.I.C., and F. E. Emery, A.M.E.I.C., have been selected to represent the Alberta Association of Professional Engineers at the convention.

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

Trip to Britannia Mines.

The Vancouver Branch held a joint excursion with the mining section of the Vancouver Board of Trade, to the mines and mill of the Britannia Mining and Smelting Company, Howe Sound, on Wednesday, June 20th.

A special steamer was chartered from the Union Steamship Company, which left Vancouver at 9.15 a.m., and landed the party at Britannia Beach about noon. Two parties were then formed, the one to visit the mines and the other to inspect the mill, it being impossible to do justice to both in the few hours at our disposal.

C. P. Browning, general manager of the Britannia Company, Ltd., and his staff of engineers showed the visitors every courtesy, and went to very considerable trouble to make the trip through the mill and the workings both easy and interesting, by providing suitable transportation and very efficient guides.

General Description of the Company's Property.

The present mill has only recently been completed, and is therefore the last word in such plants. It replaces the former mill, which was destroyed by fire in 1921, and has a capacity of 2,500 tons of ore per day. The Britannia Company was the first in British Columbia to adopt the oil-flotation concentration process on a commercial scale in 1912, when that method was in experimental stages; and in the new concentrator, this process is carried on to a high degree of perfection.

From the top of the mill, which is located on the hillside at Britannia Beach, a bird's-eye view of the townsite is obtained, which still exhibits evidences of the disastrous flood on the night of October 28th, 1921, when a large part of the little town was wiped out, with scarcely a moment's warning, involving considerable loss of life. The company has constructed new dwellings on a higher level. These are of the bungalow type, and appear both comfortable and attractive.

The mines are located in the mountain immediately in rear of the Beach and are very extensive. They are reached firstly, by a light railway which carried the visitors to a transfer point on a level above the mill; thence by a long and steep cable railway to a height of about 1,500 feet above the mill, which is known as the 2,700-foot level; and lastly by a 3½-mile switchback electric railway which rises to the 2,200-foot haulage level, terminating in a tunnel into the heart of the mountain nearly a mile in length. At this point the visitors were transferred to the main shaft; by which they were conveyed to the 1,700- and 1,800-foot levels, where the ore-crushers are located, and afterwards to other parts of the workings, where they obtained a very good general idea of the mining methods employed.

The ore is dumped down rock-raises, from the upper levels, to the crushers, from which it is dropped into ore-cars on the 2,200-foot haulage level. It is then hauled over the switchback railway to the 2,700-foot level, where it is dumped down a rock-raise 1,500 feet deep, on an incline of nearly 70 degrees to chutes on the 4,100-foot level. From this point, which is known as the main haulage level, it is conveyed in ore-cars to the ore-bins at the top of the mill, distant about three-quarters of a mile. A very considerable amount of ore from other workings, is conveyed to the mill by aerial tramway.

The whole plant is operated by electricity and compressed air, electric power being developed at four points.

The tunnel power house, three miles from the beach, is one. It is at an elevation of 2,084 feet. This with the beach power house, elevation 165 feet, constitutes the two hydro-electric plants of the mine. The tunnel power house develops about 1,950 horse-power, while the beach power house has a capacity of 8,490 horse-power.

A high-tension line transmitting 4,500 to 6,000 horse-power at 34,000 volts was built from North Vancouver during the past year, to supply electric power to the company at Britannia Beach. It follows the rugged coast-line for thirty miles to Britannia Beach, where distribution is handled by the mining company.

There are several reasons for the big Howe Sound mine turning to the B. C. Electric for power. One of the most important is that at certain times of the year water shortage affects the operation of its local power plant. In order to make provision against this it has been necessary to build expensive storage reservoirs, which are now at capacity. The company also has in reserve an auxiliary steam-turbine power station installed at the Beach.

The entire hydro-electric power supply from the company's stations is obtained from Britannia creek — quite a small stream, about seven miles long, which flows into the sound. By using a succession of high heads sufficient power is developed for the light and power uses of the mine and the homes of the little town. The storage reservoirs are at an elevation of 4,000 feet.

The twenty odd members of the Vancouver Branch, who took advantage of this opportunity to visit this famous mine, were well repaid for their trouble, and it is most regrettable that more of the members did not find it possible to join the party.

More detailed information regarding the Britannia property, concentrator and workings, may be obtained by referring to the 1922 "Annual Report of the Minister of Mines for the Province of British Columbia," pages 244 to 249, and a paper read by C. P. Browning before the annual general meeting of the B. C. Division of the Canadian Institute of Mining and Metallurgy, entitled "General Mining and Milling Practice at the Britannia Mine, Howe Sound, B.C.", which is published in the Bulletin of the C.I.M.M., January, 1922, pages 50 to 61.

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

Annual Excursion

A very successful outing was enjoyed by the members of the Peterborough Branch and their friends, on Saturday afternoon, June 23rd, when they journeyed by train or automobile to Campbellford. Nine cars carried those whose preference it was to travel by automobile. The rendez vous of the party was the generating station of the Hydro-electric Power Commission at Ranney's falls, this station having been thrown open to the visitors through the kindness of the commission.

A special staff of operators and engineers were on hand to show the visitors around the plant, and it was the first opportunity that many of the party had had to see this first-class and up-to-date plant in operation. On last year's excursion it may be recalled that this plant was inspected by the members of the branch shortly before it was put into operation.

Some of the party took advantage of the opportunity provided of visiting the plant of the Canada Paperboard Company, nearby. Their tour of inspection completed, the party was photographed in front of the power house.

The most strenuous event of the outing was the ball game, which was started at 4 o'clock, between the teams of Chairman R. L. Dobbin, M.E.I.C., and Vice-Chairman E. R. Shirley, M.E.I.C. Great enthusiasm was shown by both teams, but the laurels of victory went to the Vice-Chairman's team. Those who did not take part in the game either looked on from the side lines or played tennis on the adjacent courts. The following was the line-up of the ball teams:

Chairman Dobbin's team: Killaly, c; Henderson, ss; Wood, p; Hay, 1b; Gifford, 2b; Flitton, 3b; Dobbin, cf; Coutts, lf; Hawthorne, rf.

Vice-Chairman Shirley's team: Gates, c; Rose, p; McLeish, ss; McLaren, 1b; Collins, 2b; Burgess, 3b; Cruthers, cf; Salamis, rf; Millen, lf.

Subs: Manning, Roseborough, Mackenzie, Crowe, and any others willing to volunteer. F. A. Burgar, A.M.E.I.C., acted as umpire.

The next item on the programme was supper, and the party adjourned to Long's restaurant where a sumptuous repast was awaiting them. Chairman Dobbin presided, and the meal was interspersed with songs from *The Institute* song sheet. The songs were sung with gusto and added greatly to the fine spirit of conviviality which prevailed. The speeches were brief and to the point. A. E. Caddy, M.E.I.C., of Campbellford, welcomed the guests, in the absence of Mayor Meyers, who found it impossible to be present. When Vice-Chairman Shirley was asked to say a few words on behalf of his winning team, he replied that that was not necessary, as the players had spoken eloquently for themselves by their work on the diamond. J. A. Humphries of Campbellford was asked to present the prizes to the winning team. This he did with appropriate words, the prizes consisting of a tin automobile for each member of the victorious team. Another prize presented by Mr. Humphries was a rubber doll to F. A. Burgar, A.M.E.I.C., who has recently become a benedict. R. B. Rogers, M.E.I.C., also spoke briefly, recalling with pleasure that he had at one time been a resident of Campbellford.

The time soon arrived when the engineers had reluctantly to leave the scene of their festivities, thus bringing to a conclusion one of the most successful outings this branch has ever held.

The arrangements for the outing were in the hands of James Mackintosh, A.M.E.I.C., Paul Manning, A.M.E.I.C., and W. E. Ross, Jr.E.I.C., with a committee in Campbellford consisting of A. E. Caddy, M.E.I.C., A. L. Malcolm, A.M.E.I.C., and Mayor Meyers. W. H. Barry acted as pianist for the party.

Annual Excursion of Peterborough Branch

1 H. H. Darling
2 D. W. Roseborough
3 B. C. Salamis
4 A. J. McLeish
5 A. L. Malcolm
6 D. V. Canning
7 H. Rose
8 A. J. Wood
9 J. G. Stevenson
10 A. H. Munro
11 G. Henderson
13 W. M. Cruthers
14 G. Ironsides
15 J. Anderson
16 T. Lang
17 J. H. Johnson
18 J. W. Milne
19 W. G. Cornell
20 B. I. Burgess
21 G. Coutts
22 J. W. Collins
23 I. MacKenzie
24 M. B. Wyman
25 G. Hawthorne
26 A. L. Dickieson
27 A. L. Killaly
28 W. H. Barry
29 C. Morris
30 J. Mackintosh
31 J. W. Bateman
32 B. Ottewell
33 W. E. Ross
34 R. L. Dobbin
35 R. C. Flitton
36 A. E. Caddy
37 A. B. Gates
38 E. R. Shirley
39 D. L. McLaren
40 J. Dibblee
41 F. A. Burgar
42 G. B. Smith
43 C. S. MacLean
44 P. Manning
45 J. M. Perrin
46 C. H. Crowe
47 P. Smedmor

Cape Breton Branch

D. W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

K. H. Marsh, M.E.I.C., chairman of the branch, resigned his position as chief engineer of the Dominion Coal Company Limited and has gone to the United States, where he will be located in future.

On June second, a farewell party was given to Mr. Marsh by the members of the branch, at Camp "Open Hearth", North Sydney, the summer home of Thos. J. Brown, M.E.I.C., deputy commissioner of mines for Nova Scotia. The members gathered at the branch rooms in Sydney, at 3.30 p.m., and drove in automobiles the fifteen miles to camp. About thirty-five members were present, C. M. Odell, M.E.I.C., being in the chair. After dinner Mr. Marsh was presented with a chime clock. The speakers of the evening, besides Mr. Odell and Mr. Marsh, were T. J. Brown, M.E.I.C., George D. Macdougall, M.E.I.C., and John S. Whyte, M.E.I.C.

This branch has been unfortunate in losing three of its members during the past few months, all three being members of the executive, the third being C. C. Curtis, M.E.I.C., manager of the Cape Breton Electric Company Limited. This company is controlled by the well known firm of Stone and Webster, and Mr. Curtis has been promoted to a position in one of their larger branches.

At a recent meeting of the executive, S. C. Mifflen, A.M.E.I.C., and A. P. Theuerkauf, M.E.I.C., were appointed to the executive in place of Mr. Marsh and Mr. Curtis, resigned. Horace Longley, M.E.I.C., was elected chairman and A. W. McMaster, A.M.E.I.C., vice-chairman of the branch for the remainder of the term.

OTHER SOCIETIES NEWS

Association of Professional Engineers of Alberta

The Association has recently issued a copy of their act, by-laws and list of members; which has been very conveniently arranged in booklet form.

Association of Professional Engineers of British Columbia

Last month the luncheon discussed "Engineers in Public Life". Major G. A. Walkem, M.E.I.C., addressed the members somewhat in the following way:

"Some six months ago, after just having been elected reeve of Point Grey, I said to you in this room 'This is a progress report, I have only just started'. Now, after some six months, I wish to say: the more I see of public affairs, the more sure I am of the need for *engineers* in public life. Why do I say this? Well, first — ninety per cent of the work carried out by public bodies is engineering. Who so qualified then as an engineer? Secondly — where the work is or is not engineering, certain qualities, educational qualities are desirable; these desirable qualities, such as the analytical mind, the engineer's training and education give him in a large degree. I have here three abstract which bear on the two points I have mentioned:—

Engineering work has become an increasingly important factor in the progress of civilization and in the welfare of the community. The engineering profession is held responsible for the planning, construction and operation of such work, and is entitled to the position and authority which will enable it to discharge this responsibility and to render effective service to humanity.

That the dignity of their chosen profession may be maintained, it is the duty of all engineers to co-operate in upholding the engineering profession by exchanging general information and experience with fellow engineers and students of engineering and also by contributing to work of engineering societies, schools of applied science and the technical press. (Excerpt from the A.S.M.E., Code of Ethics.)

The problem of universal wellbeing offers a challenge and a call to duty that the engineer may not refuse. The primary conditions and responsibility for universal wellbeing now rests upon his shoulders, and the engineer does not like to be concerned with a half-finished "job". There is a good reason to believe he will do his share of work in attaining the ultimate results desired. Already there are significant signs that he has accepted this duty.

. . . .Unless we can in some manner change our industrial system so we can more nearly attain universal wellbeing and distribute the fruits of our industry more equitably we have no reason for believing that our civilization will endure, and its bones will surely strew the shores of time with the great civilizations that have preceded us. (Dexter S. Kimball.)

We pride ourselves in saying, 'Once an engineer, always an engineer'. Whatever may be the course of life followed by any of us, it will always be marked by the indelible seal of the scientific, practical, and logical training to which the engineer is subjected during the early years of life.

Some have made the remark in criticism that engineers lack political intuition and ability; I would answer that a larger dose of logic and positiveness applied to politics would bring great advantage to public affairs. (Gelasio Caetani, Italian Ambassador to the U.S.)"

Committee on Public Affairs

The chairman then introduced the possibility of taking part in the next Vancouver civic elections, he dealt with the activities of last year, the property qualifications necessary (these have been sent to all members) and after addresses from J. P. Hodgson, C. Bentall, C. Brakenridge, W. W. Fraser, F. Biggam, E. G. Matheson, J. Porter, C. E. Cartwright, the following committee on "Public Affairs" was appointed: J. P. Hodgson, Chairman, F. Sanford, C. Brakenridge, C. Bentall, E. G. Matheson.

Recent Publications Received

Transactions, Proceedings, Etc.

Presented by the Societies.

Permanent International Association of Navigation Congresses, Thirteenth Congress, London, 1923. (first section) Inland Navigation, Communications, Questions. (second section) Ocean Navigation, Communications, Questions.
Engineering Association of Malaya, volume 1, 1922.
Mining Institute of Scotland, List of Members, August 1922.
American Institute of Mining and Metallurgical Engineers, Directory of, 1923.
Institution of Mechanical Engineers, Proceedings, volume 2, 1922.
Western Society of Engineers, Year Book, 1923.
Society of Naval Architects and Marine Engineers, Transactions, volume 30, 1922.
American Institute of Electrical Engineers, Year Book, 1923.
Institution of Engineers of Australia, Transactions, volume 1, 1920.
American Society of Civil Engineers, Year Book, 1923.
University of Toronto Engineering Society, Transactions and Year Book, April 1923.
National University of Ireland, Calendar, 1922.
Royal Society of Canada, Proceedings and Transactions, third series, volume 16, meeting of May 1922.
American Institute of Consulting Engineers, Incorporated, Year Book 1922.
Institution of Engineers (India) List of Members, March 1923.
Institution of Water Engineers, Transactions volume 27, 1922 (includes contents and subject index volumes 1-27.
American Concrete Institute, Proceedings, Sixteenth Convention, volume 16, 1920.
Association of Ontario Land Surveyors' Annual Report and Proceedings, Thirty-first Annual Meeting, 1923.
Canadian Manufacturers Association, Conference on Scientific and Industrial Research, February 20-22, 1923.
Liverpool Engineering Society, Transactions, volume 43.

Reports

Harbour Commission of Montreal; Annual Report of the Harbour Commissioners, 1922.
Interim Report of the Dominion Fuel Board, 1923.
City of Boston Public Works Department, Annual Report, 1921.
New Brunswick Electric Power Commission, Third Annual Report, 1922.
The Air Board of Canada, report for year 1922.
The Engineering Foundation, report for the year ended February 8th, 1923.

Dominion Bureau of Statistics, Department of Trade and Commerce:
Prices and Price Indexes, 1918-1922.
Central Electric Stations in Canada, 1921, Part 1. (Statistics)

Dominion Water-Power Branch, Department of the Interior:
Central Electric Stations in Canada, 1922, Part 2. (Directory)

University of Toronto School of Engineering and Research:
Torsional Strength of Rectangular Sections of Concrete Plain and Re-inforced, bulletin No. 3, 1922, section 9.

Ontario Department of Mines:
Thirty-first Annual Report, volume 31, parts 4, 5 and 6, 1922; Fourth report of Joint Peat Committee. Natural Gas in 1921. Petroleum in 1921. Geology and Minerals of the County of Leeds.

United States Geological Survey:
Hydro-Electric Power Systems in California and their extensions into Oregon and Nevada.
Fuel Products in 1922.
Sodium Sulphate: Its Resources and Uses, bulletin 717.
Coke and By-Products in 1921.

State of Illinois Department of Registration and Education:
Activated Sludge Studies, 1920-22, bulletin No. 18.

United States Department of Commerce:
List of publications available for distribution, May 1st, 1923.

Department of Commerce, Bureau of Standards, Washington:
Technologic Papers:
"Lathe Breakdown Tests of Some Modern High-Speed Tool Steels," No. 228, part of volume 17.
"Some Tests of Steel-Wire Rope on Sheaves," No. 229, part of volume 17.
"A Recording Chronograph for the Inverse Rate Method of Thermal Analysis," No. 230, part of volume 17.
"Tentative Standard Test Methods and Percentages of Oil and Moisture in Hair Press Cloths," No. 231, part of volume 17.
"Methods of Measuring the Plasticity of Clays," No. 234, part of volume 17.
"Thermal Stresses in Steel Car Wheels," No. 235, part of volume 17.
"Loading Test of a Hollow Tile and Reinforced Concrete Floor of Arlington Building, Washington, D.C.," No. 236, part of volume 17, April 21st, 1923.
Scientific Papers:
"Composition, Purification, and Certain Constants of Ammonia," No. 465, part of volume 18.
"Wave Length Measurements in the Arc Spectra of Gadolinium and Dysprosium," No. 466, part of volume 18.
"Specific Volume of Saturated Ammonia Vapor," No. 467, part of volume 18.
"Formulas and Tables for the Calculation of the Inductance of Coils of Polygonal Form," No. 468, part of volume 18.
"A Method for the Accurate Measurement of Short-Time Intervals," No. 470, part of volume 19.
"Methods of Measurement of Properties of Electrical Insulating Materials," No. 471, part of volume 19.
Circulars:
"Solders for Aluminum," No. 78. (2nd edition)
"United States Government Specification for Volatile Mineral Spirits for Thinning Paints," No. 98. (2nd edition
"Auxiliary Condensers and Loading Coil Used with Simple Home-made Radio Receiving Outfits," No. 137.
"A Decimal Classification of Radio Subjects — An extension of the Dewey System," No. 138.
"United States Government Specification for Wood Screws," No. 140.
"Description and Operation of an Audio-Frequency Amplifier Unit for Simple Radio Receiving Outfits," No. 141.
"Tables of Thermodynamic Properties of Ammonia," No. 142.

Technical Books

Presented by John Wiley & Sons, Incorporated.
"The Engineering of Excavation," by George B. Massey.
"The Design of Steam Boilers and Pressure Vessels," by George B. Haven, S.B. and George W. Swett, S.B., second edition.
"Industrial Furnaces," by W. Trinks. Volume 1.
"The Planning of The Modern City," by Nelson P. Lewis and assisted by Harold M. Lewis, second edition.

Presented by Chapman & Hall.
"Line Charts for Engineers," by W. N. Rose, B.Sc., Eng. (Lond.)
"Workshop Routine," by W. J. Hiscox.

Presented by Columbia University Press.
"Robert Fulton and the Submarine," by Wm. Barclay Parsons

Presented by the author and Doubleday, Page and Company.
"A Symbol of Safety," by Harry Chase Brearley.

Presented by The Chemical Publishing Company.
"Portland Cement," by Richard K. Meade, M.S. Second editio

Presented by U.P.C. Book Company, Incorporated.
"Furnace Heating," by William G. Snow. Sixth edition.
"Estimating the Cost of Buildings," by Arthur W. Joslin. Thi edition.

Presented by Induatrial Management Library.
"Mastering Power Production," by Walter N. Polakov.
"Graphic Methods for Presenting Facts," by Willard C. Brinton.

Presented by Charles Griffin & Company, Limited.
"Dock Engineering," by Brysson Cunningham, D.Sc., 3rd edition.
"Harbour Engineering," by Brysson Cunningham, D.Sc., 2nd edition.

Presented by The Chemical Catalog Company, Incorporated.
"Modern Pulp and Paper Making," by G. S. Witham, Sr.

Presented by Constable & Company, Limited.
"Plane & Geodetic Surveying for Engineers, Volume 1, Plane Surveying," by David Clark, B.Sc., (Lond.)
"Plane & Geodetic Surveying for Engineers, Volume 2, Higher Surveying," by David Clark, B.Sc., (Lond.
"The Theory of Prime Movers," by C. A. Middleton Smith, M.Sc., and A. G. Warren, B.Sc., Volume 2. (A Handbook of Testing).

Department of Roads, Quebec

Tenders will be received at the office of the Minister of Roads, Government Building, in the city of Quebec, until twelve o'clock, of the afternoon of Tuesday, the seventh of August, 1923 (eastern standard time) for the construction of an oiled waterbound macadam on the following highways: Iberville-St. Albans in the municipalities of the parishes of St. Athanase, 13,796 feet, and Ste. Anne of Sabrevois, 6,341 feet; and Laprairie-Valleyfield in the municipalities of the village of Lac St. Louis, 21,825 feet, and of the parish of St. Timothee, 10,955 feet.

Department of Highways, Saskatchewan

Tenders will be received by H. S. Carpenter, M.E.I.C., deputy minister of highways, Regina, Sask., until eleven o'clock a.m. (standard time) on Wednesday, August eighth, 1923, for the excavation of approximately 33,000 cubic yards of earth and other work required in the construction of provincial highway from Springside West, eight miles. Copies of plans, profiles and specifications may be seen at the office of the deputy minister, and at the office of each of the following parties: — Wm. Grant, 105 Ross Block, Saskatoon, Sask.; J. R. Reid, A.M.E.I.C., Court House, Swift Current, Sask.; F. G. Kissack, North Battleford, Sask.; E. B. Wedster, A.M.E.I.C., Yorkton, Sask.

Preliminary Notice

of Applications for Admission and for Transfer

July 19th, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in August, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ATKINSON—FRED, of 337 Northcliffe Avenue, Montreal, Que. Born at Hull, England, May 1st, 1891; Educ., evening tech. classes; 1908-11, Royal Engineers, southern command, general shop training; 1911-12, mechanic, Birmingham Corporation; 1912-13, junior engr., Leamington Water Works; 1914-15, asst. chief engr., Empire Coal Company; 1915-16, asst. to engr., Montreal Tramways; 1916-17, watch engr., Bell Telephone Co.; 1917-18, chief engr., Standard Shirt Company, in charge of steam and elec. equipment; 1918-20, chief engr., Place Viger Hotel, C.P.R.; 1920-21, supt. of light, heat and power, Canadian Explosives, Beloeil plant; 1922-23, chief engr., Place Viger, C.P.R.; At present, combustion engr., Gates Engineering Company, Ltd., Montreal.

References: J. T. Farmer, J. A. Shaw, [illegible] A. Ryan, [illegible] A. Combe, I. J. Tait.

CAMPBELL—ROBERT ARTHUR, of Winnipeg, Man. Born at Winnipeg, Man., August 25th, 1899; Educ., I.C.S.; 1918, rodman, Greater Winnipeg Water District; 1919, rodman, 1920-21 and 1923, transitman, C.P.R.; 1922, res. engr. Abitibi Railway and Navigation Company; At present, transitman on mtce. work, for the C.P.R. at Brandon, Man.

References: G. W. Coburn, J. C. Holden, D. A. Livingston, J. M. Gilchrist, D. E. McPherson.

CARMICHAEL—JAMES, of 476 Aylmer Street, Montreal, Que. Born at Montreal, March 2nd, 1877; Educ., 5 years app'ticeship, J. and R. Weir, marine engrs., Montreal; 5 years, mech. supt., erecting and operating, Canada Cement Company, Longue Pointe, Que.; master mechanic and chief engr., Canadian Consolidated Rubber Co., Canada, 4 years service, Granby, Que., 2 years service, Kitchener, Ont.; 2 years chief engr., Chateau Frontenac, Quebec; 1 year supt. engr., Frick Ice and Refrigeration Co., Montreal. At present, chief engr., Henry Morgan & Co. Ltd., Montreal.

References: A. Wilson, W. H. Wardwell, I. J. Tait, A. H. Ross, F. Irvine.

HUGHES—JAMES WENCESLANS, of 2428 Mance Street, Montreal, Que. Born at Chatham Centre, N.Y., Sept. 28th, 1886; Educ., grad. scientific course, Mount St. Louis Institute, Montreal, 1903; 1904-05, switchboard constrn., Northern Elec. Co.; 1905-07, test dept., Montreal Light Heat and Power Co.; 1907-11, asst. engr., 1911-15, asst. elec. engr. (east lines), and 1915 to date, elec. engr. (east lines), C.P.R. Montreal, Que.

References: J. A. Shaw, R. M. Wilson, B. Ripley, J. E. Beatty, J. A. Douglas, L. H. Marrotte, J. M. Robertson, M. A. Sammett.

MARTIN—WILLIAM LEONARD, of 2920 Regina Avenue, Regina, Sask. Born at London, England, Nov. 3rd, 1901; Educ., Diploma, practical telephony, I.C.S.; Sept. 1917 to date, employed by the Sask. Govt. Dept. of Telephones, first at the repair dept. as ap'tice switchman, and later as third class switchman, Regina exchange, Regina, Sask.

References: W. R. Warren, S. R. Parker, R. N. Blackburn, H. B. Sherman, J. R. MacDonald.

MASSE—JOSEPH NAPOLEON, of 440 Third Avenue, Rosemount, Montreal, Que. Born at St. Jean de Dieu, Que., Aug. 7th, 1894; 1910-11, employed by Mr. Malcolm D. Barclay; 1913-14, employed by Mr. Marius Dufresne; 1914-16, employed by the city of Montreal under Messrs. P. E. Mercier, Amireault, and D. B. Lamarche; 1917-19, overseas with C.E.F. 22nd, Battn.; 1919 to date, employed by the city of Montreal, under Mr. Geo. R. MacLeod.

References: G. R. MacLeod, J. G. Caron, J. E. Gill, L. Laferme, P. Chevalier, L. T. G. Boisseau, S. Howard.

SCHULTE—THEODORE, of Strathmore, Alta. Born at Neosha, Miss., U.S.A., June 21st, 1887; Educ., 1902-04, technical training, Central Institute, Cleveland, Ohio. 1906-09, student course, American Telegraph and Telephone Co., New York. 1907 (June-Oct.), studying European elect'l. practice abroad; 1904-06, asst. testing lab., North Electric Co., Cleveland, Ohio; 1911-17, telephone inspr., Dept. Nat. Res., C.P.R., responsible for mtce. and operation of telephone plant, C.P.R. Irrigation Block, Southern Alberta; 1917 to date, supt., telephone electrical equipment, Dept. Nat. Res., C.P.R., Calgary, Alta.

References: A. S. Dawson, P. J. Jennings, H. J. McEwen, S. G. Porter, R. S. Stockton, B. L. Thorne, R. S. Trowsdale.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

CHAPLEAU—JOSEPH PAUL, of St. Joseph d'Alma, Lake St. John, Que. Born at Montreal, Que., Feb. 27th, 1896; Educ., B.Sc., C.E., Ecole Polytech., Laval Univ., 1920; 1917-19 (summers), dftsman. and instr'man., on topog'l. surveys, Quebec Streams Commission; 1920-21, asst. to res. engr. on constrn. of Shipshaw river hydro-electric development, for Price Bros.; 1921 (June-Nov.), first asst. engr. in charge on party investigating water power resources on northern tributaries of St. Lawrence river; 1921-22, water power investigation and inspection of dams, with the Hydraulic Service; At present res. engr., Alma and Jonquiere Railway Company. Industrial railroad for the development of the Saguenay power, Grand Discharge, Lake St. John.

References: O. O. Lefebvre, C. N. Shanly, L. A. Dubreuil, H. Cimon, A. B. Normandin, L. T. G. Boisseau.

DAVIES—VERNON RUSSELL, of Montreal, Que. Born at Sheffield, England, Feb. 27th, 1890; Educ., M.Sc., B.Sc., McGill Univ., 1920, M.C.E., Univ. of Man., 1923; D.L.S.; 1913 (summer), rodman, 1914, (summer), instr'man., Lake of the Woods watershed survey, 1915 (summer), observer triangulation of international boundary; 1916-19, overseas, Can. Mach. Gun. Corps, Lieut., M.C.; 1920-22, junior asst., paper mill constrn., St. Maurice Lumber Co., Three Rivers; Sept. 1922 to date, demonstrator, dept. of geodesy and surveying, McGill University, Montreal. Engaged during this period on post graduate work in hydraulics leading to degree of M.Sc.

References: [illegible] P. [illegible], H. M. Mackay, [illegible] Brown, [illegible], A. H. White, F. M. Montague.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

deCARTERET—HILLIER ST. GEORGE SQUARES, of Youngstown, Ohio. Born at Beer, Devon, England, July 4th, 1898; Educ., B.Sc., Dalhousie Univ., 1921; 1920 (summer), struct'l. dftsman., design of details, Doctor Graham Bell's Laboratories, Baddeck, N.S.; 1916-19, overseas, Lieut., C.G.A., C.F.A. and R.F.C.; 1921-[illegible], [illegible] man and res. engr., Nova Scotia Highways Board; Since May 192[illegible], struct'l. [illegible] with, Truscon Steel Company, Youngstown, Ohio.

References: W. P. Copp, W. A. Hendry, R. W. McColough, A. R. [illegible], F. R. Faulkner, H. W. L. Doane.

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Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

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ACCIDENTS

Metal Mines. Metal Mine Accidents in the United States during the Calendar Year 1921, William W. Adams. U.S. Bur. of Mines — Tech. Paper, no. 331, 1923, 96 pp., 42 tables. Classification by injuries; accident statistics by states; causes and distribution of accidents; statistics by groups of mines; accidents classified by mining methods; fatalities due to explosives; accidents at metallurgical plants; publications on accident statistics.

AIR COMPRESSORS

Electrically Driven. Electrically-driven Air Compressors. Engineer, vol. 135, no. 3515, May 11, 1923, p. 508, 1 fig. on p. 500. Compressed-air plant consisting of four compressors, having capacity of 2500 cu. ft. per min., at pressure of 75 lb. per sq. in.; installed at a Durham coal mine, constructed by Ingersoll-Rand Co.

Multi-Stage Calculation. The Calculation of Multi-Stage Compressors (Berechnung mehrstufiger Kompressoren), M. Seiliger. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 19, May 12, 1923, pp. 460-461, 2 figs. Graphic method for precalculation without use of entropy chart; introduction of logarithmic co-ordinates makes it possible to plot variation of state with straight lines.

AIR CONDITIONING

Bibliography. Public Health Engineering Abstracts, U.S. Pub. Health Service, No. K-301, Mar. 24, 1923, 7 pp. Abstracts on air conditioning.

Silk Mills. Humidity in Silk Mills, A. W. Thompson. Textile World, vol. 63, nos. 14 and 19, Apr. 7 and May 12, 1923, pp. 115-117, and 55 and 57. Describes processes that are necessary as a background for proper consideration of atmospheric conditions, and part they play in the industry. Silk responds quickly to changes in humidity; importance of regain factor in commercial transactions; importance of using sling psychrometer.

AIRCRAFT

French Industry. Glimpses of the French Aircraft Industry. Aviation, vol. 14, no. 25, June 18, 1923, pp. 664-665, 1 fig. Report issued by Aeronautical Chamber of Commerce of America. Notes on capital invested, government aid; some wasteful methods; principal engines used.

Stabilizers. On the Application of the Gyroscope to the Solution of the "Vertical" Problem of Aircraft, James G. Gray. Roy. Soc. Edinburgh — Proc., vol. 42, part 3, session 1921-22, pp. 257-317, 38 figs. Describes inventions relating to apparatus for finding, maintaining, and thus defining true vertical and horizontal on airplanes and airships; principles of Gray stabilizers; Gray vertical indicator; adjustment of stabilizers; sensitiveness of ball erectors; desirability of using powerful gyroscopes.

AIRPLANE ENGINES

Air-Cooled. The 220 Hp. Lawrence J1 Air-Cooled Aero Engine. Flight, vol. 15, no. 14, Apr. 5, 1923, pp. 183-184, 4 figs. Particulars of Lawrence 9-cylinder radial air-cooled engine, which was fitted to Curtiss TR1 seaplane.

High-Altitude. Adaptation of Aeronautical Engines to High Altitude Flying, K. Kutsbach. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 142, May 1923, 30 pp., 13 figs. on supp. plates. Limits of engine output, high-altitude engines; influence of air density on proportions of mixture; methods of varying proportions of mixture; automatic prevention of fuel waste; design and application of air-pressure regulators to high-altitude flying. Translated from Technische Berichte, vol. 3, no. 4.

Radiators. Experiments with a Built-In or Fuselage Radiator, C. Wieselsberger. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 141, May 1923, 12 pp., 4 figs. Experiments carried out to determine whether radiators having similar cooling properties offer less resistance when incorporated in fuselage, than when hitherto customary arrangement is employed, with radiator in free air current more or less independent of fuselage. Translated from Technische Berichte, vol. 3, part 4.

AIRPLANE PROPELLERS

Efficiency Curve. The General Efficiency Curve for Air Propellers, Walter S. Diehl. Nat. Advisory Committee for Aeronautics — Report no. 168, 1923, 11 pp., 4 figs. Study of propeller efficiency based on given formula which it is shown, may be used to obtain general efficiency curve in addition to well-known maximum efficiency curve.

AIRPLANES

Ailerons. Notes on the Design of Ailerons, W. S. Diehl. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 144, June 1923, 10 pp., 3 figs. Notes compiled from various sources in order to supply data and instructions for obtaining satisfactory results based on given requirements.

Damping, Measurement in Flight. The Measurement of the Damping in Roll on a JN4h in Flight, F. H. Norton. Nat. Advisory Committee for Aeronautics — Report, no. 167, 1923, 6 pp., 6 figs. Investigation carried out for measuring value of *Lp* in flight; results show that damping found in wind tunnel by method of small oscillations is in general 40 per cent higher than damping in flight; also that at 50 m.p.h. lateral maneuverability is low.

Longitudinal Control. Notes on the Determination of Longitudinal Control Forces of Airplanes During Horizontal Flight. Aerial Age, vol. 16, no. 6, June 1923, pp. 267-268. Principal factors governing longitudinal control are (1) location of center of gravity, (2) hinge moment due to weight of elevators, and (3) slipstream effect on tailplane.

Wings. Calculations for a Single-Strut Biplane with Reference to the Tensions in the Wing Bracing, O. Blumenthal. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 143, June 1923, 28 pp., 6 figs. Example is worked out for heavily staggered biplane with single rigid outer strut; it is shown that moderate initial tension of cable up to about 15 per cent of total weight, exerts no harmful influence on strength of SSW airplane and is even advantageous for lower rear spar. Translated from Technische Berichte, vol. 3, no. 5.

Determination of the Static Test Index of Transport Planes Deducted From the Dynamic Action of an Aerial Shape (Note sur la détermination de l'indice d'essai statique des avions de transport déduit de l'action dynamique d'une houle aérienne), Louis Breguet and René Devillers. Aérophile, vol. 31, nos. 7-8, Apr. 1-15, 1923, pp. 102-106. Determination of ratio to be adopted between rupture charge of airplane wings and that to which they are usually subjected in flight; formulas and calculations.

AIRSHIPS

Hull Stresses, Balancing. Aircraft as an Engineering Problem, Ralph H. Upson. Mich. Technic, vol. 36, no. 3, Mar. 1923, pp. 5-7, 3 figs. Discusses balance of all forces acting on hull.

Inertia. The Inertia Coefficients of an Airship in a Frictionless Fluid, H. Bateman. Nat. Advisory Committee for Aeronautics — Report, no. 164, 1923, 16 pp., 3 figs. Investigation of apparent inertia of airship hull, and case of rotation of airship hull.

ALLOY STEELS

Developments. The Large Place Taken by Alloy Steels, J. Kent Smith. Iron Age, vol. 111, no. 23, June 7, 1923, pp. 1621-1623. Recent developments in connection with vanadium, chrome, tungsten and molybdenum; iron-foundry progress with alloys.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Brass. *See Brass.*

Extra-Light. Magnesium and Extra-Light Alloys (Le magnésium et les alliages ultra-légers), A. Portevin. Société des Ingénieurs Civils de France — Procès Verbal, nos. 8-9, Apr. 20, 1923, pp. 319-323. Properties of extra-light alloys, including magnesium, advantages, and utilization.

Liquation in. Liquation Phenomena in Metal Alloys, O. Bauer and H. Arndt. Brass World, vol. 19, nos. 4 and 5, Apr. and May 1923, pp. 103-107 and 160-162, 17 figs. Influence of velocity of cooling upon liquation of metals that form mixed crystals during cooling; explains "reversible" block liquation. Translated from Stahl u. Eisen, no. 35, 1922, p. 1346.

Manufacture and Use. Recent Progress in the Manufacture and Use of Alloys (Récents progrès dans la fabrication et l'utilisation des alliages), Léon Guillet. Journal de Physique et le Radium, vol. 4, no. 3, Mar. 1923, pp. 89-114, 19 figs. Discusses iron alloys, copper alloys, light alloys, including alloys of aluminum and magnesium, and some other alloys.

Tin-Antimony-Lead. Observations on the Tin-Antimony-Lead Alloys, R. W. Irwin. Chem., Met. and Min. Soc. of S. Africa — Jl., vol. 23, no. 9, Mar. 1923, pp. 171-174, 12 figs. on supp. plate. Results of investigations which have been carried out on alloys.

ALUMINUM ALLOYS

Alpax. Alpax, a New Aluminum Alloy (Un nouvel alliage d'aluminium: L'Alpax), Léon Guillet. Génie Civil, vol. 82, nos. 18 and 19, May 5 and 12, 1923, pp. 413-419 and 441-444, 33 figs. An aluminum-silicon alloy of about [illegible] per cent silicon, produced by special treatment; constitution; macrostructure and microstructure; chemical properties; properties of rolled and forged alloy; machining; tests made; industrial applications.

Aluminum Bronze. Aluminum Bronze as an Engineering Material, W. M. Corse. Can. Foundryman, vol. 14, no. 5, May 1923, pp. 31-32. Is essentially 90 to 92 parts of copper and 8 to 10 parts aluminum; its adaptability [illegible] manufacture, etc.; wrought aluminum bronze.

ALUMINUM

Production. Progress in the Aluminum Industry (Les progrès dans l'industrie de l'aluminium), M. Guérin. Société des Ingénieurs Civils de France — Procès Verbal, nos. 8-9, Apr. 20, 1923, pp. [illegible]. Reviews history of development; production of aluminum by electrolysis.

AMMONIA

PURIFICATION. Composition, Purification, and Certain Constants of Ammonia, E. C. McKelvy and C. S. Taylor. U. S. Bur. of Standards — Sci. Papers, vol. 18, no. 465, Mar. 9, 1923, pp. 655-693, 6 figs. Chemical tests made on several brands of commercial ammonia indicate that most commercial brands contain less than 0.1 per cent of impurities. 15 samples of purified ammonia were prepared by five different methods for use in determination of various thermodynamical properties of ammonia; these were found to contain less than 0.01 per cent of water and less than 0.001 per cent of other impurities.

SATURATED VAPOR, SPECIFIC VOLUME OF. Specific Volume of Saturated Ammonia Vapor, C. S. Cragoe, E. C. McKelvy and G. F. O'Connor. U. S. Bur. of Standards — Sci. Papers, vol. 18, no. 467, Mar. 17, 1923, pp. 707-735, 4 figs. Measurements were made in temperature interval − 50 to + 50 deg. cent. by two methods, final results are expressed by means of empirical equation which forms basis of appended tables in metric and English units. Bibliography.

ARCHES

TWO-HINGED. Calculation of Two-Hinged Arches (Calculation de l'arc à deux rotules), Léon Legens. Génie Civil, vol. 82, no 18, May 5, 1923, pp. 421-423, 7 figs. Calculations based on theory of elasticity, as statics do not apply.

Study of an Arch With Two Hinges With Any Center Line (Étude de l'arc à deux articulations, à fibre moyenne quelconque), A. Rogoff. Génie Civil, vol. 82, no. 17, Apr. 28, 1923, pp. 394-398. Methods of calculation.

AUTOMOBILE MANUFACTURING PLANTS

LOCOMOBILE CO., BRIDGEPORT, CONN. Improved Methods in Locomobile Shop, L. S. Love. Iron Age, vol. 111, no. 25, June 21, 1923, pp. 1763-1769, 19 figs. Economical arrangement of machines saves floor space and increases production; thread milling reduces costs; unusual turret-lathe fixtures.

AUTOMOBILES

REPAIR SERVICE. Discussion of Papers at the Chicago Service Meeting. Soc. Automotive Engrs. — Jl., vol. 12, no. 6, June 1923, pp. 535-538. Discussion of following papers: Service and Its Relation to the Industry, Otis C. Funderburk; Maintenance Effects of Automotive Electrical-Equipment Standardization, A. H. Packer; Development of a Modern Service-System.

S. P. A. The 20 Hp. S.P.A. Auto-Motor Jl., vol. 28, no. 18, May 3, 1923, pp. 365-368, 10 figs. Details of high-class Italian production; four-wheel braking; monobloc cylinders.

AVIATION

NIGHT FLYING. Developing Equipment for Night Flying. Aviation, vol. 14, no. 22, May 28, 1923, pp. 578-581, 3 figs. How landing lights and high intensity searchlights are solving problem.

TRANSOCEANIC. Commercial Ocean Transit by Air plane, E. R. Armstrong. Aviation, vol. 14, no. 23, June 4, 1923, pp. 602-606, 6 figs. Proposed service between New York and London, with capital cost estimates and operating expense.

B

BALANCING

ROTATIVE. New Principles in Rotative Balance. Soc. Automotive Engrs. — Jl., vol. 12, no. 6, June 1923, pp. 562-564, 1 fig. Discussion of paper by Amos F. Moyer and author's reply.

TURBO-ALTERNATOR ROTORS. Balancing of Rotors for Turbo-Alternators (Equilibrage des rotors de turbo-alternateurs), J. Bellisson. Revue Générale de l'Electricité, vol. 13, no. 17, Apr. 28, 1923, pp. 693-762, 23 figs. Dynamic balancing; examples of calculations from given data for given requirements.

BALANCING MACHINES

DEVELOPMENTS. Recent Developments in Balancing Machines, Carl R. Soderberg. Mech. Eng., vol. 45, no. 6, June 1923, pp. 353-355 and 383, 6 figs. Describes efforts to solve problem of balancing of small high-speed motors for domestic use; development of balancing machine that eliminates difficulties and makes it possible to manufacture quietly running motors. (Abridged).

BEAMS

CONTINUOUS. Moments in Continuous Beams for varying Ratios of Live Load to Dead Load, Charles S. Gray. Concrete and Constr. Eng., vol. 18, no. 5, May 1923, pp. 306-313, 8 figs. Presents figures giving maximum moments in several spans for varying ratios of live to dead load.

REINFORCED-CONCRETE. A Particular Case of Unequal Flexure in Reinforced-Concrete Beams (Sopra un caso particolare di flessione deviata nelle travi di cementarmato), Luigi Stabilini. Giornale del Genio Civile, vol. 60, Dec. 31, 1922, pp. 791-794, 4 figs. Calculations.

Reinforced Concrete Beam Design Simplified, T. D. Mylrea. Can. Engr., vol. 44, no. 22, May 29, 1923, pp. 531-534, 6 figs. Time-saving and generally applicable method outlined and illustrated by typical examples; primarily a design method, although readily adaptable to check analysis; case of unsymmetrical T-beams trated; accuracy depends on value of j.

Unequal Flexure in Reinforced-Concrete Beams (La flessione deviata nelle travi ci cimento armato), Guglielmo Sacerdoti. Giornale del Genio Civile, vol. 60, Dec. 31, 1922, pp. 770-790, 8 figs. on supp. plate. Discusses theory and makes calculations.

BEARINGS

SHAFT, POWER LOSSES IN. Power Lost in Shaft Bearings, H. M. Brayton. Am. Mach., vol. 58, no. 24, June 14, 1923, pp. 861-863, 2 figs. Factors affecting friction losses, equations and chart for determining power losses; loose- and tight-fitting bearings and those under uniform pressure.

BEARINGS, ROLLER

HEAVY-DUTY. New Heavy Duty Roller Bearing, L. Cammen. Iron Age, vol. 111, no. 24, June 14, 1923, pp. 1708-1710, 8 figs. Floating axes of rolls designed to carry heavy mold in centrifugal casting machine; applicable to other machinery.

BELTING

EFFICIENCY. Industrial Efficiency of Belting (Recherches sur le rendement industriel des courroies), M. Laboussay. Revue de l'Industrie Minérale, no. 57, May 1, 1923, pp. 233-252, 15 figs. Results of experiments carried out at Conservatoire des Arts et Métiers with belting of various types for name fan drive and factory use, properties, elasticity, coefficient of adherence.

LEATHER, RECLAIMING. Reclaiming Leather Belts, Frank I. Gooding. Indus. Engr., vol. 81, no. 6, June 1923, pp. 304-309 and 321, 16 figs. Methods that may be used to reduce operating and maintenance costs by reusing discarded belts.

BLAST FURNACES

FAILURE, INVESTIGATION OF. Brick Column Lifts Furnace Top, G. M. Hohl. Iron Trade Rev., vol. 72, no. 25, June 21, 1923, pp. 1813-1819 and 1827, 15 figs. Shell rivets on Eastern Pennsylvania stack are sheared and entire top rigging elevated by excessive pressure caused by amorphous accumulation between wearing plates; investigation discloses important data.

BOILER FEEDWATER

SODA TROUBLES. Matter of Avoiding Difficulties Caused by Soda in Boiler Feedwater (Les moyens d'éviter les inconvénients dus à la soude dans l'eau d'alimentation des chaudières), G. Paris. Génie Civil, vol. 82, no. 17, Apr. 28, 1923, pp. 392-394, 4 figs. Pitting, corrosion of boiler plates, brass and bronze mountings, etc., and destruction of glass of level gages.

TREATMENT. Fuel Saving Aspect of Boiler Water Treatment, C. R. Knowles. Ry. Age, vol. 74, no. 25, May 26, 1923, pp. 1288-1289. Notes on scale, suspended matter; foaming; treatment, and treating plants in service.

The Contraflo System of Evaporation and Deaeration. Power Engr., vol. 18, no. 207, June 1923, pp. 213-215, 5 figs. Describes number of modern plants for special treatment of feedwater for big-duty boilers.

BOILER OPERATION

AIR PREHEATING. Preheating Air For Combustion (Le réchauffage de l'air de combustion), M. Nouhet. Revue de l'Industrie Minérale, no. 58, May 16, 1923, pp. 305-312, 10 figs. Utilization of waste heat in flue gases by applying to preheaters, describes various types of preheaters.

EFFICIENCY. Improving Boiler Room Practice, Robert June. Gas Age-Rec., vol. 51, no. 15, Apr. 14, 1923, pp. 467-470, 9 figs. Use of cheaper coal, elimination of smoke, advantages of mechanical stokers, handling of stokers.

BOILERS

CORROSION. Corrosion Problems in Modern Plant Equipment. Power House, vol. 16, no. 9, May 5, 1923, pp. 26-29. Basic principles of feedwater troubles; causes of corrosion from chemical standpoint and practical application of effective prevention in boilers and economizers.

ELECTRICALLY-HEATED. Electrically-Heated Boilers (Der elektrisch beheizte Dampfkessel), Wintermeyer. Elektrotechnischer Anzeiger, vol. 40, nos. 71 and 72, May 3 and 5, 1923, pp. 496-498 and 504-507, 2 figs. Resistance and electrode heating, advantages and drawbacks; economics of electric heating.

LARGEST IN WORLD. A Super Boiler, Albert L. Clark. Mich. Technic, vol. 36, no. 4, May 1923, pp. 17-18 and 30, 2 figs. Describes world's largest boiler installed in heating plant of Detroit Edison Co., with 2982 hp. and heating surface of 29,820 sq. ft.; stoker is Taylor three-plunger type, with 14 retorts on each side of boiler.

LOCOMOTIVE. *See Locomotive Boilers.*

POWER, A.S.M.E. CODE FOR. Proposed Code for Care of Power Boilers. Mech. Eng., vol. 45, no. 6, June 1923, pp. 368-383. Preliminary report of subcommittee of A.S.M.E. Boiler Code Committee on rule for care of steam boilers and other pressure vessels in service. Second revision of A.S.M.E. boiler code, 1923.

SUPER-PRESSURE. Design Features of New 1200-lb. Boilers. Power Plant Eng., vol. 27, no. 12, June 15, 1923, pp. 637-638, 1 fig. Inclined header, cross-drum-type boiler; forged steel drum with 4-in. walls; two superheaters used; one of which reheats exhaust from high-pressure turbine.

TEMPERATURE CONTROL. The Control of Boilers, John B. C. Kershaw. Combustion, vol. 8, no. 4, Apr. 1923, pp. 226-231, 3 figs. Discusses interdependence of test results of CO_2 temperature and draft, and describes some of the latest indicating and recording instruments for making latter type of measurements.

WASTE-HEAT. Recent Developments in Connection with Gas-Fired Steam Boilers and the Utilization of Waste Heat for Steam-Raising Purposes, W. Gregson. Gas Jl., vol. 162, no. 3130, May 9, 1923, pp. 351-354 and (discussion) 354-355. Deals with steam production from gaseous fuels and from waste heat, describing gas-fired and waste-heat boilers, and their outstanding features.

WATER-TUBE. *See Boilers, Water-Tube.*

BOILERS, WATER-TUBE

CONSTRUCTION DEFECTS. Constructional Defects in Water-Tube Boilers, R. Schirmer. Mech. Eng., vol. 45, no. 6, June 1923, pp. 365-366, 4 figs. Discusses causes of troubles with water-tube boilers, in particular, ruptures of boiler walls. Translated from Wärme, vol. 46, no. 2, Jan. 12, 1923, pp. 15-18, 4 figs.

BRASS

MELTING AND POURING. Notes on Melting and Pouring Brass and Bronze, F. L. Wolf and Wm. Romanoff. Metal Industry (N. Y.), vol. 21, no. 6, June 1923, pp. 238-240. Essential of good foundry practice as carried on in large modern plant; deals with pouring temperatures, comparison of melting furnaces; mixes; fluxes; and deoxidizers. Paper read before Am. Foundrymen's Assn.

BRICK

CONCRETE, HOLLOW. Hollow Concrete Blocks for Economic House Construction (Blocchi forati cementizi per costruzione di case economiche popolari), F. Corradini. Ingegneria, vol. 2, no. 4, Apr. 1, 1923, pp. 102-103, 8 figs. Application in various countries; properties of blocks; heat transmission, etc.

CONCRETE VS. CLAY. Tests Show Differences Between Clay and Concrete Brick. Eng. News-Rec., vol. 90, no. 22, May 31, 1923, pp. 959-961, 5 figs. Concrete-brick piers prove stronger in proportion to individual brick strength than clay-brick piers. Results of laboratory tests at Columbia University.

SAND-LIME. Acme of Sand-Lime Products, Charles A. Breskin. Rock Products, vol. 26, no. 9, May 5, 1923, pp. 19-25, 25 figs. Description of plant of Clayton Brick & Tile Co., Dubuque, Iowa, manufacturing sand-lime brick, inset and floor tile, profile stonework, culverts, sewer pipe, etc., under German process, and some of their methods.

BRIDGE DESIGN

DEVELOPMENT. Development in Bridge Design Practice, C. R. Young. Contract Rec. & Eng. Rev., vol. 37, no. 22, May 30, 1923, pp. 152-155. Influence of improved steels, use and development of concrete, effect of improved equipment, more careful analysis, new types and details, riveted construction, arch cantilever in concrete, and probable span limits.

BRIDGE ERECTION

CONCRETE, ECONOMICAL USE OF. Economical Use of Concrete in Bridge Construction, L. G. Holleran. Eng. & Contracting Building, vol. 59, no. 4, Apr. 25, 1923, pp. 923-927, 6 figs. Stone-faced concrete slab and girder and reinforced-concrete frame with stone facing bridges of Bronx River Parkway.

BRIDGE PIERS

PNEUMATIC CONSTRUCTION PROCESS. Use Pneumatic Process for Twelve Bridge Piers. Ry. Age, vol. 74, no. 25, May 26, 1923, pp. 1255-1258, 7 figs. Rebuilding of Union Pacific structure over Columbia River, Wash.

BRIDGE STRENGTHENING

GIRDER ADDITIONS. Strengthening the Trisanna Bridge. Engineer, vol. 135, no. 3518, June 1, 1923, p. 588, 3 figs. Work carried out on line over Arlberg Pass between Innsbruck and Swiss frontier, without interference to traffic; existing bowstring girders were strengthened by means of addition of two inverted girders of same type.

BRIDGES, HIGHWAY

CANTILEVER. Cantilever Highway Bridge Across the Ohio at Ironton, J. F. Jackson. Eng. News-Rec., vol. 90, no. 22, May 31, 1923, pp. 954-958, 7 figs. Main span of new toll bridge is 725 ft. and anchor arms 350 ft. each, hydraulic jacks assist erection.

FIRE PREVENTION. Highway Bridge Fire Protection. Nat. Fire Protection Assn.—Quarterly, vol. 16, no. 3, Jan. 1923, pp. 246-249, 1 fig. Investigation by co-operative committee of fire risk, causes of fires, relation of preservative treatment to fire risk, construction and maintenance of bridge, provisions for fire fighting, fire-retardant paints or treatment.

STANDARDIZED. Standardized Bridges for Highways, C. A. Melick. Eng. & Contracting (Buildings), vol. 59, no. 5, May 1923, pp. 1183-1190. Practice of Mich. State Highway Dept.

BRIDGES, LIFT

BASCULE. Construction of Double Bascule Bridge at Vlaardingen (Eenige mededeelingen over de constructie en den bouw van een 2de keersluis en den onderbouw voor een dubbele rolbasculebrug te Vlaardingen), S. Netto. Ingenieur, vol. 38, no. 13, Mar. 31, 1923, pp. 249-254, 8 figs. Details of design and construction; calculations.

BRIDGES, RAILWAY

RENEWAL. The Renewal of Bridges, B. P. Fletcher. Int. Ry. Congress—Bul., vol. 5, no. 5, May 1923, pp. 444-452, 15 figs. Discusses method of erection; repairs to masonry viaducts, and to tunnels.

BROACHING MACHINES

HYDRAULICALLY OPERATED. Hydraulic Operation of Ram Feature of New Broaching Machine. Automotive Industries, vol. 48, no. 24, June 14, 1923, pp. 1288-1289, 1 fig. Variable-pressure pump supplies oil pressure; useful life of broaches prolonged; broad range of speeds and feeds provided; developed by J. N. Lapointe Co., New London, Conn.

BUILDINGS

TOPOGRAPHICAL WORK, FOR. New Building for Topographical Work (Het nieuwe gebouw voor de Topographische Inrichting), J. H. de Man. Ingenieur, vol. 38, no. 16, Apr. 21, 1923, pp. 303-314, 17 figs. Plans and construction; central heating equipment; electric equipment.

C

CAISSONS

REINFORCED-CONCRETE. Pre-Cast Concrete Caissons Used in Terminal Construction, W. A. Scott. Eng. World, vol. 22, no. 5, May 1923, pp. 227-229, 7 figs. Some details of work in connection with China Basin Terminal which is being constructed on harbor front of San Francisco, especially seawall structure containing line of 40 precast reinforced-concrete caissons.

CANALS

LOCKS. Comparison of Rolling and Sliding Gates for Canal Locks (Comparaison entre les portes roulantes et les portes glissantes pour la fermeture des grandes écluses maritimes, A. Bijls. Génie Civil, vol. 82, no. 18, May 5, 1923, pp. 419-421, 6 figs. Describes canal gates at Ymuiden, in Amsterdam; details of old gates and preparative gates 400 m. long, 50 m. wide and 55 m. of water in lock.

CAR LIGHTING

ELECTRIC. Application of Automatic Control to Electric Train Lighting (Application du Régulateur automatique à l'éclairage électrique des Trains), V. Sylvestre. Houille Blanche, vol. 22, nos. 75-76, Mar.-Apr. 1923, pp. 66-69, 6 figs. Characteristics and construction of Brown-Boveri equipment, consisting of an a. c. shunt dynamo, storage battery and regulator, applicable to individual cars or to trains.

CARS, FREIGHT

BOX. New Designs of Freight Cars for the Santa Fe. Ry. Age, vol. 74, no. 28, June 16, 1923, pp. 1409-1413, 8 figs. Construction embodies new arrangement of side posts, underframe bracing, and door opener and closer.

ORE. High-Capacity Ore Cars for the Great Northern. Ry. Age, vol. 74, no. 28, June 16, 1923, pp. 1437-1438, 3 figs. Paying load is 81 per cent of gross weight; distinctive features of design.

REINFORCED-CONCRETE. Reinforced-Concrete Railway Freight Cars (Die Eisenbahngüterwagen aus Eisenbeton), Max Gensbaur. Beton u. Eisen, vol. 21, nos. 5, 7 and 8, Mar. 5, Apr. 5 and 20, 1923, pp. 67-69, 91-93 and 107-110, 17 figs. Development of reinforced-concrete car construction in Europe and America, proposes to determine whether train of reinforced-concrete cars requires more coal than train of wood-iron cars; formation of cracks; tests of reinforced-concrete cars.

STEEL. Reducing the Corrosion in Steel Cars, J. J. Tatum. Ry. Age, vol. 74, no. 28, June 16, 1923, pp. 1427-1430, 7 figs. Steel containing small percentage of copper adopted to prevent rapid deterioration.

CARS, REFRIGERATOR

MOLDI TESTS. Tests on a Refrigerator Car Model, P. X. Rice. Ry. Mech. Engr., vol. 97, no. 6, June 1923, pp. 351-355, 14 figs. Experiments indicate that side-draft bunker system is superior to present arrangement of end bunkers.

CAST IRON

CHARACTERISTICS. Some Characteristics of Cast-Iron, Robt. N. Richardson. Eng. Production, vol. 6, no. 129, June 1923, pp. 307-309. Expansion, contraction, and growth of cast iron in producing iron castings.

HARDNESS AND STRENGTH. The Relations between Tensile Strength, Hardness and Carbon in Cast Iron (Die Beziehungen zwischen Zugfestigkeit, Härte und gebundenem Kohlenstoff beim Gusseisen), Emil Schüz. Stahl u. Eisen, vol. 43, no. 22, May 31, 1923, pp. 720-722, 3 figs. Formula for relation of Brinell hardness to strength, relation to structure.

MELTING, BRITISH PRACTICE. Melting Iron in a British Shop, H. Cole Estep. Foundry, vol. 51, no. 12, June 15, 1923, pp. 475-478, 7 figs. Improved methods adopted by North of England rail-chair foundry have increased output 12 per cent and reduced labour costs $1800 a year, charges weighted accurately.

CASTING

CENTRIFUGAL. Centrifugal Casting of Iron Piston Rings, John A. Rathbone. Can. Foundryman, vol. 14, no. 5, May 1923, pp. 26-27 and 46, 3 figs. Use of cores, carbon precipitated as temper carbon on annealing, annealed metal proves excellent for pipe nipples, centrifugal casting of copper shell rings.

CATALYSIS

APPLICATIONS. Industrial Applications of Catalysis (Les applications industrielles de la catalyse en chimie organique), A. Mailhe. Technique Moderne, vol. 15, no. 9, May 1, 1923, pp. 257-264. Catalysis by metals, by metallic oxides, by metallic salts and by acids, and their applications. Bibliography.

CEMENT

ALUMINA. Fused Circuit (Il concreto fuso). Ingegneria, vol. 2, no. 4, Apr. 1, 1923, pp. 100-101, 1 fig. Contains 40 per cent alumina, production and use.

CENTRAL STATIONS

CANADA. Central Electric Stations in Canada. Dept. Interior—Can., Water Resources Paper no. 33, Nov. 1, 1922, 479 pp., 22 figs. Directory of central stations; relation of central-station industry to water power; water-power resources of Canada; basis of computation; utilization of developed water power; water power in central-station and in pulp and paper industry; past and future growth in utilization of water power.

DEVELOPMENT. Central Station Developments, C. W. Stone. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 325-327. General trend up to present time and future possibilities; author thinks public utilities in future may serve public by radio broadcasting of entertainments, etc.

LARGE, DATA ON. Data on Some Large Central Stations Recently Completed and Under Construction. Power, vol. 57, no. 22, May 29, 1923, 4-p. supp. sheet, and (editorial comment) p. 863. Tabulated data on steam and electrical equipment of 23 large central stations and 14 industrial power plants, including important values. Data show trend toward higher steam pressure, employment of reheating, feedwater heating by means of stage bleeding, use of electrical auxiliaries, and pulverized coal firing.

CENTRAL STATIONS

SWITCHING EQUIPMENT. Switching Equipment for Large Power Stations, Chas. McL. Moss. Elec. Jl., vol. 20, no. 6, June 1923, pp. 228-230, 4 figs. Method of controlling ever-increasing concentration of power in large central stations by safe, flexible and economic switching equipment; design and requirements of circuit breakers segregated phase type of switching equipment and its advantages.

CHARTS

ROUTINE. Routine Chart Construction, G. Charter Harrison. Management Eng., vol. 4, no. 6, June 1923, pp. 389-394, 5 figs. Describes what materials to use and what procedure to follow; advantages of using standardized methods.

CIRCUIT BREAKERS

OIL. Dimensions, Construction and Determination of Oil-Break Switches (dimensionnement, construction et détermination des disjoncteurs à huile), P. Charpentier. Revue Générale de l'Électricité, vol. 13, no. 18, May 5, 1923, pp. 737-745, 8 figs. Discusses spark gaps in air and oil; dimensions of switches; work of rupture and its calorific and mechanical effects; effect of velocity of rupture.

CITY PLANNING

STREET SYSTEMS. The Street System of a Modern City, F. S. Beason. Military Engr., vol. 15, no. 80, Mar.-Apr. 1923, pp. 105-111, 12 figs. Notes on highway plan; width of streets; rapid-transit streets and their development, traffic highways and their development; sidewalks and parkings on traffic highways; block divisions; alleys; intersection plans; etc.

COAL

CARBONIZATION. Coal Carbonization and the World's Fuel, Horace C. Porter. Indus. & Eng. Chem., vol. 15, no. 4, Apr. 1923, pp. 335-338, 4 figs. Discusses possibilities of coal carbonization as solution of problem of slowly diminishing natural resources; difficulties involved, principally excessive costs of process, due to high expenditure of energy, heavy plant expense, and insufficient "form values" of its products; progress of industry in eliminating these difficulties, particularly possibilities of low-temperature carbonization processes in increasing "form value".

RECOVERY FROM ASHES. Recovery of Combustible Material From Coal Ashes. Paper Trade Jl., vol. 76, no. 14, Apr. 5, 1923, pp. 69-72, 6 figs. Description of Elmore hand jig, simple device to determine recovery value of ash pile, and its operation; ash is first screened to remove dust and finer particles, larger ones are crushed to pass through approximately 1¼-in. round hole.

SPECIFICATIONS. What Constitutes a Good Coal Specification? Russel G. Paddock. Power, vol. 57, no. 24, June 12, 1923, pp. 929-930. What should be included in specifications and how it should be prepared.

COAL HANDLING

AUTOMATIC RAILWAY. The Automatic Railway. Indus. Management (Lond.), vol. 9, no. 10, May 17, 1923, pp. 307-309, 2 figs. Discusses automatic gravity railway and concludes that it is not applicable for large and run-of-mine coal, but is useful for such small coal as is generally used in gas works.

COAL INDUSTRY

PROBLEMS. Some Problems of the Coal Industry, George B. Harrington. Boston Soc. Civ. Engrs.—Jl., vol. 10, no. 6, June 1923, pp. 229-238. Notes on present situation in industry and immediate problems.

COAL MINES

REFUSE DISPOSAL. The Disposal of Pit Refuse, John C. Blake and D. C. Gemmell. Iron & Coal Trades Rev., vol. 106, no. 2881, May 18, 1923, pp. 739-740, 9 figs. Discusses methods which have been adopted for mechanical tipping of colliery refuse. Paper read before Nat. Assn. Colliery Mgrs.

COAL MINING

COAL CUTTING BY MACHINERY. Coal Cutters at Work. Sci. & Art of Min., vol. 33, no. 21, May 12, 1923, pp. 322-323, 6 figs. Changing plane of cut, coal dust and friable coal, direction of cleat, occurrence of faults or steps at coal face.

COAL STORAGE

WINTER SUPPLY. Storing the Winter's Coal Supply, S. E. Balcome. Management Eng., vol. 4, no. 6, June 1923, pp. 377-380, 6 figs. Methods in use at Gorton & Knight Mfg. Co.

COKE OVENS

OTTO REGENERATIVE. Compound Regenerative By-Product Coke Ovens. Iron & Coal Trades Rev., vol. 106, no. 2881, May 18, 1923, pp. 742-743, 4 figs. Feature of Otto coke oven is that it can be heated by coke oven, producer or blast furnace gas as independent firing medium, or by any mixture of said gases in any proportion, describes recent installation of battery of 10 ovens.

CONCRETE

STONE SCREENINGS AS AGGREGATE. Stone Screenings as Fine Aggregate for Concrete, Duff A. Abrams. Eng. & Contracting (Buildings), vol. 59, no. 4, Apr. 25, 1923, pp. 947-953, 4 figs. Results of studies of strength of mortar and concrete made from sand and screenings. Paper read before Nat. Crushed Stone Assn.

CONCRETE, REINFORCED

SHEARING STRENGTH. Tension Tests for Determination of Shearing Strength of Reinforced Concrete (Verdrehungsversuche zur Ermittlung der Schubfestigkeit von Eisenbeton), Otto Graf and E. Mörsch. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 238, 1922, 52 pp., 105 figs. The effect of torsion in concrete cylinders with and without reinforcement, methods and results of tests.

CONCRETING

COLD-WEATHER. Concreting Plant Designed for Cold Weather Work. Richard P. Wallis. Eng. News-Rec., vol. 90, no. 23, June 7, 1923, pp. 994-997, 4 figs. Special layout for group of buildings in Cleveland erected during cold weather of past winter; principles of cold-weather concreting.

CONDENSERS, STEAM

DEVELOPMENT AND PRACTICE. Steam Condenser Development and Practice. Frank G. Boyce and J. W. Mackenzie. Power Plant Eng., vol. 27, no. 11, June 1, 1923, pp. 588-591, 4 figs. Conductivity tests, methods of cleaning tubes and detecting causes of corrosion.

GINABAT TUBE ARRANGEMENT. The Effect of Condensed Steam on the Efficiency of a Condenser. Mar. Engr. & Nav. Architect, vol. 46, no. 548, May 1923, pp. 171-172, 3 figs. Describes Ginabat condenser with improved tube arrangement invented by engineer in French Navy.

CONDUITS

PRESSURE. Reinforced-Concrete High-Pressure Conduits (Condotte forzate in cemento armato ad alta pressione). Nicola Kelen. Ingegneria, vol. 2, no. 3, Mar. 1, 1923, pp. 58-60, 3 figs. Calculations in regard to conduits for hydro-electric plants; advantages of reinforced-concrete.

CONVERTERS

CHARACTERISTICS AND PERFORMANCE. Characteristics and Performance of Conversion Apparatus for Edison Systems. T. F. Varton and C. M. Fulk. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 348-362, 19 figs. Information concerning characteristics and performance of converters and motor-generators, particularly with regard to starting, synchronizing, low-voltage connections, d.c. voltage range, 3-wire operation, effect of a.c. disturbances, etc.

SYNCHRONOUS. Notes on Synchronous Converters. Patrick Fraser. S. African Inst. Elec. Engrs.—Trans., vol. 14, part 3, Mar. 1923, pp. 47-50, 4 figs. Practical experiences met with in operation of La Cour converter; deals with starting, flashing over, etc.

CONVEYORS

BULK MATERIALS. Bulk Materials Handling, and the Common Labour Shortage. Matthew W. Potts. Indus. Management (N.Y.), vol. 65, no. 6, June 1923, pp. 338-345, 8 figs. Describes types of bucket elevators and conveyors.

PNEUMATIC. Route Your Materials Via Air Line. F. L. Jorgensen. Chem. & Met. Eng., vol. 28, no. 21, May 28, 1923, pp. 932-938, 15 figs. Short study of art of pneumatic conveying; classification of various systems in use; examples of successful installations; how abrasives are handled.

COST ACCOUNTING

FACTORY. Underlying Principles of Industrial Cost Accounting (Grundzüge industrieller Kostenlehre). A. Walther. Schweizerische Bauzeitung, vol. 81, nos. 15, 17 and 18, Apr. 14, 28 and May 5, 1923, pp. 177-181, 201-205 and 222-224, 12 figs. Study of theory of cost accounting. Investigation of production costs.

CRANES

RUNWAYS. Good Practice in the Design of Crane Runways, Robins Fleming. Eng. News-Rev., vol. 90, no. 21, May 24, 1923, pp. 918-920, 1 fig. Condensed discussion of impact effect, lateral stiffening, expansion, rail fastening and miscellaneous points.

SLEWING. Standard Steam Slewing Cranes and Their Application (Normale Dampfdrehkrane und ihre Verwendung). Benedict. Fördertechnik u. Frachtverkehr, vol. 16, no. 10, May 18, 1923, pp. 109-113, 23 figs. Design and construction of Demag cranes, including controlling devices for all operations; adaptable to variety of work.

TRAVELING. 80-Ton Traveling Cranes at the Bellinzona Locomotive Repair Shops of the Swiss Federal Railways. Int. Ry. Congress—Bul., vol. 5, no. 5, May 1923, pp. 497-498, 3 figs. Describes cranes made at Oerlikon Machine Works. Translated from Schweizerische Bauzeitung.

CRANKSHAFTS

BURNISHING BEARINGS. Burnish Machine for Crankshaft Bearing. John E. Collins. Machy. (N.Y.), vol. 29, no. 10, June 1923, pp. 772-773, 2 figs. Machine that eliminates old hand method of scraping in crankshaft bearings of automobile engines, whole engine, so far as main bearings are concerned, is limbered up in one operation on this machine.

CUPOLAS

TAP-HOLE TROUBLES. Some Notes on Cupola Practice, with Special Reference to Tap-Holes. Foundry Trade Jl., vol. 27, no. 354, May 31, 1923, pp. 445-446, 6 figs. Discusses methods of avoiding trouble with tap holes, and dealing with leaks.

D

DAMS

GRAVEL RETAINING. Building a Gravel Retaining Dam by Dragline. C. H. Eiffert. Eng. News-Rec., vol. 90, no. 21, May 24, 1923, pp. 926-927, 3 figs. Low concrete dam on porous bottom has flexible concrete-block apron; built in halves in cofferdam part of river improvement of Miami Conservancy District.

MASONRY. The Cordeaux and Avon Reservoirs for Sydney Water Supply. Engineer, vol. 135, no. 3518, June 1, 1923, pp. 570-573, 10 figs., partly on supp. plate. Construction details of two large masonry dams within water-supply catchment area for Sydney, Australia; reservoirs formed by construction of dams will increase existing storage to total of 84,553 million gal.

MULTIPLE-ARCH. Vertical or Inclined Multiple-Arched Dams? (Dighe a volte multiple a generatrici verticali o inclinate?). Diofebo Negrotti. Industria, vol. 37, no. 2, Jan. 31, 1923, pp. 23-24, 1 fig. Arched dam construction for storage reservoirs with counter-force; cites American Practice.

DIESEL ENGINES

COOLING WATER FOR. The Use of Cooling Water for Diesel Engines. J. G. Griffin. Diesel Engine Users Assn., no. 852, for meeting Apr. 13, 1923, 15 pp., including discussion. Notes on cooling-water systems; quantity of water required; scale troubles, formation, avoidance and removal of scale; water softening.

DESIGN AND PRACTICE. Modern Diesel Engine Practice. J. H. Dyer. Roy. Engrs. Jl., vol. 37, no. 2, June 1923, pp. 280-286, 2 figs. Objects and modifications of design; fuel; limitations and advantages.

DOCKS

CONCRETE AND STEEL. Great Northern Builds New Dock at Superior. H. A. Gorst. Ry. Age, vol. 74, no. 26, June 2, 1923, pp. 1311-1314, 6 figs. Timber structure replaced by one of concrete and steel which embodies several innovations.

DREDGES

DIESEL ENGINED. Diesel Engined Dredge Does 7,000 Tons Per Day. Oil Engine Power, vol. 1, no. 4, Apr. 1923, pp. 1182-1183, 32 figs. Details of Elizabeth Pfeil, an all-steel, electrically-operated, ladder type dredge for recovery of sand and gravel, put into service by Iron City Sand Co., Pittsburgh, Pa.; Worthington 300-hp. 4-cylinder 2-cycle solid injection Diesel engine is principal unit.

DROP FORGING

CUT-OFF. Early History of the Cut-Off. R. C. Jennings. Forging & Heat Treating, vol. 9, no. 5, May 1923, pp. 219-221, 8 figs. History and development; accidental discovery of pass-by cut-off an important factor in drop-forging industry.

DYNAMOMETERS

TRANSMISSION. Dynamometers and the Measurement of Power. J. Lewis. Electricity, vol. 37, no. 1695, May 4, 1923, pp. 227-228, 2 figs. Notes on absorption and transmission dynamometers; methods of using dynamo as transmission dynamometer.

E

ECONOMIZERS

CARE AND OPERATION. Care and Operation of Fuel Economizers. H. M. Gilbert. Power Plant Eng., vol. 27, no. 11, June 1, 1923, pp. 567-569, 2 figs. Notes on interior corrosion, steel tube economizers; prevention of corrosion; operating points.

EDUCATION, ENGINEERING

CO-OPERATIVE. Developments in Co-operative Engineering Courses. R. J. Sackett. Eng. News-Rec., vol. 90, no. 24, June 14, 1923, pp. 1050-1051. Review of various alternate industry and class-room courses given in different American colleges.

OPPORTUNITY IN. The Opportunity in Engineering Education. William E. Pulleck. **Eng. Education, vol. 13, no. 9, May 1923, pp. 566-570. Points out that** principal requirement to-day is not for technical design but rather for opportunity to get designs into production; and engineering education must deal not only with engineering design, but with public and economic life which student must soon enter.

EDUCATION, INDUSTRIAL

PROMOTING. Promoting Industrial Education. Harold C. Smith. Iron Trade Rev., vol. 72, no. 24, June 14, 1923, pp. 1749-1750 and 1760. Efforts of Nat. Assn. of Mfrs. resulting in large number of establishments training their own workers; practical work done to assist members; make plan to fit shop.

ELECTRIC DISTRIBUTION

DEVELOPMENTS. Modern Distribution of Electric Energy (La distribution moderne de l'énergie électrique). M. Mandar. Outillage, vol. 7, no. 16, Apr. 21, 1923, pp. 386-389, 4 figs. Discusses overhead transmission lines and underground cables, including suspended insulators.

ELECTRIC FURNACES

IRONLESS INDUCTION. Conversion of Electromagnetic Energy Into Useful Heat. E. F. Northrup. Forging & Heat Treating, vol. 9, no. 5, May 1923, p. 228. Describes high-frequency induction furnace invented by author and used, in its smaller sizes to melt precious metals and their alloys, and samples of carbonless iron and its alloys; in its larger sizes, silver and base non-ferous metals and their alloys are melted, also nickel and iron alloys.

LARGE MELTING. Development of the Large Electric Melting Furnace. Frank Hodson. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 6, June 1923, pp. 600-604, 4 figs. Developments; limitations of large electrode furnaces; design and construction of largest electric melting furnace ever built; advantages of correct heat application; influence of new Soderberg continuous electrode on furnace design; possibility of using large electric furnaces as intermediate process for manufacture of cheap steel.

TYPES. The Use of Electric Furnaces in Alloy Foundries and for Heat Treatment (L'emploi du four électrique en fonderies d'alliages et dans les traitements thermiques). Métallurgie, vol. 55, no. 20, May 17, 1923, pp. 717-718. Application of induction and arc furnaces, including Morgan, Ajax, Westinghouse, and other types.

ELECTRIC GENERATORS, A.C.

DESIGN. Alternating-current Generators. W. J. Foster. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 363-367, 8 figs. Discusses efficiency, temperature, stability and insulation.

ELECTRIC LOCOMOTIVES

COMPARISON WITH STEAM. The Case for the Electric Locomotive. H. R. Halloran. New Zealand Jl. Sci. and Technology, vol. 5, no. 6, Mar. 1923, pp. 336-346. Notes on relative merits of steam and electric traction, with reference to recent publications on improvements in performance of electric locomotives in comparison with steam locomotives.

VIRGINIAN RAILWAY. Locomotives for the Virginian Electrification. R. L. McClellan. Ry. Age, vol. 74, no. 28, June 16, 1923, pp. 1451-1453, 5 figs. Will handle 6000 tons over mountains and 9000 tons on down grade; construction details.

ELECTRIC METERS

LUBRICATION. A Study of Meter Lubrication. F. C. Holtz. Elec. Jl., vol. 20, no. 6, June 1923, pp. 223-225, 3 figs. Desirable characteristics which oils for electric meters should possess, and characteristics of the various oils which may be used.

ELECTRIC MOTORS

CONTROL. Control for Power Station Auxiliary Motors. A. I. Harvey. Power Plant Eng., vol. 27, no. 11, June 1, 1923, pp. 581-585, 7 figs. Considerations involved in selection of control for power-plant auxiliaries; a.c. vs. d.c.; voltage; contactors; starting equipment for squirrel-cage for wound-rotor motors and for d.c. motors; boiler draft fans; stoker drive; etc.

ELECTRIC MOTORS, A.C.

INDUCTION. Regulating the Speed of Induction Motors. Récents procédés de réglage de la vitesse dans les moteurs d'induction). P. Normac. Industrie Electrique, vol. 32, no. 741, May 10, 1923, pp. 169-174, 10 figs. Control by rheostat; dynamic control; use of a rotary converter (Kraemer), or polyphase collector (Scherbius).

SYNCHRONOUS. Resynchronizing Characteristics of Synchronous Motors. C. E. Shirley. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 412-418, 10 figs. Discusses factors for successful operation, torque characteristics and tests under operating conditions; show results of interruption in power supply.

ELECTRIC TRANSMISSION LINES

CALCULATOR. A Transmission Line Calculator. Edith Clarke. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 380-390, 10 figs., partly on supp. plates. Describes calculator designed by author and its use.

GROUNDING NEUTRAL. General Considerations in Grounding the Neutral of Power Systems. H. H. Dewey. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 6, June 1923, pp. 589-600, 9 figs. General considerations of neutral grounding of overhead line and underground cable systems; points out different possible methods of grounding system and shows by diagrams flow of short-circuit current with different methods; considers use of grounding resistors of different types and gives figures showing effect of time and current in design of metallic resistors; it is concluded that on overhead and underground systems, high-voltage strains are more to be feared than high-current strains.

220,000-Volt. World's Highest Voltages Transmission Line, Charles W. Geiger. Nat. Engr., vol. 27, no. 6, June 1923, pp. 247-249, 3 figs. Engineering problems involved in construction of 220,000 volt transmission line of Pit River power project; description of system and equipment details.

Status of 200,000-volt Transmission, G. F. Brown. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 419-423, 10 figs. Describes present status, giving list of installations now made and being made, discusses apparatus, use of lightning arresters and line insulation, and gives notes on corona, line charging and regulation.

ELECTRIC WELDING

Aplications. Electric Welding, Wm. Mason, Metal Industry (Lond.), vol. 22, no. 20, May 18, 1923, pp. 497-499, 5 figs. Describes important applications of electric welding, and foresees considerable development in application of process to construction and maintenance of machinery.

Oil Storage Tanks. Welding Oil Storage Tanks. Welding Engr., vol. 8, no. 5, May 1923, pp. 25 and 28-29, 11 figs. Bottoms and roofs are welded for containers having storage capacity of 80,000 bbl. of oil.

Railway Shops. Electric Welding in Railway Shops, W. E. Symons. Ry. and Locomotive Eng., vol. 36, no. 6, June 1923, pp. 169-175, 8 figs. Its application and use in locomotive construction and repair.

ELECTRIC WELDING, ARC

Boilers and Condensers. Arc Welding in the Manufacture of Condensers and Steam Boilers (Die Lichtbogenschweissung bei der Fabrikation von Behältern und Dampfkesseln), Fr. W. Achenbach. Wärme, vol. 46, nos. 16 and 17, Apr. 20 and 27, pp. 161-164 and 177-178, 20 figs. As result of successful repairs, proposes production by seam method; vaporization of condensers and small steam boilers; application of same methods to large steam boilers, locomotive boilers, etc.

ELECTRICITY SUPPLY

Rate Curves. Straight Lines as Rate Curves, H. E. Eisenmenger. Elec. World, vol. 81, no. 22, June 2, 1923, pp. 1263-1268; 5 figs. New method of making rate studies by using graphical charts; hyperbolic curves reduced to straight lines without making calculations; greater accuracy and convenience secured.

ELEVATORS

Controllers. Operation of Gearless Traction Elevator Controller, Wm. Zepernick. Power, vol. 57, no. 23, June 5, 1923, pp. 886-892, 7 figs. Describes controller for slow-speed elevator motor developed and used by Otis Elevator Co.

Interlocks. Electro-Mechanical Interlocks, C. W. Bassett. Safety Eng., vol. 45, no. 4, Apr. 1923, pp. 122-125, 7 figs. Outline of general functions and advantages of electric-contact and electro-mechanical devices.

EMPLOYEES' REPRESENTATION

Bethlehem Plan. Five Years of Employee Representation Under "The Bethlehem Plan," John Calder. Iron Age, vol. 111, no. 24, June 14, 1923, pp. 1689-1697. Beginnings of plan; representation basis; unique feature of Bethlehem plan; industrial-relations department; how plan functions; president's participation; issues raised by employees; lessons for steel industry.

EMPLOYMENT MANAGEMENT

Centralized Employment. Experiences with Centralized Employment, Arthur Notman. Min. and Metallurgy, vol. 4, no. 198, June 1923, pp. 300-302, First step in centralized employment, and present labour situation at Phelps Dodge Corp., Bisbee, Ariz.

ENGINEERING

Abstract Science Applied to. The Interdependence of Abstract Science and Engineering, Richard T. Glazebrook. Engineering, vol. 115, nos. 2993 and 2994, May 11 and 18, 1923, pp. 599-602 and 633-636, 13 figs. Deals with organization, methods and application of engineering research, and refers in detail to applications of abstract science to various branches of engineering, including radiotelegraphy, properties of materials, lubrication, aeronautics, internal-combustion engine and steam turbine. Lecture before Instn. Civil Engrs. See also Engineer, vol. 135, no. 3515, May 11, 1923, pp. 502-504.

Human, Foundation of. The Foundation of Human Engineering, Walter N. Polakov. Management Eng., vol. 4, no. 5, May 1923, pp. 345-348. Discusses language of new mathematical logic; points out that mathematics may deal with non-quantitative problems; definition of "human engineering"; true, false, and meaningless propositions; mathematics in daily life. Bibliography.

ENGINEERS

License Laws. Fifteen Years of the Engineering License Law in Louisiana, Donald Derickson. La. Eng. Soc.—Proc., vol. 9, no. 1, Feb. 1923, pp. 12-33, 7 figs. Experience resulting from nearly 15 years under state law to regulate practice of civil engineering and surveying.

Why One Engineers' Registration Law Was Not Enacted, Arthur Richards. Eng. News-Rec., vol. 90, no. 23, June 7, 1923, pp. 992-993. Comments on license laws in general and on proposed law in Ohio in particular.

EXECUTIVES

Scientific Method for. The Scientific Method for Executives, Wallace Attwood. Indus. Management (Lond.), vol. 9, nos. 9, 10 and 11, May 3, 10 and 17, 1923, pp. 267-269, 301-303 and 337, 1 fig. May 3, Analysis of scientific principles governing efficient industrial administration. Applying scientific method.

EXPLOSIVES

Safe. The Testing of "Safety" Explosives, E. Lemaire. Colliery Guardian, vol. 125, nos. 3258 and 3254, May 4 and 11, 1923, pp. 1070-1071, and 1143, 2 figs. May 4: External stemming and safety sheath. May 11: Ignition of firedamp by hot gases, including ignition by projected particles from explosives and by compression of air; determination of safety explosives. Translated from Annales des Mines de Belgique.

F

FATIGUE

Industrial. Industrial Fatigue. Times Trade and Eng. Supp., vol. 12, no. 254, May 19, 1923, p. 226. Abstract of statement submitted by secretary of Indus. Fatigue Research Board to Statistical Soc. on recent developments in Board's work and its prospects.

FILTRATION PLANTS

Ontario. Filter and Pumping Plant at Dunnville, Ont., E. H. Darling, Can. Engr., vol. 44, no. 20, May 15, 1923, pp. 489-493, 7 figs. Water supply from Grand River; plant has capacity of 1,200,000 gal. per day; rapid sand filters in three units, centrifugal pumps driven by electric motors and gasoline engines.

FLOORS

Allowable Loads. Standardizing Allowable Floor Loads. Safety Eng., vol. 145, no. 5, May 1923, pp. 147-151, 4 tables. Building Code Committee of Dept. of Commerce issues first report on recommend minimum requirements for small dwelling constructions.

Hollow-Tile and Reinforced-Concrete. Loading Test of a Hollow Tile and Reinforced Concrete Floor of Arlington Building, Washington, D.C. U.S. Bur. of Standards — Technologic Papers, vol. 17, no. 236, Apr. 21, 1923, pp. 405-445, 30 figs. Strain measurements were taken on concrete and reinforcing steel of slabs and of girders; deflections of slab were also measured; effect of time under load was very pronounced in first 20 hours and comparatively small later. Bibliography.

FIRE PROTECTION

Sprinklers. A New Calcium Chloride Sprinkler System. Nat. Fire Protection Assn. — Quarterly, vol. 16, no. 3, Jan. 1923, pp. 267-275, 1 fig. Describes system of automatic sprinklers using non-freezing calcium-chloride solution, supplied by four 50,000-gal. gravity tanks in towers of Montreal cold-storage warehouse.

FLOW OF AIR

Measurement. Experiments Develop New Constants in Air Flow Measuring Formulae Johnstone Taylor. Automotive Industries, vol. 48, no. 21, May 24, 1923, pp. 1126-1128, 3 figs. Venturi and orifice methods have been revised considerably as result of recent studies; latter involves use of somewhat simpler apparatus, consisting of tin plate with circular opening, U-tube, and air receiver.

FLOW OF FLUIDS

Pipes. Orifice Coefficients — Data and Results of Tests, Jacob M. Spitzglass. Mech. Eng., vol. 45, no. 6, June 1923, pp. 342-346 and (discussion) 346-348 and 399, 7 figs. Results of experimental work conducted at research laboratory of Republic Flow Meters Co., Chicago, on use of orifice plates for measuring flow in pipes; tests were conducted on seven sizes of pipes, from 2-in. to 12-in. standard. Includes number of tables and characteristic curves that may be employed for determining flow through orifice plates in given size of pipe. (Abridged.)

FLOW OF STEAM

Pipes. The Flow of Steam in Pipes, W. Mason. Chem. Trade Jl. and Chem. Engr., vol. 72, no. 1880, June 1, 1923, p. 666. Simplification of Unwin's formula, and table showing its application; examples showing use of logarithmic chart.

FORGING

Non-Ferrous Metals. The Die Forging of Non-Ferrous Metals (Das Pressen von Nichteisen-Metallen), A. Peter. Zeit. für Metallkunde, vol. 15, nos. 1 and 2, Jan. and Feb. 1923, pp. 1-6 and 41-47, 54 pp. Development of hot forging process; useful scope of pressed pieces; qualities of pressed metals and alloys; directions for design of pressed pieces; tolerances; types of swages; machines and methods for hot forging; economy of process.

FOUNDRIES

Aluminum. A New Aluminum Foundry, Seymour Pile. Metal Industry (Lond.), vol. 22, no. 22, June 1, 1923, pp. 554-556, 3 figs. Equipment and methods of Birmingham Aluminum Casting Co.

British Practice. Foundry Practice in Britain, Percy Longmuir. Foundry, vol. 51, no. 12, June 15, 1923, pp. 497-501, 2 figs. Metallurgical features of ferrous and non-ferrous metals are discussed and typical analyses presented to show effect of melting and heat-treating metals at varying temperatures. Paper presented before Am. Foundrymen's Assn.

Malleable-Iron. Points on Malleable Iron Foundry Practice. Can. Foundrymen, vol. 14, no. 5, May 1923, pp. 28-30, 2 figs. Two articles: Malleable Iron Cast in Small Quantities, by S. J. Felton; Checking Malleable Foundry Scrap, by E. D. Halsey.

Material Handling Equipment. The Handling of Loads in Iron Foundries (Heben und Befördern von Lasten in Eisengiessereien), Carl Rein. Giesserei-Zeitung, vol. 20, no. 10, Apr. 15, 1923, pp. 167-176, 21 figs. Discharge and storage of raw material; furnace charging; lifting and conveying of loads to molding and cleaning shops.

FRAMEWORK

Steel. Steel Joints for Tall Buildings, Allen L. Curtis. Eng. World, vol. 22, no. 5, May 1923, pp. 291-294, 8 figs. Discusses advantages of structural steel in framing, especially for high structures, giving several buildings as examples.

FUEL ECONOMY

Power Plants. Fuel Economy and Production Expenses, Allen M. Perry. Elec. World, vol. 81, no. 22, June 2, 1923, pp. 1259-1262. Data for 45 coal-burning plants ranging from 10,000 to 122,000 kw.

Railways. Fuel — A Reducible 13 Per Cent of Expense, J. Kruttschnitt. Ry. Age, vol. 74, no. 25, May 26, 1923, pp. 1277-1290. Comprehensive review of present fuel situation and future outlook. (Abstract.) Address before Int. Ry. Fuel Assn. See also Ry. Rev., vol. 72, no. 21, May 26, 1923, pp. 877-884.

FUELS

Drying. Drying of Moist Fuels Outside of the Furnace. Zuee Kogan. Power Plant Eng., vol. 27, no. 12, June 15, 1923, pp. 619-622, 7 figs. Points out that atmospheric drying will be found economical when using fuels with high moisture content.

Gaseous. The Combustion of Gaseous Fuels, George F. Moulton. Indus. and Eng. Chem., vol. 15, no. 6, June 1923, pp. 583-587, 6 figs. Presents figures showing how injection of primary air in gas burners is modified by variations in gas rate, pressure, and specific gravity, resulting in different types of flame.

Recovery from Ashes. The Separation and Recovery of Fuel, Alwyne Meade. Gas Engr., vol. 39, no. 565, May 1923, pp. 105-108, 7 figs. Economies of fuel separation; construction and operation of Blackett washer and other machines, disadvantages of wet separation, separation by fractional resistance.

See also Coal, Coke; Oil Fuels, Pulverized Coal.

FURNACES, ANNEALING

Recuperative. Practice on Recuperative Annealing Furnaces, Karl G. Gustafsson. Iron Age, vol. 111, no. 25, June 21, 1923, pp. 1782-1783, 2 figs. Pot furnace designed to act as simple producer, high economy claimed compared with oil-fired apparatus.

FURNACES, HEAT TREATING

Combustion. Combustion as it Pertains to Industrial Heat Treatment Furnaces, A. D. Frydendall. Am. Soc. Steel Treating — Trans., vol. 3, no. 8, May 1923, pp. 824-832. Discusses luminous and non-luminous flames as met with, in use of common fuel gases, deals with various types of fuels commonly met with and used in industrial heating, and points out advantages and disadvantages of various types, points of prime importance in efficient operation and handling of fuels in heating materials.

Electrically Heated. Heat Treat To Remove Strains, Pat Dwyer. Iron Trade Rev., vol. 72, no. 24, June 14, 1923, pp. 1743-1748, 5 figs. Large turbine frames and other castings of similar character are heat treated in special electrically heated oven in which casting is raised to approximately 700 deg. Fahr.

Heating, Hardening and Tempering. Modern Heating, Hardening and Annealing Furnaces, O. Dahne. Eng. Progress, vol. 4, no. 5, May 1923, pp. 91-95, 7 figs. Notes on plate, double chamber, and tempering furnaces, forge and forging [illegible]

G

GALVANIZING

HOT-DIP. Effects of Hot Dip Galvanizing. W. R. Bean. Foundry, vol. 51, no. 11, June 1, 1923, pp. 447-455, 18 figs. Malleable shown by research not to be deteriorated by this process when phosphorus and silicon are low; high-phosphorus irons will be embrittled by galvanizing; details of experience.

GAS PRODUCERS

DEVELOPMENTS. Recent Developments in Gas Producers. T. Roland Wollaston and A. L. Booth. Chem. and Industry, vol. 42, no. 19, May 11, 1923, pp. 200T-203T, 1 fig. Describes new plant running on semi-coked coal, feature of which is freedom of gas from dust.

GEAR CUTTING

HOBBING MACHINES. Simplicity of Indexing Mechanism Features New Gear Hobber. Automotive Industries, vol. 48, no. 21, May 24, 1923, pp. 1124-1125, 1 fig. Product of Cincinnati Gear Cutting Machine Co. permits continuous production of single design with great accuracy; cutter head fixed; allows cutting of 4 diametral pitch teeth.

MACHINES. Spiral Bevel Gear-Cutting Machine. Machy. (Lond.), vol. 22, no. 554, May 10, 1923, pp. 183-184, 3 figs. Describes tooth-cutting machine invented by N. G. Gwynne.

WORM GEAR. Cutting Worm-Gears, Franklin D. Jones. Machy. (N.Y.), vol. 29, no. 10, June 1923, pp. 784-789, 9 figs. Use of ordinary hob and radial in-feed; fly-cutter method; use of tapering hobs.

GEARS

BEVEL. Considering the Advantages of Spiral Bevel Gears. Can. Machy., vol. 29, no. 20, May 17, 1923, pp. 29 and 44. Applications and advantages; continuous pitch-line contact; smooth and quiet operation; right and left spirals; vibration reduced to a minimum.

GRINDING TEETH OF. Gear-Grinding and Tooth-Forms, Glenn Muffly. Soc. Automotive Engrs. — Jl., vol. 12, no. 6, June 1923, pp. 545-555 and (discussion) 555-559, 25 figs. Shows how gear teeth are being ground within new limit of accuracy in regular production and how minute errors in tooth curves and spacing may be measured.

INDUSTRIAL. The Modern Industrial Gear. W. H. Phillips and L. F. Burnham. Engrs.' Soc. West. Pa. — Proc., vol. 39, no. 1, Feb. 1923, pp. 19-35 and (discussion) 36-43, 11 figs. Notes on design, material and heat treatment, manufacture, inspection, installation and maintenance.

MACHINE-CUT. Power Transmission through Machine-Cut Gearing, W. H. Child. S. African Instn. Engrs. — Jl., vol. 21, no. 8, Mar. 1923, pp. 155-165 and (discussion) 165-167, 4 figs. Notes on rolling-mill, winding and haulage and turbine gear.

STANDARDIZATION. Progress in Gear Standardization. Am. Mach., vol. 58, no. 25, June 21, 1923, p. 97. Résumé of work accomplished by subcommittee of American Gear Mfrs.' Assn. since October 1922.

TESTING. Dial Gage Device Used with Success to Test Spiral Bevel Gears, P. M. Heldt. Automotive Industries, vol. 48, no. 20, May 17, 1923, pp. 1088-1089, 4 figs. Machine Developed to determine inaccuracy of tooth outline and errors of indexing adapted to check correctness of curvature.

GIRDERS

PLATE. Plate-Girder Design and Detailing — Notes from Practice, Robins Fleming. Eng. News-Rec., vol. 90, no. 24, June 14, 1923, pp. 1032-1037, 7 figs. Methods of calculating resisting moment; strength of wide cover plates; stiffener spacing and rivet pitch as governed by web shear.

GRAIN ELEVATORS

BALTIMORE, MD. New Railway Grain Terminal at Baltimore, Md. Eng. and Contracting (Railways), vol. 59, no. 5, May 16, 1923, pp. 1110-1112, 1 fig. B. & O. R.R. $5,500,000 project will be one of largest and most highly developed in country. Details of special car dumpers, workhouse, cleaning and drying facilities, pier to be constructed power equipment.

GRAIN HANDLING

PNEUMATIC SHIP-DISCHARGING PLANT. Floating Pneumatic Grain-Handling Plant. Engineering, vol. 115, no. 2994, May 18, 1923, pp. 608-610, 34 pp. partly on p. 622 and supp. plate. Describes two floating pneumatic grain discharging plants employed at flour mill at Cardiff for discharging ships which cannot be brought up alongside mills, wheat being transferred to lighters and barges by means of these plants.

H

HEALTH

EYESIGHT CONSERVATION IN INDUSTRY. Eyesight Conservation in Industry, Reginald Gordon. Indus. Management (N.Y.), vol. 65, no. 6, June 1923, pp. 345-346. What management is doing to aid workers and increase production.

INDUSTRIAL PHYSICIANS. What Industrial Medicine Means to the Plant Manager, F. W. Dershimer. Indus. Management (N.Y.), vol. 65, no. 6, June 1923, pp. 379-381. Points out need for special training on part of industrial physician, and for better understanding of his functions by management.

HEAT TRANSMISSION

PRINCIPLES. The Principles of Transference of Heat. Geoffrey J. Greenfield. Chem. and Industry, vol. 42, nos. 16 and 17, Apr. 20 and 27, 1923, pp. 390-393 and 417-419, 2 figs. Consideration of heat transmission by convection, conduction and radiation.

HEATING, HOT-AIR

HEATERS. Types of Heaters for Hot Blast Work, Charles L. Hubbard. Power Plant Eng., vol. 27, nos. 10 and 12, May 15 and June 15, 1923, pp. 521-524 and 626-629, 7 figs. Methods of construction and assembly for heating plants in public buildings and industrial plants. Methods for determining hearing surface.

HEATING, STEAM

CENTRAL-STATION. Central Heating of Manitoba's Parliament Building. Geo. R. Archdeacon. Power House, vol. 16, no. 9, May 5, 1923, pp. 21-23, 3 figs. Daily log kept of water of condensation from statement of total cost of operation is prepared for Minister of Pub. Works each month; novel color scheme adopted in piping throughout system.

UNIVERSITY OF WISCONSIN. The University Heating System, Gustus L. Larson. Wis. Engr., vol. 27, no. 8, May 1923, pp. 137-140 and 154, 5 figs. Plant contains nine 350-hp. Babcock & Wilcox water-tube boilers, steam is generated and distributed at 150 lb. pressure; operating records.

HELICOPTERS

FUTURE OF. Air Travel with Special Reference to the Helicopter. F. M. Green. Aerial Age, vol. 16, no. 6, June 1923, pp. 268-270. Comparison of helicopter with airplane with regard to power used for support and for flight; safe landing, stability and structural safety; in author's opinion, it is highly unlikely that helicopter type of machine will ever afford useful means of getting from place to place. Lecture before Roy. Aeronautical Soc. of G.B.

HIGH VOLTAGES

RESEARCH. Applying the Results of High-Voltage Research to Practice. F. W. Peek, Jr. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 407-411, 11 figs. Shows value of research work in solving "field problems" in high-voltage transmission, describes testing laboratory at Pittsfield Works of Gen. Elec. Co.

HOUSING

WORKINGMEN'S HOUSES. Low-Cost Workingmen's Houses. O. P. Hipple. Management Eng., vol. 4, no. 6, June 1923, pp. 395-398, 4 figs. Possibilities of standardized construction.

HYDRAULIC TURBINES

GOVERNORS. Turbines and Governors of the Ritom Hydro-electric Plant of the Swiss Federal Railway (Turbinen und Regler des Kraftwerkes Ritom der Schweizerischen Bundesbahnen). Victor Gelpke. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 18, May 5, 1923, pp. 436-443, 21 figs. Main closing valves of main and auxiliary lines; use of bell-shaped valves for turbines; turbine installation consisting of 4 turbines with total of 9000 kw. at 333⅓ r.p.m. and 810 m. head; regulation of needle and deflector, safety devices.

KAPLAN. Tests on a Kaplan Turbine (Versuche an der Kaplan-Turbine). Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 18, May 5, 1923, pp. 444-447, 7 figs. Details of design and installation of experimental turbine and testing equipment; results of experiments in tabular form.

MODERN TYPES. Modern Hydraulic Turbines. Indian and Eastern Engr., vol. 51, no. 9, Mar. 1923, pp. 135-137, 7 figs. Recent developments in Pelton-wheel practice; Turgo impulse turbines; Pelton-wheel governors; pumped storage.

HYDRO-ELECTRIC DEVELOPMENTS

MUSCLE SHOALS, ALA. Muscle Shoals as it Stands To-Day, Carroll E. Williams. Mfrs. Rec., vol. 73, no. 18, May 3, 1923, pp. 99-103, 8 figs. Work on Wilson dam; dam and power house expected to be completed in 1925 with favourable conditions; total of 850,000 hp. declared possible from dams 2 and 3.

HYDRO-ELECTRIC PLANTS

CANADA. City of Winnipeg Hydro Electric Plant, J. G. Glassco. Universal Engr., vol. 37, no. 5, May 1923, pp. 16-21, 4 figs. Notes on power house, which is divided into three bays, viz., wheel pits generator room, switch and transformer rooms; the eleven generators now installed, consisting of five 3000-kva. 6600 volts 3-phase 60-cycle 164 r.p.m., three 5000-kva. 6000 volts 3-phase 60-cycle 138½ r.p.m., and three 6500-kva. 6000 volts 3-phase 60-cycle 150 r.p.m.; turbine room; pressure piping, air compressors; electric condensers; transformers; transmission lines; etc.

HYDROLOGY

FLOW COEFFICIENT. Coefficient of Flow (Considérations sur le coefficient de ruissellement), E. Gardener. Revue Générale de l'Electricité, vol. 13, no. 14, May 12, 1923, pp. 787-792, 1 fig. Verification of Cottagne formula expressing coefficient of flow as function of pluviometric height by means of pluviometric data of Alsace and Baden showing formula correct with slight modifications.

I

ICE MANUFACTURE

CLEAR ICE. Clear Ice Without Agitation, Van Rensselaer H. Greene. Refrig. World, vol. 58, no. 5, May 1923, pp. 13-14. Possibilities of manufacturing a good uniform product by a new system more economical for plants of over 60 tons capacity than those in vogue to-day. Paper read before joint meeting of Va. Ice Mfrs. Assn. and East. Ice Mfrs. Assn.

RAW-WATER ICE. Advancements in Raw Water Ice, Ralph N. Cole. Ice and Refrigeration, vol. 64, no. 5, May 1923, pp. 384-387. Notes on water softening, air agitation system, air dehydrators, use of can baskets, advantages of basket system, dip-tank agitation, can-filling tanks, brine agitation, electric drive, water heaters, ice storage, etc.

ICE PLANTS

OPERATION. Economical Operation of Ice Plants, Halbert P. Hill. Refrig. World, vol. 58, no. 5, May 1923, pp. 16-18. Points out cost of inefficiency and makes suggestions for effecting savings by correcting defects in operation of plants. Paper read before Joint meeting of Va. Ice Mfrs. Assn. and East. Ice Mfrs. Assn.

IMPACT TESTING

REPEATED. Further Report on Repeated Impact Tests, Tsuruzô Matsumura. Kyoto Imperial University, College of Eng. — Memoirs, vol. 3, bo. 2, Mar. 1923, pp. 47-60, 27 figs. Results of investigation of depth of notch and blow number; blow number and Upton-Lewis' toughness number; impact energy and blow number.

INDICATORS

ELECTRICAL. R. A. E. Electrical Indicator for High-Speed Internal-Combustion Engines, and Gauge for Maximum Pressures, Harry Wood. Instn. Mech. Engrs. — Proc., no. 2, Jan. 1923, pp. 137-146, 5 figs. Royal Aircraft Establishment electrical indicator is of "balanced" type.

INTERNAL-COMBUSTION-ENGINE. Engine-Testing Instruments, J. Okill. Automobile Engr., vol. 13, no. 176, May 1923, pp. 150-153, 20 figs. Notes on optical indicators, including Hospitalier-Carpentier, Schultz, Burstall's, and Midgley types, and the pressure indicator designed by author.

MICRO. Micro-Indicator for High-Speed Engines, W. G. Collins. Instn. Mech. Engrs. — Proc., no. 2, Jan. 1923, pp. 127-135, 12 figs. Instrument is of cylinder and piston type, principal novel feature of which is production of small-scale diagrams on transparent celluloid.

OPTICAL. A New Form of Optical Indicator, F. W. Burstall. Instn. Mech. Engrs. — Proc., no. 2, Jan. 1923, pp. 111-125, 17 figs. Primarily developed for purpose of research work connected with medium-speed high-compression gas engine, and to serve in laboratory where internal-combustion engine experimenting is carried out.

PROBLEMS. The Problems of the Engine Indicator, Loughnan Pendred. Instn. Mech. Engrs. - Proc. no. 2, Jan. 1923, pp. 95-110. Discusses nature of problems, including inertia, spring vibration, drum and its mechanism, springs and pistons, optical indicators.

INDUSTRIAL MANAGEMENT

CHANGES IN DESIGN. Carrying Out Changes in Design, Clive B. Kearney. Indus. Management (Lond.), vol. 9, nos. 10 and 11, May 17 and 23, 1922, pp. 295-296 and 329-330, 1 fig. Author attempts to analyze expenses most generally incurred, and to suggest ways of simplifying and standardizing semi-clerical work involved in carrying out changes.

CHARTS. *See Charts.*
COST ACCOUNTING. *See Cost Accounting.*
EXECUTIVES. *See Executives.*
GENERAL MANAGER. What Makes the General Manager Successful? E. H. Fish Management Eng., vol. 4, no. 6, June 1923, pp. 387-388. Duties of general manager.
TIME CARDS. Methods of Recording Elapsed Time on Jobs, Charles W. Lytle. Management Eng., vol. 4, no. 6, June 1923, pp. 429-435, 18 figs. Presents time cards of various systems.
TIME STUDY. *See Time Study.*
WORKSHOPS. Factory Organization and Management, Kenneth M. Sloan. Eng. Production, vol. 6, no. 129, June 1923, pp. 290-291. Guiding principles of efficiency in workshops.

INDUSTRIAL RELATIONS

ARBITRATION. Industrial Arbitration, William MacKenzie. Roy. Soc. Arts — Jl., vol. 71, no. 3677, May 11, 1923, pp. 433-445 and (discussion) 445-448. Early legislative efforts by parties; Conciliation Act; Committee on Production during war period; industrial Court.

INSULATION, HEAT

GLASS WOOL. Glass Wool Heat Insulation in Europe, A. D. Saborsky. Am. Ceramic Soc. — Jl., vol. 6, no. 5, May 1923, pp. 674-684, 11 figs. Review of its development, manufacture and use in Europe. Author believes it to be coming heat insulation of future.

INTERNAL COMBUSTION ENGINES

CORROSION. Corrosion, W. R. Douglas Shaw. Automobile Engr., vol. 13, no. 176, May 1923, pp. 139-140. Brief notes in relation to internal-combustion engines.
MAINTENANCE. Notes on Maintenance of Four-Cycle Internal Combustion Engines, L. F. P. Sorge. Inst. Mar. Engrs. — Trans., vol. 34, Apr. 1923, pp. 540-552, 7 figs. Discusses troubles which arise in practice, dealing with fuel, exhaust, inlet and starting valves, cylinder cover, piston, air compressors, bearings, etc.
See also Airplane Engines; Diesel Engines; Oil Engines.

IRON

CONTRACTION. Influence of Alloy Additions on the Contraction of Iron (Einfluss einiger Fremdkörper auf die Schwindung des Eisens), F. Wüst. Stahl u. Eisen, vol. 43, no. 22, May 31, 1923, pp. 713-720, 6 figs. New contraction-measurement instruments; influence of carbon, silicon, manganese, phosphorus, sulphur, nickel and chromium on contraction.

IRON CASTINGS

CHILLED ROLLS. Casting Hard Rolls. Engineering, vol. 115, no. 2996, June 1, 1923, pp. 695-696, 8 figs. Account of experimental work carried out by Emil Schüz and described in paper printed in Stahl u. Eisen; explains why molds will crack within first 6 min. after pouring, if they crack at all, and accounts for other peculiarities known to steel foundrymen.
GRAY-IRON. Tentative Specification for Grey Iron Castings. Foundry Trade Jl., vol. 27, no. 354, May 31, 1923, p. 449 and (editorial comment) p. 433. Submitted to Instn. Br. Foundrymen.

L

LABOUR

TWO AND THREE SHIFTS. Labour Shifts in Continuous Industries in the United States, Horace B. Drury. Int. Labour Rev., vol. 7, no. 2-3, Feb.-Mar. 1923, pp. 189-208. Particulars of arrangement of shifts and hours in various industries wholly or partly on continuous processes; methods of effecting change from two to three shifts and results on wages, efficiency, and costs.
WAGES AND HOURS. Wages and Hours of Labour. Monthly Labour Rev., vol. 16, no. 5, May 1923, pp. 117-130. Wages and hours of labour in blast furnaces in 1922; in Australia, 1922; hours of labour on German federal railways; Great Britain; cotton textile industry in Bombay, India.

LABORATORIES

GENERAL ELECTRIC CO., LONDON. The Research Laboratories of the General Electric Company at London (Les laboratoires de recherches de la Général Electric Company Ltd., à Londres), P. Calfas. Génie Civil, vol. 82, no. 21, May 26, 1923, pp. 485- 490, 7 figs. Details of plant and equipment for research covering tungsten filaments, chemistry, glass, refractories, primary batteries, electric lamps, metallurgy, photometry, microscopy, electron tubes, etc.

LATHES

HOLLOW-SPINDLE. 8½-In. Hollow Spindle Gap Lathe. Engineering, vol. 115, no. 2996, June 1, 1923, pp. 678-679, 12 figs. Describes new pattern of lathe arranged for screw cutting, sliding and surfacing work.
MACHINING SPHERICAL SURFACES. Machining Spherical Surfaces, F. Osgood Hickling. Machy. (Lond.), vol. 22, no. 554, May 10, 1923, pp. 168-170, 8 figs. Operations on automatic turret and capstan lathes.

LIGHTING

DAYLIGHT. Daylight Illumination on Horizontal, Vertical and Sloping Surfaces. Illuminating Eng. Soc. — Trans., vol. 18, no. 5, May 1923, pp. 434-474, 28 figs. Report of Committee on Sky Brightness. Sky-brightness and daylight-illumination measurements made during year ending Apr. 6, 1922.

LIQUIDS

SPECIFIC HEAT. Note on the Theory of the Specific Heat of Liquids, F. A. Lindemann. Lond., Edinburgh and Dublin Philosophical Mag. and Jl. of Sci., vol. 45, no. 270, June 1923, pp. 1119-1120. Author challenges theory of Prof. Honda published in Jan. issue of same journal.

LOCKS

FOUNDATIONS, TESTING. Resistance and Elasticity Testing of Foundations of the New Lock at Ymuiden, Holland [Essais de résistance et d'élasticité du terrain de fondation de la nouvelle écluse maritime d'Ymuiden (Hollande)], A. Bijls. Génie Civil, vol. 82, no. 21, May 26, 1923, pp. 490-492, 3 figs. Theory; resistance of ground; arrangements for testing resistance of foundations; results of tests.

LOCOMOTIVE BOILERS

DESIGN. Boiler Design in Relation to Maintenance, A. E. Kyffin. Boiler Maker, vol. 23, nos. 4 and 5, Apr. and May 1923, pp. 100-103 and 132-134, 16 figs. Apr.: Factors entering design and construction of British locomotives and their influence on upkeep and repair problems. Paper read before Instn. Locomotive Engrs. May: Practices employed in British shops in building and repairing locomotive boilers to give maximum service.
STAYBOLTS. New Staybolt Designed to Promote Flexibility. Boiler Maker, vol. 23, no. 5, May 1923, pp. 129-131 and 149, 10 figs. Details of double articulated staybolt developed by A. F. Pitkin for use in locomotive boilers.

LOCOMOTIVES

ELECTRIC. *See Electric Locomotives.*
LONG RUNS. The Extension of Locomotive Runs. C. B. Peck. Ry. Age, vol. 74, no. 25, May 26, 1923, pp. 1282-1285. Author suggests limitations of locomotive runs; extent to which wide variations in operating conditions are likely to affect results; relation of long runs to development of locomotive; service and maintenance facilities with which it must co-ordinate.
LUBRICATION. Locomotive Lubrication, W. E. Symons. Ry. and Locomotive Eng., vol. 36, no. 5, May 1923, pp. 139-141. Review of early practice and comments on hydrostatic vs. force feed of power lubricators.
MOUNTAIN AND MIKADO TYPES. Mountain and Mikado Types for the Frisco. Ry. Mech. Engr., vol. 97, no. 6, June 1923, pp. 357-359, 5 figs. New oil-burning locomotives based on U.S.R.A. designs modified to suit railroads standards.
PACIFIC TYPE. New Pacific Type Locomotives for the Louisville & Nashville R.R. Ry. and Locomotive Eng., vol. 36, no. 6, June 1923, p. 191, 1 fig. New 4-6-2-type built by Baldwin Locomotive Works; tractive force, 40,700 lb.
STANDARDIZATION OF REPAIR PARTS. Standardization of Locomotive Repair Parts, M. H. Williams. Ry. Mech. Eng., vol. 97, no. 6, June 1923, pp. 341-347, 10 figs. With particular emphasis on methods of standardizing and machining valve motion pins and bushings.
SUPERHEATER. Double-Expansion Superheater Locomotive With Four Coupled Axles and Four Cylinders, Two Inferior and Two Exterior—Group 746 (Locomotive a 4 assi accoppiati e asse portante anteriore, e posteriale a vapora surisca1dato e a doppie espansione, a 4 cilindri, 2 interni e 2 esterni—gruppo 746), industria, vol. 37, no. 6, Mar. 31, 1923, p. 107, 1 fig. New Italian Locomotive type 2-8-2.
THERMIC SIPHONS. Locomotive Service Tests on the N.C. & St. L. Ry. Age, vol. 74, no. 28, June 16, 1923, pp. 1425-1426, 1 fig. Engine with Nicholson thermic siphons runs against one of similar design not so equipped.

LUBRICATING OILS

BLENDING. Formulas for Blending Oils, Forrest A. Huff. Oil News, vol. 11, no. 9, May 5, 1923, pp. 17-18. Formulas for making automobile oils and specialties; practical directions for good compounding Eastern and Western stocks.

LUMBER

KILN DRYING. Kiln Drying Handbook, Rolf Thelen. U.S. Dept. Agriculture —Dept. Bul., no. 1136, May 12, 1923, 64 pp., 24 figs. Fundamental facts about drying of wood; deals with kiln drying of lumber and other forms of wood.

M

MACHINE TOOLS

CHANGE GEARS. Designing Change-gears for Fixed Centers, H. H. Manning. Machy (N.Y.), vol. 29, no. 10, June 1923, pp. 799-802. Presents tables and formulas dealing with design of gear sets mounted on shafts or studs having fixed center distances.
EFFICIENCY. Machine Efficiency, G. E. Bailey. Machy. (Lond.), vol. 22, nos. 549 and 550, Apr. 5 and 12, 1923, pp. 27-30 and 57-62, 4 figs. Apr. 5: Studies in cutting-time percentages. Deals with drilling and milling machines. Apr. 12: Planning machines; vertical and horizontal boring machines.

MACHINERY

SOUND DETECTION IN. The Detection, Location and Comparison of Sound, C. E. Noël-Storr. Eng. Production, vol. 6, no. 129, June 1923, pp. 301-302, 2 figs. Describes the Sonometer, a sounder of dual type, developed by Capac Company.

MALLEABLE IRON

HIGH TEMPERATURES, EFFECT OF. Tests Showing the Effect of High Temperatures in Malleable Iron, T. D. Lynch and W. J. Merten. Am. Soc. Steel Treating — Trans., vol. 3, no. 8, May 1923, pp. 833-840, 13 figs. Results of numerous tests made upon malleable-iron castings after being subjected to various high temperatures; susceptibility of structural changes of malleable iron when subjected to various elevated temperatures is shown; tests indicate wide variation in critical temperatures of different samples; authors recommend use of high annealing temperatures from 900 to 925 deg. cent. for malleablizing when it is desired to obtain high quality of material.

MATTER

ELECTRONS, ATOMS AND ETHER. Electrons, Atoms and The Ether, W. B. Cartmel. Eng. Jl. (Eng. Inst. Can.), vol. 6, nos. 4, 5 and 6, Apr., May and June, 1923, pp. 177-179, 245-247 and 281-284, 18 figs. Outline of present knowledge of subject resulting from recent investigations.

METALS

HARDENING. Hardness and Hardening, Walter Rosenhain. Chem. & Met. Eng., vol. 28, no. 20, May 21, 1923, pp. 899-901, 5 figs. Hardness of material is defined as power of resisting local displacement of portions of its substance; how hardening can be effected. (Abstract.)

Lattice Strain Theory of Hardening of Metals, Skezug Kimura. Electrotechnical Laboratory — Researches, no. 123, Mar. 1923, 7 pp., 2 figs. According to author's theory, amorphism is considered to be only resulting feature following lattice strain, and interatomic stress caused by this lattice distortion is considered as very origin of hardening, origin of hardness may be attributed to increase of network of boundaries hardened by distortion of lattice.

SHRINKAGE. The Shrinkage of Metals, F. Johnson. Foundry Trade Jl., vol. 27, no. 352, May 17, 1923, pp. 393-396, 2 figs. Consequences of shrinkage; theory of angular weakness explained; effect of various factors on total shrinkage, pouring temperature and shrinkage, use of equilibrium diagram; shrinkage apparatus.
STRAIN AND FRACTURE. Strain and Fracture in Metals. Chem. & Met. Eng., vol. 28, no. 23, June 11, 1923, pp. 1026-1030, 9 figs. Notes on Dr. Rosenhain's recent lecture tour. Why slip, once started, stops; method for distinguishing shock fractures, cure for season cracking, how to increase endurance of metal to alternate stress.

METALLURGY

SHOP PRACTICE, IN. Metallurgy in the Modern Shop, M. H. Medwedeff. Am. Soc. Steel Treating — Trans., vol. 3, no. 9, June 1923, pp. 928-930. Points out importance of familiarity with shop practice, and of study of typical failures.

MINING

CANADA, 1922. Mining and Metallurgical Progress in Canada, Stopford Brunton. Can. Chem. & Met., vol. 7, no. 5, May 1923, pp. 119-120. Review of situation during 1922, and proposals for future developments.
METHODS. Coal and Metal-Mining Methods Contrasted, D. Harrington. Coal Age, vol. 23, no. 24, June 14, 1923, pp. 961-967, 8 figs. High temperatures in metal mines, methane found in workings of both types, blasting timber causes fires in mines producing metals, dust in such mines probably causes more deaths than coal dust explosions. Published by permission of U. S. Bur. of Mines.

MOLDING METHODS

PROPELLER WHEELS. Propeller Molding Is Varied. R. H. Palmer. Foundry, vol. 51, no. 12, June 15, 1923, pp. 482-485 and 490, 18 figs. Methods adopted in molding four standard wheels, while similar in general principle, differ considerably in many details essential to making of molds.

MOLDS

LONG-LIFE. New Long-Life Mould Development. Richard Moldenke. Metal Industry, Lond., vol. 22, no. 21, May 25, 1923, pp. 529-531, 3 figs. Describes mold which is said to be capable of producing 400 castings per hour, and its application in casting carburetors and pistons. Paper read before Am. Foundrymen's Assn.

MOTOR BUSES

ENGINES. Six-Cylinder Bus Engine Developed by Herschell-Spillman Automotive Industries, vol. 48, no. 21, May 24, 1923, pp. 1129-1131, 2 figs. New 452-cu. in. product has seven-bearing crank-shaft, other features include full-pressure lubrication controlled by inter-connection with throttle, cams-shaft shifted for relief of compression and overhead valves with barrel-type guides.

GASOLINE-ELECTRIC. A Petrol-Electric Development. Motor Transport, London, vol. 36, no. 950, May 14, 1923, pp. 595-596, 4 figs. Describes vehicle for passenger service manufactured by Tilling-Stevens Motors, Ltd., England, known as T.S. 6; driver-beside-engine type chassis; Ricardo engine.

MOTOR TRUCKS

ELECTRIC. Autocar Adds an Electric Truck to Present Line. Automotive Industries, vol. 48, no. 23, June 7, 1923, pp. 1235-1236, 2 figs. Similar to gasoline type in design and construction; motor and controller located under seat and readily accessible; drives through two-piece propeller shaft; weighs without battery about 4,000 lb.

SIX-WHEELED. Renault Six-wheelers. Motor Transport (Lond.), vol. 36, no. 949, May 7, 1923, pp. 561-563, 6 figs. Details of 5-ton and 10-ton flexible combination vehicles with detachable semi-trailers; 4-cylinder monobloc engines; 5-tonner, 15.9 hp., and 10-tonner 22.4 hp.

STEAM. The Steam Wagon from the Designer's Point of View. F. J. Bretherton. Automobile Engr., vol. 13, no. 176, May 1923, pp. 156-159, 9 figs. Deals with boilers, engines, undertype engines, steering gear, transmission, rear axles, frames and fuel supply.

N

NON-FERROUS METALS

CORROSION. Corrosion of Non-Ferrous Metals (Betrachtungen über Korrosion von Nechteisenmetallen). W. Fraenkel. Zeit. für angewandte Chemie, vol. 36, no. 37-38, May 9, 1923, pp. 245-247. Corrosion of condenser tubes; electro-chemical action; role of oxygen; protection against corrosion; etc.

NOZZLES

DIFFUSERS FOR AIR CURRENTS. Tests with Diffusers [Ueber Versuche mit Verdichtungsdüsen (Diffusoren)], August Riffart. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 257, 1922, 42 pp., 70 figs., 8 tables on supp. plates. Theory of diffuser; account and results of test to investigate phenomena of flow in various types and causes for great losses. Deals only with diffusers for air currents.

O

OFFICE BUILDINGS

HEATING AND POWER COST. Heating and Power Cost Analysis for Office Buildings. Heat & Vent. Mag., vol. 20, no. 1, Jan. 1923, pp. 40-41. Based on actual figures compiled during 1921 and covering 150 buildings located in 47 cities.

OIL ENGINES

DE LA VERGNE. Steps in De La Vergne Oil Engine Development. Power Plant Eng., vol. 27, no. 12, June 15, 1923, pp. 630-632, 4 figs. Features of early engines which have influenced design of present solid or pump-injection type. Types of Modern Power Plant Oil Engines. Oil Engine Power, vol. 1, no. 5, May 1923, pp. 233-239, 9 figs. New De La Vergne vertical 4-cycle model which is eventual outgrowth from original Akroyd engine which antedated Diesel type.

FALK. Types of Modern Power-Plant Oil-Engines. Oil Engine Power, vol. 1, no. 6, June 1923, pp. 288-292 and 297-298, 10 figs. New Falk trunk-piston, 4-cycle, airless-injection unit.

HOT-BULB. Hot-Bulb Oil Engines with Cold-Starting Device. Engineering, vol. 115, no. 2996, June 1, 1923, p. 694, 4 figs. Details of 36-hp. twin-cylinder 2-stroke, hot-bulb oil engine which will run satisfactorily on crude or refined petroleum.

LUBRICATION. Automatic Lubrication of Oil Engines and the McCord System. Oil Engine Power, vol. 1, no. 4, Apr. 1923, p. 193, 1 fig. Data on internal and external lubrication, and on force-feed lubricator developed by McCord Radiator & Mfg. Co.

SOLID-INJECTION. The Development of the Hesselman Solid-Injection Oil Engine. Edvin Lundgren Power, vol. 57, no. 24, June 12, 1923, pp. 927-929, 6 figs. In new engine, comparatively low compression is used and dual combustion takes place; engine compression must be high enough to insure ignition; fuel-valve design and advantages.

OIL FUELS

SELF-IGNITION TEMPERATURES. The Self-Ignition Temperatures of Fuels. H. T. Tizard. Automobile Engr., vol. 13, no. 176, May 1923, pp. 136-137. Summarization of results of experiments described in previous paper, and description of further experiments elucidating points of special interest.

OPEN HEARTH FURNACES

COKE-OVEN-GAS HEATING. Working Process in Open-Hearth Plant of the Hoesch Iron and Steel Works, with Special Consideration of the Hoesch Process and the Heating of Furnaces with Coke-Oven Gas (Ueber die Arbeitsweise im Martinwerk des Eisen- und Stahlwerks Hoesch unter besonderer Berucksichtigung des Hoeschverfahrens und der Beheizung der Oefen mit Koksofengas). Otto Schweitzer. Stahl u. Eisen, vol. 43, no. 20, May 17, 1923, pp. 649-657 and (discussion) 657-659, 4 figs. Practical results with Hoesch process; advantages of heating with coke-oven gas.

MALLEABLE CASTINGS. New Furnace for Malleable Castings. Alfred Gradenwitz. Iron Age, vol. 111, no. 25, June 21, 1923, pp. 1781-1782, 4 figs. Small open-hearth furnace developed in Switzerland to make thin-walled and complicated castings; unusually high temperature used.

REVERSING VALVES. Regenerative Reversing Valve. Iron Age, vol. 111, no. 23, June 7, 1923, pp. 1628-1629, 4 figs. Six-way self-contained unit performs whole operation in 10 sec.; avoids gas leak during reversal. See also Iron Trade Rev., vol. 72, no. 23, June 7, 1923, pp. 1669-1671, 5 figs.

ORDNANCE

SHRINK FITS. Shrink Fits at Watertown Arsenal. F. Brauer. Am. Mach., vol. 58, no. 23, June 7, 1923, pp. 845-846, 4 figs. Data as to practice of Ordnance Dept. of U. S. Army in shrink fits for both bronze and steel.

ORE DRESSING

BALL AND ROD MILLING. Ball and Rod Mills in American Milling Practice. Percy R. Middleton. Chem. Eng. & Min. Rev., vol. 15, no. 175, Apr. 5, 1923, pp. 244-249, 7 figs. Describes American crushing and grinding methods with details of machinery more or less strange to Australian metallurgists.

OXY-ACETYLENE WELDING

AMMONIA PIPE LINES. Oxy-Acetylene Welding of Ammonia Pipe Lines, Coils and Pressure Vessels. C. Wilkie. Refrig. Eng., vol. 9, no. 11, May 1923, pp. 325-331 and (discussion) 331-332 and 334, 10 figs. Advantages of welded pipe lines and coils, fusion welding of steel pipe, welding metal for fusion welding, preparing pipe for welding, quality and efficiency of welded pipe joints, relieving welding strains in pipe lines, requirements of first-class pipe welder.

LOCOMOTIVE FRAME. Locomotive Frame Welding. A. F. Dillon. Welding Engr., vol. 8, no. 5, May 1923, pp. 19-20 and 32, 6 figs. Locomotive frame welding by oxy-acetylene process; welder must have room to handle torch comfortably; welders work in shifts.

PROGRESS. Progress in Oxy-Acetylene Metal Work (Fortschritte in der autogenen Metallbearbeitung). C. Ad. Dittmann. Werkstattstechnik, vol. 17, no. 9, May 1, 1923, pp. 266-267, 6 figs. Describes apparatus for cutting of rivet heads, and for welding of copper tubes and sheets, armored cutting burners, safety against strike-back of flame.

STORAGE TANKS. Fabricating Storage Tanks by Oxy-Acetylene Welding. Acetylene Jl., vol. 24, no. 12, June 1923, pp. 583-586, 7 figs. How one producer of gasoline storage tank has speeded up output and increased economy in his plant; construction methods for underground, rectangular, and large storage tanks, layout of welding shop; methods of testing.

P

PAINTS

MINERAL SPIRITS FOR THINNING. United States Government Specification for Volatile Mineral Spirits for Thinning Paints. U. S. Bur. of Standards—Circular no. 98, Feb. 28, 1923, 10 pp., 2 figs. Specification officially adopted by Fed. Specifications Board for use of departments and independent establishments of Government in purchasing.

WHITE PIGMENTS. Brightness, Whiteness and Hiding Power of Opaque White Pigments, Paints and Enamels. H. A. Gardner and P. C. Holdt. Paint Mfrs. Assn. of U. S., Sci. Section—Circular no. 17, Apr. 1923, pp. 153-182, 12 figs. Experimental results.

PIERS

CONSTRUCTION. Construction of Ballantyne Pier, Vancouver, B.C., A. L. Harvey. Can. Engr., vol. 44, no. 21, May 22, 1923, pp. 509-512, 6 figs. General layout, dredging and filling, details of piers and pier construction, etc.; pier is 1200 ft. long and 341 ft. wide; gravel fill with concrete deck on each side carried on two lines of timber and three lines of concrete piers; reinforced-concrete sheds.

PILES

DRIVING. How the 250-Foot Piles for One of the Ventilating Shafts of the Hudson River Vehicular Tunnel were Driven, Frank W. Skinner and S. G. Roberts. Compressed Air Mag., vol. 28, no. 6, June 1923, pp. 524-526, 7 figs. Details of work involved.

PLANERS

SIDE. A Modern Side Planing Machine. Brit. Machine Tool Eng., vol. 2, no. 21, May-June 1923, pp. 628-631, 9 figs. Points out advantages of this type of machine and variety of work it can deal with.

PORTS

BALTIMORE. American Port Equipment and Service. Am. Shipg., vol. 17, no. 4, Apr. 1923, pp. 20-23, 5 figs. Descriptive data of the Port of Baltimore.

POWER FACTOR

SYNCHRONOUS MOTORS. Compensating Phase Displacement in Industrial Electric Systems (La compensation du dephasage dans les réseaux électriques industriels), J. Dardenne. Revue Générale de l'Electricité, vol. 13, no. 19, May 12, 1923, pp. 781-786, 4 figs. Discusses optimum power factor for synchronous motors running light to produce reaction current.

POWER PLANTS

SOLAR. The Berland-Caufourier Solar Power Plant, P. Caufourier. Mech. Eng., vol. 45, no. 6, June 1923, pp. 364-365, 2 figs. Describes combination of Caufourier self-vaporizer for generation of steam from water at temperatures of 50 to 75 deg. cent. and Berland system of mirrors; project for application of this type of power plant has been worked out at Touggourt oasis, which calls for solar power plant with mirror area of 2400 sq. m., and power output per year of 300,000 kw-hr. Translated from Génie Civil, vol. 82, no. 14, Apr. 7, 1923, p. 327.

POWER TRANSMISSION

APPARATUS, SAFETY CODE FOR. Safety Code for Mechanical Power-Transmission Apparatus. Mech. Eng., vol. 45, no. 6, June 1923, pp. 384-385. Code now proposed for general adoption by industrial accident boards and commissions of various states.

PRESSWORK

METHODS, PRESSED-STEEL PLANT. Practice of a Pressed Steel Plant, Fred R. Daniels. Machy. (N. Y.), vol. 29, no. 10, June 1923, pp. 790-793, 10 figs. Methods employed by New England Pressed Steel Co. Sheet-metal drawing performed by dies of unusual design.

PRODUCER GAS

PULVERIZED-COAL. Producer Gas from Powdered Coal, R. T. Haslam and Louis Harris. Indus. & Eng. Chem., vol. 15, no. 4, Apr. 1923, pp. 355-357, 1 fig. Report of experiments carried out to find reason for lack of development of process, and, if possible, to devise means for overcoming difficulties.

PROFILING

METHODS. Effecting Profiling Methods, J. Booth. Machy. (Lond.), vol. 22, no. 558, June 7, 1923, pp. 299-300, 5 figs. Describes tools designed to produce pieces with correct outline of profile and accurate relation of profile to other characteristics.

PULLEYS

BROKEN, REPAIR OF. How to Repair and Balance a Broken Belt Pulley. Gustav H. Radebaugh. Coal Age, vol. 23, no. 24, June 14, 1923, pp. 969-972, 20 figs. Method of balancing pulley; preventing belt from slipping, covering pulley for greater adhesion.

PULVERIZED COAL

ADVANTAGES AND TESTS. Advantages to be Gained from Pulverizing Canadian Fuels. H. D. Savage. Eng. Jl., vol. 6, no. 6, June 1923, pp. 271-280, 5 figs. Review of practical results in existing installations and operating tests with various powdered fuels.

FIRING. Pulverized Coal Firing at Plant of Société Anonyme Ougree-Marihaye, Ougree, Belgium [Installation de chauffage par combustible pulvérisé aux établissements de la Société Anonyme Ougree-Marihaye Ougree (Belgique)], P. Butez. Chaleur et Industrie, vol. 4, no. 36, Apr. 1923, pp. 327-331, 6 figs. partly on supp. plate. Describes plant constructed on Quigley system, including pulverizers, conveying and distribution, and data of operations.

The "Lopulco" System of Pulverized-Fuel Firing. Iron & Coal Trades Rev., vol. 106, no. 2882, May 25, 1923, p. 790, 1 fig. Describes boiler house being built and equipped with Lopulco system for Société Anonyme Union d'Électricité, Paris; details of system; power consumed by system for preparation of coal, delivering it to burners, including pulverizing, air separating, drying, and conveying, will not exceed 19½ kw.-hr. per ton of coal burned. See also description by David Brownlie in Power Engr., vol. 18, no. 207, June 1923, pp. 205-208 and 224.

The Technique of Powdered Fuel Firing, Henri Verdinne. Fuel in Sci. & Practice, vol. 2, no. 5, June 1923, pp. 146-151. Inflammability of dust cloud; degree of pulverization and limiting rate of fall of particles; practical difficulties. Translated from Revue Universelle des Mines, Apr. 1923.

PUMPS

PNEUMATIC DISPLACEMENT. A New Pneumatic Displacement Pump. Power Engr., vol. 18, no. 207, June 1923, pp. 231-232, 1 fig. Aeroflux pump suitable for comparatively small units, special feature of which lies in patented valve mechanism.

R

RADIOTELEPHONY

AMPLIFIERS. Description and Operation of an Autio-Frequency Amplifier Unit for Simple Radio Receiving Outfits. U.S. Bur. of Standards—Circular, no. 141, Mar. 24, 1923, 18 pp., 4 figs. Description of parts of complete radio-receiving station; assembly and wiring; connections; operation; cost of parts.

RADIOTELEGRAPHY

ANTENNAS. Radiogoniometric Frame Antennas (Compensation des cadres radiogoniométriques), Rene Mesny. Revue Générale de l'Électricité, vol. 13, no. 19, May 12, 1923, pp. 773-780, 5 figs. Electric asymmetry in frame antennas; radiogoniometric equations; measurement of radiation; compensation of rotating field; rotating field at night.

STATIONS. The Lyon Radiotelegraph Station (La station radiotélégraphique de Lyon), H. Ballet. Annales des Postes, Télégraphes et Téléphones, vol. 12, no. 5, May 1923, pp. 535-564, 9 figs. Origin, development and present condition; design and equipment, including antennas, poles, lines, etc.; sources of energy.

RAILS

PRESSURE OF WHEELS ON. Measurement of Pressure of Wheels on Rails on Railway Tracks (Messungen des Druckes zwischen Rad und Schiene am Eisenbahngleis), Saller. Zentralblatt der Bauverwaltung, vol. 43, no. 37-38, May 9, 1923, pp. 220-222, 1 fig. Reviews development of problem; calculations based on oscillation of car springs; optical measurement; measurement of oscillation of spring-suspended cars.

RE-ROLLING. The Re-rolling of Old Rails (Das Wiederverwalzen alter Eisenbahnschienen), A. Nöll. Stahl u. Eisen, vol. 43, no. 19, May 10, 1923, pp. 617-624 and (discussion) 624-625, 15 figs. Operation of roll with indirect pressure; calibration for re-rolling in inclined position according to Dickmann process; influence of strength factors; economic factors.

RAILWAY CONSTRUCTION

ECONOMICS. Notes on the Economics of Railroad Construction, Maintenance and Operation, F. S. Stevens. New York R. R. Club—Official Proc., vol. 33, no. 6, Apr. 20, 1923, pp. 7039-7046. Importance of light grades; slow-speed continuous train movement; terminal problem; steam vs. electric locomotives; track maintenance; super-elevation of rail on curves. Author foresees necessity for use of wider gage. See also (discussion) pp. 7046-7061.

RAILWAY ELECTRIFICATION

VIRGINIAN RY. Virginian to Electrify Heavy Grade Division. Ry. Elec. Engr., vol. 14, no. 5, May 1923, pp. 131-132, 2 figs. Project will include 134 mi. of line and will cost $15,000,000; single-phase system will be used.

RAILWAY MANAGEMENT

STAFF RECORDS MAINTENANCE. The Maintenance of Railway Staff Records. Ry. Gaz., vol. 38, no. 19, May 11, 1923, pp. 719-720, 6 figs. Card-index system of maintaining staff records is adopted in western division of Lond., Midland & Scottish Ry.; greater facility of reference, improved accessibility and clearer indication are among advantages claimed, as compared with old book method.

RAILWAY OPERATION

TRAIN ACCIDENTS. Train Accidents in Great Britain, George Hold. Ry. Signal Engr., vol. 16, no. 6, June 1923, pp. 250-252. Analysis made covering 20-year period; better instruction, supervision and discipline suggested as remedies. (Abstract.) Paper presented before Instn. Ry. Signal Engrs. of Great Britain.

TRAIN LOADING. Train Loading—A Problem for the Dispatcher, O. O. Carr. Ry. Rev., vol. 72, no. 20, May 19, 1923, pp. 850-852. Methods for enforcing most economical train loading.

RAILWAY REPAIR SHOPS

LOCOMOTIVE. A Modern Medium-Size Shop at Cheyenne. Ry. Mech. Engr., vol. 97, no. 6, June 1923, pp. 325-333, 14 figs. Union Pacific makes 15 classified locomotive repairs a month in new plant employing 570 men.

LOCOMOTIVE. Factors in the Location and Lay-out of Locomotive Repair Shops, H. L. Cole. Ry. Board of India (unofficial publication), Tech. Paper, no. 232, 1922, 71 pp., 13 figs. (See also supp. paper including 24 plates). Classification of repair shops and repairs; location and types of main repair shops; grouping of shop buildings and of machine tools; engine mileage and frequency of shopping; shop repairs and traffic humps; capacity in relation to pit accommodation and to personnel; trade proportions and man-hours per engine repaired; capacity in relation to machine-tool equipment; production. Shop layout and system at Stratford shops of Grand Trunk Ry.; examples of locomotive repair schedules.

RAILWAY SHOPS

CAR. Steel-Car Construction at the Angus Shops of the Canadian Pacific Railway, Montreal, H. R. Naylor. Mech. Eng., vol. 45, no. 6, June 1923, pp. 349-352, 7 figs. Describes shop completely, giving particulars regarding its layout, crane facilities, machine equipment, etc.; various machining operations and jig method of car assembly, first put into practice at this shop, and methods used in final erection and finishing of cars. (Abridged.)

RAILWAY SIGNALING

AUTOMATIC BLOCK. C. & O. Installs New Signaling with Train Control. Ry. Age, vol. 74, no. 27, June 9, 1923, pp. 1357-1360, 10 figs.; also Ry. Signal Engr., vol. 16, no. 6, June 1923, pp. 243-248, 13 figs. Three-indication color-light automatic block signals operated by alternating current, together with ramps and control equipment for automatic train control, installed on 40 mi. of single track between Charlottesville, Va., and Staunton.

INDICATOR, D. C. Direct Current Relays. Am. Ry. Assn. (Signal Section)—Proc., Mar. 1923, pp. 422-434. Specification for d. c. indicator.

INTERLOCKING. B. R. T. Automatic Interlocking, A. A. Roberts. Ry. Signal Engr., vol. 16, no. 6, June 1923, pp. 253-255, 3 figs. Switch, signals and train stop controlled automatically by train movement, introducing saving of $390 a month.

SINGLE-TRACK. Economics of Railway Signaling—Committee XIX. Am. Ry. Assn. (Signal Section)— Proc., Mar. 1923, pp. 386-397, 1 fig. Description and discussion of proposed plan for operation of single-track line by signal indication.

RAILWAY TRACK

GAGE WIDENING. Widening the Gauge, F. Lavis. New York R. R. Club—Official Proc., vol. 33, no. 6, Apr. 20, 1923, pp. 7046-7050. Discussion based on suggestion in paper by F. S. Stevens in same journal that it may in future be desirable to widen gage of railroads in order to permit haulage of heavier trains. See also articles entitled, Effect on Locomotive Design, by James Partington, pp. 7050-7052, and Wider Gauge and Train Speeds, W. E. Symons, pp. 7052-7053, bearing on same subject.

RAILWAYS

VALUATION. Federal Valuation of Railroads and Its Results, W. A. Van Hook. Eng. News-Rec., vol. 90, no. 24, June 14, 1923, pp. 1048-1049. Outline of what has been accomplished to date and what use will be made of valuation figures.

REFRACTORIES

MANUFACTURE, U. S. Manufacture of Refractories in America, A. F. Greaves-Walker. Iron & Coal Trades Rev., vol. 106, no. 2879, May 4, 1923, p. 631. Processes for fireclay, silica, and magnesite and chrome products. (Abstract.) Paper read before Ceramic Soc.

REFRIGERATING MACHINES

SMALL AUTOMATIC. Small Automatic Refrigerating Installations. Refrig. Eng., vol. 9, no. 11, May 1923, pp. 340-342, 4 figs. Describes small automatic machine, known as "Autofrigor," built by Escher, Wyss & Cie., Zurich, its construction, performance and application. Translated from Revue Générale du Froid, Jan.-Feb. 1923.

REFRIGERATING PLANTS

RADIATORS, CAST-IRON. Cast-Iron Radiators for Refrigerating Coils, H. J. Macintire. Power, vol. 57, no. 23, June 5, 1923, pp. 896-897, 4 figs. Points out advantages of radiator section for refrigeration, rather than piping; pressure tests of section; field results.

UNIFLOW STEAM ENGINE IN. The Uniflow Steam Engine. Ice & Cold Storage, vol. 26, no. 302, May 1923, pp. 112-113. Discusses use of uniflow steam engine as prime mover for refrigerating plants.

RESEARCH

HIGH-TEMPERATURE. Laboratory Apparatus for Heating to High Temperatures (Les appareils de laboratoire pour le chauffage aux hautes températures), M. Garvin and Georges Chaudron. Chimie & Industrie, vol. 9, no. 4, Apr. 1923, pp. 647-650, 6 figs. Fusion in vacuum of steel samples for studying refining of impurities; fusibility of very refractory metals.

RIVERS

OVERFLOW CONTROL. Floods and Irrigation in the Sabana of Bogota (Estudio sobre la solucion que conviene dar al problema de las inundaciones y riegos en la Sabana de Bogota), Enrique Uribe Ramirez. Anales de Ingenieria, vol. 30, nos. 355-357, Oct.-Dec. 1922, pp. 118-163, 10 figs. Hydrographic data of Bogota river; topographical maps; flow gaging; proposed control of floods.

ROAD CONSTRUCTION

CANYON-SIDE ROAD. Construction Methods on a Canyon-Side Road in Wyoming R. L. Silver. Eng. News-Rec., vol. 90, no. 23, June 7, 1923, pp. 988-991, 7 figs. Side hill cuts in solid and loose rock slopes involved coyotehole blasting, tunneling granite and diorite and blasting talus for steam shovels.

MACHINES. Road Material Preparing Plant. Engineering, vol. 115, nos. 2996 and 2997, June 1 and 8, 1923, pp. 682-683, 9 figs. Describes some of machines exhibited and tried out at demonstration in connection with summer meeting of Instn. Municipal & County Engrs.

PLANT AND APPLIANCES. Plant and Appliances for Road Construction and Maintenance. Quarry & Surveyors' & Contractors' Jl., (Roads Constrn. Section), vol. 28, no. 315, May 1923, pp. 3-20, 28 figs. Review of various types of plant and appliances introduced to assist roadmakers.

VICTORIA, B. C. Road Construction in Victoria County, Ont. Can. Engr., vol. 44, no. 21, May 22, 1923, pp. 513-516. Review of construction and maintenance operations for last season; rules and regulations for use of foremen and others.

ROADS, CONCRETE

CEMENT CONCRETE. Modern Developments in Methods of Constructing Cement Concrete Pavements, E. G. Willemin. Can. Engr., vol. 44, no. 19, May 8, 1923, pp. 480-482. Preparation of subgrade, manipulation of materials and finishing surface; transportation.

FRENCH EXPERIMENTS. French Experiments in Concrete Paving, M. Varview and E. Nicolas. Eng. & Contracting, (Roads & Streets), vol. 59, no. 6, June 6, 1923, pp. 1265-1267. Experiments in mixing aggregate with material during rolling; in spreading mortar on surface; with special cement; reinforced concrete surfacing, Pont-à-Mousson system; concrete surfacing into which materials are set in form of mosaic work. Paper presented before Int. Road Congress.

ROCK DRILLS

ROTATION MECHANISMS. Rotation Mechanisms for Rock Drills, Royal J. Day. Eng. & Min. Jl.-Press, vol. 115, no. 23, June 9, 1923, pp. 1017-1024, 15 figs. Describes devices developed to impart rotary movement to steel of power-operated drills; piston and hammer types considered.

ROLLING MILLS

BLOOM-CHARGING MACHINE. Ground Type Bloom-Charging Machine. Iron & Coal Trades Rev., vol. 106, no. 2879, May 4, 1923, p. 633, 3 figs. Duty is to take bloom from press and charge it into reheating furnace, and to deliver reheated pressing to disk mill.

ELECTRICALLY DRIVEN. Electric Mill Drive Is Efficient, Henry F. Davis. Iron Trade Rev., vol. 72, no. 22, May 31, 1923, pp. 1611-1614. Bar-mill equipment installed in East Chicago plant in 1921 has shown satisfactory and economical operation; slow-speed direct-drive motor a features; main and auxiliary apparatus. (Abstract.) Paper presented before Am. Iron and Steel Inst.

ROOF TRUSSES

REPAIRING. Method of Repairing Roof Trusses. Eng. and Contracting (Buildings), vol. 18, no. 5, May 23, 1923, pp. 1152-1154, 3 figs. How decaying ends of heavy timber trusses were replaced by new construction.

RUBBER INDUSTRY

MECHANICAL PROBLEMS. Some Mechanical Problems in the Rubber Industry, H. C. Young. Instn. Mech. Engrs. Proc., no. 2, Jan. 1923, pp. 213-279 and discussion, 279-300. 31 figs. General factory design, heating, ventilation and dust, sweeping-process powders, washing and washers, dryers, automatic mixers, standard mills, mill practice, vulcanization plant, etc.

S

SAFETY

CODES. The Development of Industrial Safety Codes, M. G. Lloyd. Mech. Eng., vol. 45, no. 6, June 1923, pp. 356-357. After giving statistics showing need for accident-prevention work from both humanitarian and economic viewpoint author shows value of state inspections and national codes; presents brief history of Am. Eng. Standards Committee's activity in this field and of Safety Code Correlating Committee outline of manner in which safety codes are now formulated.

INDUSTRIAL. Industrial Safety. Int. Labour Rev., vol. 7, no. 2-3, Feb.-Mar. 1923, pp. 402-417. Principles of accident prevention; accident prevention and inspection in Great Britain, Switzerland, Austria and Belgium, German mining accidents, rescue work and accident insurance.

SAND

DREDGING, DRAGLINE. River Sand Plant With Long Span Cableway, Arthur G. Wilson. Cement Mill and Quarry, vol. 22, no. 9, May 5, 1923, pp. 37-38, 3 figs. General layout of Tell City Sand and Gravel Co.'s plant at Tell City, Ind., including description of Sauerman dragline cableway excavator, bucket of which is of 1¼ cu. yd. capacity.

HYDRAULICKING METHODS. Mining, Washing and Loading Sand Hydraulically. Rock Products, vol. 26, no. 11, June 2, 1923, pp. 38-40, 8 figs. Operations of Atlanta Sand and Supply Co. of Atlanta, Ga., at Galliard and Rollo, Ga.: hydraulicking method employed at both; same water used in digging material is used to convey, wash and load it direct into cars for shipment.

SAND, MOLDING

PERMEABILITY. Mathematical and Experimental Contribution to the Study of Foundry Sands (Contribution mathématique et expérimentale à l'étude des sables en fonderie), Georges-Louis Borne. Fonderie Moderne, vol. 17, May 1923, pp. 151-154, 4 figs. Discusses permeability, its definition and method of determination, giving examples of calculation.

SCREW MACHINES

BRASS VS. STEEL PRODUCTS. Reducing Screw Machine Product Costs By Substituting Brass for Steel, Harold L. Burlingame. Am. Mach. vol. 58, no. 23, June 7, 1923, pp. 823-824, 1 fig. Savings result from higher operating speeds; reduction in cost of tool equipment; limitations imposed by size of stock; salvage values of materials.

SCREW THREADS

TOLERANCES, GERMAN STANDARDS FOR. Remarks on German Industrial (NDI) Standards for Screw Thread Tolerances (Erläuterungen zu den Normenblättern der Gewindetoleranzen), G. Berndt. Werkstattstechnik, vol. 17, no. 6, Mar. 15, 1923, pp. 161-175, 7 figs. Deals with tolerances and thread fits; metric and Whitworth threads; control of screws; accuracy of gages. Presents NDI standard tables for metric and Whitworth threads.

SCREWS

WOOD. U.S. Government Specification for Wood Screws. U.S. Bur. of Standards—Circular, no. 140, Mar. 26, 1923, 6 pp. Specification officially adopted by Fed. Specification Boards for use of departments and independent establishments of Government in purchasing.

SEAPLANES

TESTING MODELS OF. Ten Years' Testing of Model Seaplanes, G. S. Baker. Roy. Aeronautical Soc.—Jl., vol. 27, no. 149, May 1923, pp. 224-238 and (discussion) 239-243, 6 figs. partly on supp. plate. Account of beginnings of tank tests of seaplane hulls carried out under authority of advisory Committee for Aeronautics in 1912. Differences between model tests and machine; method of estimating machine data from model tests, and checks upon such estimates obtained by actual measurement on machines. List of published papers giving results of tests carried out in Wm. Froude National tank.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. The Activated Sludge Process, Withington Works, Edward Ardern and William T. Lockett. Chem. and Industry, vol. 42, no. 21, May 25, 1923, pp. 225T-230T, 1 fig. Summary of information accumulated as result of close study of operation of plant since January 1921.

METHOD. Modern Trend in Sewage Disposal, Geo. G. Nasmith. Contract Trec. and Eng. Rev., vol. 37, no. 32, May 30, 1923, pp. 141-145. Review of methods and results; preliminary treatment of sewage, grit chambers, treatment of sewage imhoff tanks, complete treatment, trickling filters, activated sludge process, sludge disposal, dilution as method of disposal.

SEWERS

DESIGN. Essential Points in Sewer Design. Contract Rec. and Eng. Rev., vol. 37, nos. 18 and 19, May 2 and 9, 1923, pp. 402-407 and 434, 8 figs. Cross sections that are generally used and advantages and disadvantages pertaining to them; influence of soil and other conditions on construction. From report before Am. Concrete Inst.

SILICA

DIATOMACEOUS EARTH. Mining Diatomaceous Earth at Lompoc, Cal., E. D. Gardner. Cement, Mill and Quarry, vol. 22, no. 9, May 5, 1923, pp. 41-42, 1 fig. Composition, uses and mining methods of diatomaceous earth or kieselguhr of Lompoc, Cal.

SOLDERING

PROCESSES. The Soldering of Metals, Wm. Mason. Metal Industry (Lond.), vol. 22, no. 19, May 11, 1923, pp. 469-471. Explains processes of soldering various metals and gives constituents of fluxes in general use in tabular form.

SOLDERS

ALUMINUM. Solders for Aluminum. U.S. Bur. of Standards—Circular, no. 78, Mar. 20, 1923, 14 pp. 7 figs. Results of recent tests of several new solders. Bibliography.

SOOT BLOWER

MECHANICAL. Improvements in Mechanical Soot Blowers by the Bayer Company, W. F. Shaphorst. Steam, vol. 31, no. 4, Apr. 1923, pp. 105-108, 7 figs. Revolving soot-blower element developed by Bayer Co. that overcomes temperature difficulties by use of monel metal, and possesses other valuable features.

STANDARDIZATION

AUTOMOBILE PARTS. Eliminating Needless Cost and Confusion. D. G. Baird. Indus. Management (N.Y.), vol. 65, no. 6, June 1923, pp. 334-337, 2 figs. How General Motors Corp. reduced number of parts in its products from 12,000 to 2,100.

RAILWAYS. Simplification—The New Fundamental in Business, Ray M. Hudson. Ry. Rev., vol. 72, no. 23, June 9, 1923, pp. 962-963, 1 fig. Significance of standardization to railways as largest consumers and transporters of materials.

STEAM

GENERATION. Some Elements of Efficient Steam Generation, David Brownlie. Combustion, vol. 8, no. 4, Apr. 1923, pp. 237-241, 2 figs. Continuous flue gas analysis.

STEAM-ELECTRIC PLANTS

ASBESTOS MILL. New Johns-Manville Power Plant Designed by Staff Engineers. Power Plant Eng., vol. 27, no. 12, June 15, 1923, pp. 609-618, 20 figs. New plant built for manufacture of asbestos products supplied by 4100 hp. of boiler capacity and 5000 kva. generator capacity.

DETROIT EDISON. New Marysville Plant Handles Increasing Demand, Paul W. Thompson. Power Plant Eng., vol. 27, no. 11, June 1, 1923, pp. 573-580, 7 figs. Two units at new Detroit Edison plant are supplied by four 2821-hp. boilers: details of coal handling, boiler, turbine and condenser rooms, switch house and auxiliary system; operation.

HELL GATE, NEW YORK. Alternating Current in New York, Frank W. Smith. Elec. World, vol. 81, no. 21, May 26, 1923, pp. 1190-1199, 4 figs. Additions to Hell Gate station of United Elec. Light & Power Co.; interesting features of new equipment.

LANSING, MICH. Municipal Power Plant, O. E. Bulkeley. Power, vol. 57, no. 25, June 19, 1923, pp. 968-976, 7 figs. Plant operated by Board of Commissioners, initial installation, 25,000 kw.; steam supplied to turbines at 275-lb. pressure and 200-deg. superheat; six 15,000-sq. ft. V-type boilers, each fired by 16 retort underfeed stokers.

PITTSBURGH, PA. Development of the Colfax Station of the Duquesne Light Company, J. M. Graves, Elec. Jl., vol. 20, no. 6, June 1923, pp. 198-201, 3 figs. Program for extension of Colfax Station makes provision for addition of a 60,000-kw. unit, consisting of two independent turbo-generators of 30,000-kw. capacity each, with a high-tension transformer unit; details of present and new equipment.

PUEBLO, COLO. New Plant for Pueblo, Colorado, Power, vol. 57, no. 24, June 12, 1923, pp. 922-926, 6 figs. Initial 7500-kw. unit of modern turbine plant installed; special coal and ash handling; evaporator system for make-up water; unique method of driving circulating-water tunnel.

STEAM ENGINES

HIGH VACUUM. Vacuum and Reciprocating Engines, D. G. McNair. Practical Engr. vol. 67, no. 1889, May 10, 1923, pp. 261-262, 1 fig. Points out that with reciprocating engines there is decided limit beyond which vacuum should not be forced, and explains reason for this limitation.

RECIPROCATING. Latest Development in Reciprocating Steam Engines From the Thermoelectric Standpoint (Die letzte Entwicklung der Kolbendampfmaschine vom warmetechnischen Standpunkt betrachtet), P. Stephan. Wärme, vol. 46, no. 15, Apr. 13, 1923, pp. 151-154, 10 figs. Clearance; entropy temperature diagram; compound engines; marine engines; superheating d.c. machines.

STEAM PIPES

HIGH-PRESSURE. Valves and Piping for High Pressure Steam Lines, D. H. Skeen. Power Plant Eng., vol. 27, no. 11, June 1, 1923, pp. 565-566, 3 figs. Steam pressures of 600 to 1200 lb. and correspondingly high temperatures have brought about radical changes.

STEAM TRAPS

MICHAELIS. An Improved Michaelis Steam Trap, C. C. W. Ganswijk. Int. Sugar Jl., vol. 25, no. 290; Feb. 1923, pp. 71-72, 1 fig. Describes improved apparatus for removal of condensed water from steam drums of evaporators.

STEAM TURBINES

LEAKAGE IN MULTI-STAGE IMPULSE. Disphragm Leakage in Multistage Impulse Turbines, Albert J. Jadot. Sibley Jl. Eng., vol. 37, no. 5, May 1923, pp. 110-114, 6 figs. Calculation of losses due to leakage.

REACTION. Reaction Turbine Uses Axial Clearance in High-Pressure Blading. Power, vol. 57, no. 22, May 29, 1923, pp. 839-841, 7 figs. New features incorporated in design of 5000-kw. turbines installed in municipal plant of Ashtabula, O.

VALVE GEARS, HUNTING OF. Steam-Turbine Governor and Valve Gears—Characteristics of Hunting, Eustis H. Thompson. Power, vol. 57, nos. 23, 24 and 25, June 5, 12 and 19, 1923, pp. 898-901, 2 figs., 931-933, 2 figs. and 984-986, 4 figs. June 5: Governor operation with slow changes of load is contrasted with difficulties encountered when sudden large load variations occur; general conditions known as "hunting" affects a.c. and d.c. units differently. June 12: Additional causes of hunting. June 19: Special troubles of hydraulic and mechanical types.

STEEL

ALLOY STEELS. *See Alloy Steels.*

AUTOMOBILE SHEETS, DEFECTS IN. Defects in Automobile Steel Sheets, George F. Comstock. Iron Age, vol. 111, no. 21, May 24, 1923, pp. 1475-1480, 39 figs. Causes explained by metallographic examination of 20 samples.

CARBON, MIGRATION TO INGOT IRON. Migration of Carbon from Steel to Ingot Iron, O. Z. Klopsch and H. F. Roberts. Am. Soc. Steel Treating—Trans., vol. 3, no. 8, May 1923, pp. 855-863, 16 figs. Points out possibilities of obtaining quantitative results of rate of migration and depth of penetration; results obtained show definitely that there is transfer of carbon from steel to carbonless ingot iron. Photomicrographs.

CRYSTALLIZATION, DELAYED. Delayed Crystallization in the Carbon Steels—The Formation of Pearlite, Troostite, and Martensite, A. F. Hallimond. Am. Soc. Steel Treating—Trans., vol. 3, no. 9, June 1923, pp. 931-943, 1 fig. Deals with application of supersaturation theory of steel. Bibliography.

FATIGUE TESTS. The Mechanics of the Wöhler Rotating Bar Fatigue Test, W. Mason. Engineering, vol. 115, no. 2996, June 1, 1923, pp. 698-699, 5 figs. Relation between lateral deflection and deflection in plane of bending of Wöhler rotating bar is discussed and attempt is made to ascertain if there is constant ratio between lateral deflection and width of hysteresis loop.

SPARK TESTS. Spark Tests for Steel, S. P. Rockwell. Machy. (N.Y.), vol. 29, no. 10, June 1923, pp. 779-780, 2 figs. Describes application of spark test.

STEEL CASTINGS

GRINDING. Grinding Manganese-Steel Castings, Howard Campbell. Am. Mach., vol. 58, no. 22, May 31, 1923, pp. 783-786, 11 figs. Grinding operations on manganese steel parts; grinding machines made out of lathes, planers and boring machines; methods and equipment.

STEEL, HEAT TREATMENT OF

TEMPERING. Tempering Very Soft Steel at Very High Temperature (Sur la faculté de trempe de l'acier extrafoux à très haute température), M. Sauvageot and H. Delmas. Académie des Sciences—Comptes Rendus des Séances, vol. 176, no. 19, May 7, 1923, pp. 1310-1313. As carbon content of steels decreases, critical temperature of temperingrises very rapidly and marten site obtained has decreasingly small hardness, hence it is often impossible to harden pure iron at very high temperatures.

STEEL MANUFACTURE

TEMPERATURE, INFLUENCE OF. Influence of Temperature in Steel Making Processes. Ch. Clausel. Iron Age, vol. 111, no. 24, June 14, 1923, pp. 1710-1711. Poor results follow very high working temperatures; iron oxide and its solubility; phosphorus as deoxidizer. Abstracted and translated from Revue de Métallurgie, Nov. 1922.

STOKERS

UNDERFEED. Many Features in Design of New Taylor Stoker. Power Plant Eng. vol. 27, no. 11, June 1, 1923, pp. 602-604, 3 figs. New type of H-stoker equipped with crankshaft or hydraulic drive; enclosed spur gear for crankshaft; bottom of retort formed by telescopic auxiliary pushers.

STREET CLEANING

ELECTRIC VEHICLES FOR. Electrically Driven Vehicles for Street Cleaning (Elektrisch angetriebene Fahrzeuge für die Strassenreinigung), H. Wernekke. Elektrische Betrieb, vol. 21, no. 7, Apr. 10, 1923, pp. 73-77, 12 figs. Sprinkling cars, street-washing machines, etc. with detachable two-wheel tractor; standard electric truck of Hansa-Lloyd Works.

SUBSTATIONS

AUTOMATIC. Automatic Substations and Duty Cycle of Oil Circuit Breakers. Elec. World, vol. 81, no. 23, June 9, 1923, pp. 1363-1365, 1 fig. Electrical apparatus committee of Nat. Elec. Light Assn. reports on prevailing practice in construction of industrial substations, experiences with automatic substations, agreement on duty cycle of oil circuit breakers, and revision of motor rules.

SEMI-AUTOMATIC. Distant-Controlled, Non-Overloadable „Semi-Automatic Substation. Elec. Ry. Jl., vol. 61, no. 21, May 26, 1923, pp. 873-878, 13 figs. N.Y.C. R.R. has installed in electrified zone at New York a 2000-kw. motor-generator set to raise potential 100 volts during rush hours.

SUPERPOWER

INTERCONNECTION OF SYSTEMS. Problems and Developments in the Control and Interconnection of Power Systems, H. R. Summerhayes. Gen. Elec. Rev., vol. 26, no. 6, June 1923, pp. 327-337, 8 figs. Describes problems which have to be solved when large power centers are tied together into superpower zones; control under normal and abnormal conditions.

PACIFIC NORTHWEST, SURVEY. Superpower Survey of Pacific Northwest. Elec. World, vol. 81, no. 20, May 19, 1923, pp. 1137-1138, 2 figs. Engineering investigators find that existing interconnected power systems will, through natural expansion, prove adequate for many years to needs of that part of country.

Super-Power Survey of the Pacific Northwest. Jl. Elec. & Western Industry, vol. 50, no. 9, May 1, 1923, pp. 320-329, 14 figs. Report of committee presenting present electrical development of Washington, Idaho and Oregon and its relation to their future growth.

SOCIOLOGICAL AND POLITICAL ASPECTS. Superpower—A National Resource. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 6, June 1923, pp. 645-652. Contains following articles: Power and Social Progress; Paul T. Brady; The Engineering of Superpower, R. F. Schuchardt; Su erpower as a National Policy, M. H. Aylesworth.

SURVEYING

AERIAL. Recent Experiments in Aerial Surveying by Vertical Photographs, B. Melvill Jones and J. C. Griffiths. Nature (Lond.), vol. 3, nos. 2796, June 2, 1923, pp. 745-748, 2 figs. Shows that it is possible to carry out aerial surveying by vertical photographs at rate of 100 sq. mi. of day's flying. From lecture delivered before Roy. Instn.

T

TERMINALS, RAILWAY

MAIL-HANDLING DEVICE. New Mail Handling Device at Chicago Mail Terminal. Ry. Age, vol. 74, no. 27, June 9, 1923, pp. 1385-1386, 5 figs. Describes system comprising overhead conveyor, whereby mail sacks are transported from loading dock at foot of chutes to string of mail cars and deposited into cars through any one of eight doors with aid of selective tripping device.

TEXTILE MILLS

ELECTRIC HEATING. Heating a Cotton Weave Shed by Electricity, C. T. Guildford. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 6, June 1923, pp. 582-588, 9 figs. Installation of electric heating of cotton weave shed; test of excellency of methods of estimating quantity of heat required for buildings of this kind; conditions under which electric heating in textile mill may be used.

THERMODYNAMICS

PROBLEMS. Some By-Paths in the Fundamentals of Engineering, Julius Frith and Frederick Buckingham. Engineer, vol. 135, no. 3517, May 25, 1923, pp. 544-546. Discusses terms, thermal equivalent of mechanical work, and mechanical equivalent of heat, which, author claims, do not express same thing; question of obtaining energy from compressed air.

SUPERSATURATION LIMIT. The Supersaturation Limit, H. M. Martin. Engineering, vol. 115, no. 2994, May 18, 1923, p. 607. Author compiled new tables of properties of steam at Wilson line to replace those given in his "New Theory of the Steam Turbine".

TRACTORS

TEST ANALYSIS. Nebraska Tractor-Test Analysis, Oscar W. Sjogren. Soc. Automotive Engrs.—Jl., vol. 12, no. 6, June 1923, pp. 587-594 and 609, 26 figs. Compilation of all results of tractor-testing work at University of Nebraska; author specifies equipment used, and discusses proper rating of tractors, belt speeds, weight distribution, tractive efficiency, wheel slippage, piston displacement, fuel and water consumption; comment on defects of tractors, and recommendations for remedying them.

TUNNELING

MINES. Reinforced-Concrete Section Building by the Walter and Henkel System (Der Eisenbeton-Streckenausbau der Bauart Walter und Henkel), D. R. Brenner. Gluckauf, vol. 59, no. 17, Apr. 28, 1923, pp. 410-413, 6 figs. Method capable of adaptation to local circumstances and especially suitable for high earth pressures, has been proved entirely successful.

V

VACUUM TUBES

HIGH-POWER. A New Type of High-Power Vacuum Tube (Un nouveau type de lampe à vide très puissante), M. W. Wilson. Annales des Postes, Télégraphes et Téléphones, vol. 12, no. 5, May 1923, pp. 600-611, 11 figs. Construction of vacuum tubes of more than one kilowatt and its difficulties, due to great quantity of heat it must be able to stand in operation; description of processes for production of 100 kw. tubes. From Elec. Communication, Aug. 1922.

VENTILATION

N. Y. STATE COMMISSION REPORT. The Report of The New York State Commission on Ventilation. Heat. & Vent. Mag., vol. 20, no. 5, May 1923, pp. 35-38. General plan of experiments and field investigations conducted by Commission, effect of atmospheric conditions on health, comfort and efficiency, favours window ventilation.

VOCATIONAL TRAINING

DEVELOPMENTS. Education. Int. Labour Rev., vol. 7, nos. 2-3, 4 and 5, Feb.-Mar., Apr. and May, 1923, pp. 418-442, 632-641 and 780-798. Feb.-Mar.: Vocational guidance and education in Czecho-slovakia; work of Strasburg vocational guidance office in 1922; problem of vocational ability; vocational training in various countries; workers' education in various countries. Apr.: Apprentice training in Austrian metal industry, by Fritz Rager; vocational education in United States. May: Workers' education in Sweden; proposals for chambers of crafts in France; notes on vocational guidance.

VULCANIZED FIBER

MACHINING. Machining Vulcanized Fiber, A. B. Eastman. Machy. (N. Y.), vol. 29, no. 10, June 1923, pp. 781-782. Notes on milling fiber; turning and threading; drilling and tapping; bending and forming; punching; sawing; machining in automatic machines. Further information of machining fiber described by another manufacturer.

W

WAGES

METHODS OF ESTABLISHING RATES. Methods of Establishing Wage Rates and Determining Promotions, H. P. Carruth. Paper Trade Jl., vol. 76, no. 21, May 24, 1923, pp. 49-58, 7 figs. Job analysis; basis of rating; weight factors; etc. Paper read before Tech. Assn. Pulp & Paper Industry.

OCCUPATIONAL RATING PLAN. The Occupational Rating Plan of the International Harvester Company, Arthur H. Young. Management Eng., vol. 4, no. 5, May 1923, pp. 301-306, 6 figs. Method adopted is one of purely relative values, taking prevailing community rate for common labour as base; over 900 occupations have been so classified.

PAYMENT BY RESULTS. The Future of Payment by Results, J. E. Powell. Jl. Indus. Administration, vol. 2, no. 15, Mar. 1923, pp. 67-80. Real object of payment by results; acceptability of principle; difficulties in application; influence of past practice; possibilities of stronger policy; supposed failure of individual systems.

STANDARD-HOUR SYSTEM. The Standard-Hour Plan of Wage Payment, M. E. Merriman. Management Eng., vol. 4, no. 6, June 1923, pp. 381-387. How it compares in clerical cost with other systems.

WATER PIPE

SIZES. New Charts for Calculating Pipe Sizes for Water Flow, F. E. Giesecke. Heat. & Vent. Mag., vol. 20, no. 5, May 1923, pp. 46-51, 9 figs. Describes charts and gives examples showing their use supplemented by recent test data proving their reliability.

WATER POWER

BRITISH RESOURCES. Water-Power in the British Empire, Theodore Stevens. Nature, vol. 3, no. 2792, May 5, 1923, pp. 607-609, 2 figs. Deals with reports of Water Power Committee of Conjoint Board of Scientific Societies and Board of Trade Water Power Resource Committee; hydro-electric power developments in various parts of British Empire. Lectures before Roy. Instn.

ECONOMICS. Water Power, Charles W. Kellogg. Boston Soc. Civ. Engrs.—Jl., vol. 10, no. 6, June 1923, pp. 255-266. Fundamentals in relation of water power to coal and economics of water power in general.

WATER SUPPLY

SURFACE, UNITED STATES. Surface Water Supply of the United States, 1919-1920, Nathan C. Grover. U. S. Geological Survey, Water-Supply Paper 504, 1923, 185 pp., 5 figs. Gaging-station records of St. Lawrence River basin.

WATER WORKS

DETROIT. The Detroit Water Works—A Model of Efficiency, F. H. Stephenson. Fire & Water Eng., vol. 73, no. 20, May 16, 1923, pp. 893-894 and 917-918, 4 figs. How work of department is planned; pipe-laying methods; portable lighting plants.

INTAKES. Factors in Construction of Water Works Intakes, Robert W. Angus. Can. Engr., vol. 44, no. 20, May 15, 1923, pp. 500-502, 4 figs. Relative merits of visible and submerged cribs; advantages of submerged type; protecting intake from foreign matter; intake should be of ample size and slope upward to well.

STATISTICS. Water Works Statistics. Pub. Works, vol. 54, no. 5, May 1923, pp. 174-183. Tables compiled from information furnished by superintendents of more than 600 water-works plants; mains laid in 1922; methods employed in purifying water.

WEIGHTS AND MEASURES

ULTIMATE RATIONAL UNITS. Physical Constants and Ultimate Rational Units, Gilbert N. Lewis. Lond., Edinburgh & Dublin Philosophical Mag. & Jl. Sci., vol. 45, no. 266, Feb. 1923, pp. 266-275. The metric or C. G. S. system; mechanical equivalent of heat; constant of Dulong and Petit, and gas constant; electric and magnetic units; rational unit of time new unit of mass or energy; constant of Stefan's law; Planck's constant; elimination of centimeter.

WELDING

MONEL METAL. Welding Monel Metal. Acetylene Jl., vol. 24, no. 12, June 1923, pp. 587-589, 3 figs. General instructions for welding; precautions taken for best results; welding in a New England plant.

See also Electric Welding, Electric Welding, Arc, Oxy-Acetylene Welding.

WHARVES

REINFORCED-CONCRETE. The Trafford Wharf on the Manchester Ship Canal. Engineering, vol. 115, no. 2997, June 8, 1923, pp. 703-705, 14 figs. partly on supp. plate. Features of interest are use of precast cylinders and boxes of reinforced concrete, and methods of handling and placing them in position; actual work consisted of building reinforced-concrete wharf facing, and parallel to direction of canal with foundations for warehouses extending to railway lines.

WOOD

COMPRESSIVE STRENGTH. End Bearing Strength of Wood on Surfaces Inclined to Fibres, H. H. Scofield and E. N. Burrows. Cornell Civ. Engr., vol. 31, no. 8, May 1923, pp. 98-102, 10 figs. Methods of testing conducted in University materials laboratory have established new and authoritative values of strength of wood.

WOOD PRESERVATION

MINE TIMBERS. Decay of Mine Timbers to be Fought. Mng. Congress Jl., vol. 9, no. 5, May 1923, pp. 160-161, 2 figs. Results of studies made by Forest Service, Bureau of Mines, and Min. Congress Committee.

WOODWORKING MACHINES

SURFACING AND THICKNESSING. Woodworking Machinery for Surfacing and Thicknessing. Engineering, vol. 115, no. 2994, May 18, 1923, pp. 618-620, 6 figs. Describes machine suitable for surface-planing work and for planing material to definite thicknesses.

X

X-RAYS

TUBES. X-Ray Tubes and Their Construction (Les tubes à rayons X et leur construction), M. Johannes. Société Française de Electriciens. Bul. vol. 2, no. 20, Dec. 1922, pp. 531-580, 19 figs. Reviews x-rays from physical stand-point, production of x-rays, electric discharge in rarefied gases, construction and manufacture of x-ray tubes.

Engineering Index

Supplementary List

B

BEARINGS, BALL

ROLLER AND. Underlying Principles of and Recent Experiences with Ball and Roller Bearings (Grundsatzliches und neue Erfahrungen an Kugel- und Rollenlagern). A. Riebe. Motorwagen, vol. 26, no. 4, Feb. 10, 1923, pp. 49-58, 19 figs. Discusses their use in automobile construction. Address read before (German) Automobile and Aeronautical Soc.

BLAST FURNACES

BANKING. Banking a Blast Furnace. Iron Age, vol. 111, no. 23, June 7, 1923, p. 1629. New method tried out in Belgium; furnace banked 18 months. Abstracted from Revue Universelle des Mines, Nov. 15, 1922, p. 317.

BOILER FURNACES

OIL-BURNING SYSTEMS. The Clyde Oil-Fuel Burning System. Engineering, vol. 135, no. 3519, June 8, 1923, pp. 611-614, 16 figs. partly on p. 608. Deals with detailed construction of several parts of plant installed in geared turbine steamship, Fezara, and describes applications of Clyde system, both for marine and industrial uses.

BOILERS, WATER-TUBE

KESTNER. A New British Boiler, C. H. S. Tupholme. Combustion, vol. 8, no. 6, June 1923, pp. 370-373, 4 figs. Describes Kestner-Ransome type boiler, employing waste heat; and its principles of operation.

C

CLAYS

PLASTICITY. Methods of Measuring the Plasticity of Clays, F. P. Hall. U.S. Bur. of Standards — Tech. Papers, vol. 17, no. 234, Mar. 22, 1923, pp. 345-366, 9 figs. Criticisms of more important methods; experimental data collected with use of Bingham plastometer, an instrument for measuring plasticity of paints, greases and other semi-rigid materials.

COKE

FOUNDRY, BEHAVIOR IN. Coke and its Behabiour in the Foundry, H. Koppers. Fuel in Sci. & Practice, vol. 2, no. 5, June 1923, pp. 160-165, 8 figs. Composition of coked fuel; process of combustion in blast furnaces and foundry cupolas; influence of coke on cast iron; combustibility of coke an important factor; slow-burning coke in foundry; proposals for new type of cupola.

CONCRETE CONSTRUCTION, REINFORCED

RADIOTELEGRAPH STATION. Reinforced-Concrete Construction Work for the Radiotelegraphic Station at Kootwijk (De werken in gewapend beton voor het station voor draadlooze telegrafie op het Kootwijksche Zand), J. Emmen. Ingenieur, vol. 38, no. 12, Mar. 24, 1923, pp. 231-237, 15 figs. Design and construction of sending station.

COPPER

REFINING PROCESSES. Copper, H. W. Miller. Mich. Technic, vol. 36, nos. 1, 2 and 3, Nov. 1922, Jan. and Mar. 1923, pp. 9-12 and 27-28, 29-30 and 41, and 30-34, Nov.: General History of industry; preparation of material for mining; series process. Jan.: Multiple process and recovery of valuable impurities. Mar.: Rolling and Manufacturing into tubing.

COPPER METALLURGY

SMELTING PLANT. Notes on the Selection of a Copper-Smelting Plant, W. A. Heywood. Instn. Min. and Metallurgy — Bul., no. 223, Apr. 1923, pp. 1-9. Notes on selection of plant; suitability of ore for direct smelting; adoption of blast furnace or reverberatory; treatment of oxidized ores by methods other than smelting; sulphide ores; converting. See also (discussion) no. 224, May 1923, pp. 1-8.

CRANES

NAVY YARD PROPELLING GEAR FOR. Flexible Propelling Gear of Large Navy Yard Crane. Eng. News-Rec., vol. 90, no. 23, June 7, 1923, pp. 1004-1006, 5 figs. Special wheel support and drive for operation on curves and to carry great load on 22-ft. wheelbase.

E

ELECTRIC MOTORS, A.C

CONNECTING. Practical Details and Tables for Laying Out Unequal Groupings of Coils, A. C. Roe. Indus. Engr., vol. 84, no. 6, June 1913, pp. 293-303 and 325, 3 figs. Deals with coils in induction motors having from 20 to 24 poles, 2- and 3-phase.

F

FLUE GASES

CINDER COLLECTION FROM. Collecting Cinders from Flue Gases, L. B. Salt. Combustion, vol. 8, no. 6, June 1923, pp. 384-387, 5 figs. Development of cinder-collection fan, action of fan.

H

HYDRO-ELECTRIC PLANTS

CALIFORNIA. Building of Largest Hydroelectric Power-house in the West. Eng. World, vol. 22, no. 5, May 1923, pp. 305-306, 3 figs. Details of design and equipment of fourth power house on Southern Cal. Edison Co.'s Big Creek-San Joaquin River project, known as Big Creek No. 3, now being constructed: length 200 ft., width 139 ft., height 110 ft.; initial installation will consist of three 35,000 hp. units which is one-half of its ultimate development.

I

INDUSTRIAL MANAGEMENT

REORGANIZATION. Turning Losses Into Profits, Rudolph Rosenthal and Geoffrey C. Brown. Management Eng., vol. 4, no. 5, May 1923, pp. 307-310, 3 figs. Authors explain how it became necessary for company making high-grade French mirror plates to change its management system from traditional form to plan that established control and made cost analysis possible.

INDUSTRIAL PLANTS

REPAIR SHOPS. Industrial Plant Repair Shop, E. J. Ford. Indus. Engr., vol. 81, no. 3, Mar. 1923, pp. 124-130, 12 figs. Details of methods employed and facilities available for maintenance of electrical equipment in 29 departments, in plant which covers 36 acres of ground.

L

LEAD METALLURGY

TREATMENT PLANT. Visit to a Well-known Lead and Antimony Works. Metal Industry (Lond.), vol. 22, nos. 18 and 19, May 4, and 11, 1923, pp. 444-446 and 477-479, 10 figs. Describes works of Cookson & Co., and methods employed in treatment of antimony and lead ores.

M

METALS

ELECTROMOTIVE FORCES. Further Experiments on the Mass of the Electric Carrier in Metals, Richard C. Tolman, Sebastian Karrer and Ernest W. Guernsey. Nat. Acad. of Sci. — Proc., vol. 9, no. 5, May 1923, pp. 166-169. Work is regarded as another fairly satisfactory demonstration of production of electromotive forces by acceleration of metallic conductor, and as indicating again that mass of carrier in metals is about the same as mass of electron in free space.

INTERNAL STRAIN. The Underlying Principles of the Processes of Internal Strain (Die Grundlagen der Verfestigungsvorgänge), J. Czochralski. Zeit. fur Metallkunde, vol. 15, no. 1, Jan. 1923, pp. 7-16, 15 figs. Based on results of cold stretching tests on copper and aluminum crystals, conclusions are drawn with regard to processes of internal strain in metallic materials, nature of strain; relation between processes of flow and strain and internal friction.

P

PISTON RINGS

MANUFACTURE. The Manufacture of Piston Rings. Machy. (Lond.), vol. 22, no. 557, May 31, 1923, pp. 261-268, 14 figs. Methods employed by British Piston Ring Co., Coventry, in manufacture of piston rings from centrifugal castings.

R

RAILWAY ELECTRIFICATION

SWITZERLAND. The Completion of the Rhaetian Railway Electrification. Engineer, vol. 135, nos. 3514 and 3515, May 4 and 11, 1923, pp. 454-466 and 474, and 492-494, 16 figs. System represents total length of track of about 280 km., and includes gradients to 4.5 in 100; whole line has been electrified single-phase system with current at 11,000 volts, $16\frac{2}{3}$ cycles being adopted. Details of power supply, distribution system overhead, equipment, communication and signaling circuits, repair-shop equipment.

RAILWAY SIGNALING

LIGHT SIGNAL. New Signals Being Installed at the Chicago Union Station, T. Holt. Ry. Age, vol. 74, no. 25, May 26, 1923, pp. 1263-1264, 3 figs. Use of five-position light indications results in maximum visibility.

ROADS, ASPHALT

PAVING MIXTURES. Plant Inspection of Asphaltic Paving Mixtures, W. J. Emmons. Eng. and Contracting (Roads and Streets), vol. 59, no. 5, May 2, 1923, pp. 999-1008. Duties of inspector with suggestions regarding procedure. (Abstract.) Bul. of Agricultural and Mech. College of Texas.

S

SPRINGS

LEAF. The Manufacture and Inspection of Leaf Springs, H. G. Peebles. Am. Soc. Steel Treating — Trans., vol. 3, no. 9, June 1923, pp. 907-917, 20 figs. Manufacture of leaf springs for automotive industry, discusses various microstructures and imperfections found in spring steels, and describes manufacturing methods, furnaces, electrical control of furnaces, mechanical quenching machines and final capacity testing of springs.

STEEL

FATIGUE TESTS. Some Fatigue Tests on Spring Steels, R. E. Lewton. Am. Soc. Steel Treating — Trans., vol. 3, no. 9, June 1923, pp. 944-953, 11 figs. Outlines procedure and subsequent results of tests made with view of determining suitable means of comparing different types of springs steels.

W

WATER-METERS

TYPES. The Present Status of Water-Meter Construction (Der gegenwaertige Stand des Wassermesserbaues), H. Duebel. Gas- u. Wasserfach, vol. 66, nos. 11, 12, 13 and 14, Mar. 17, 24, 31 and June 7, 1923, pp. 153-154, 167-169, 178-180 and 192-193, 10 figs. Notes on velocity meters, vane water-meters; regulation of velocity meters, reverse registration, room water meters; piston and disk meters.

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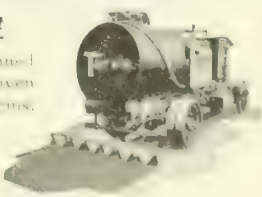

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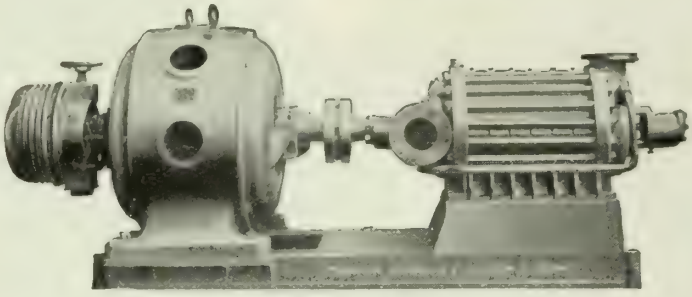

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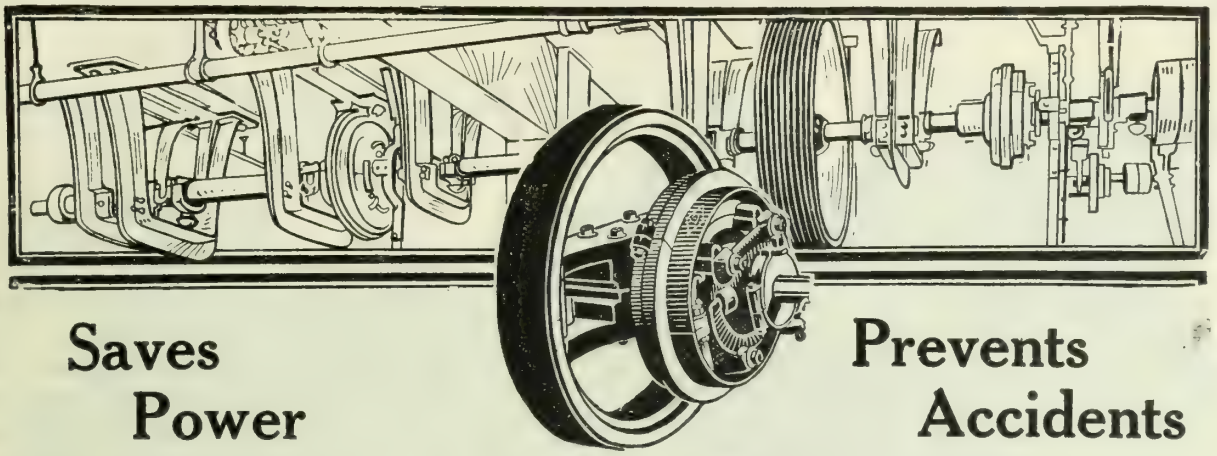

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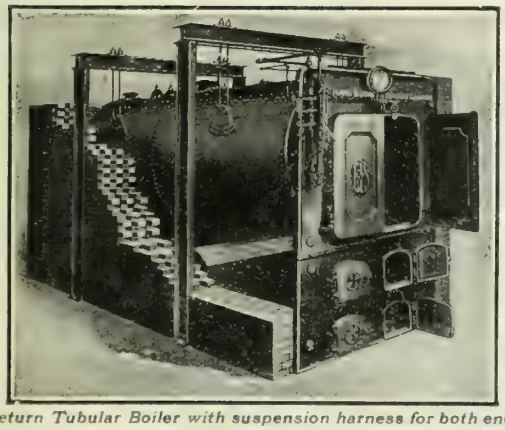

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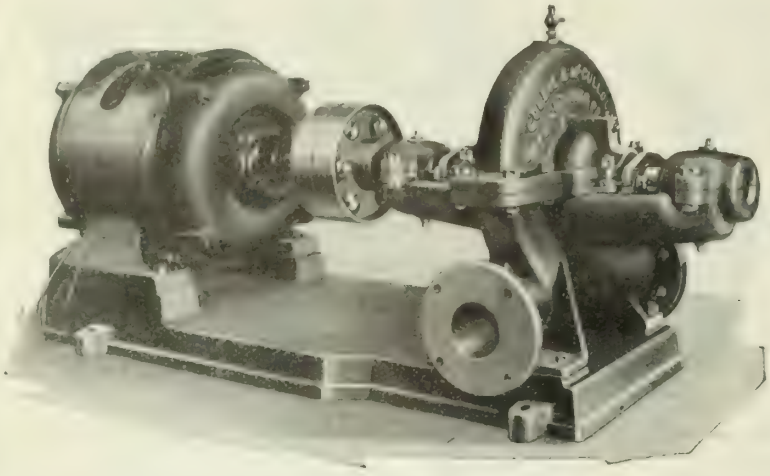

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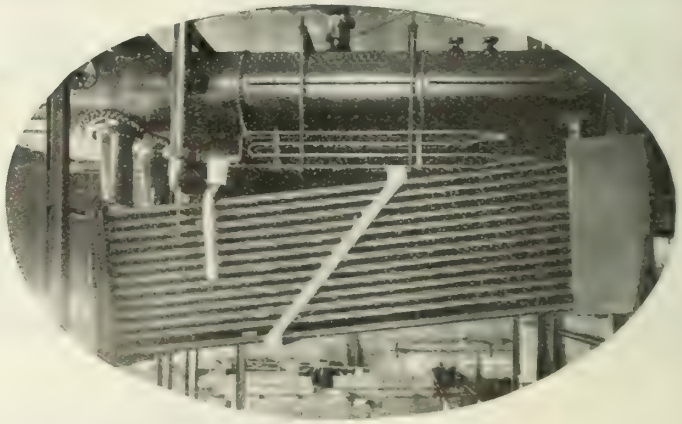

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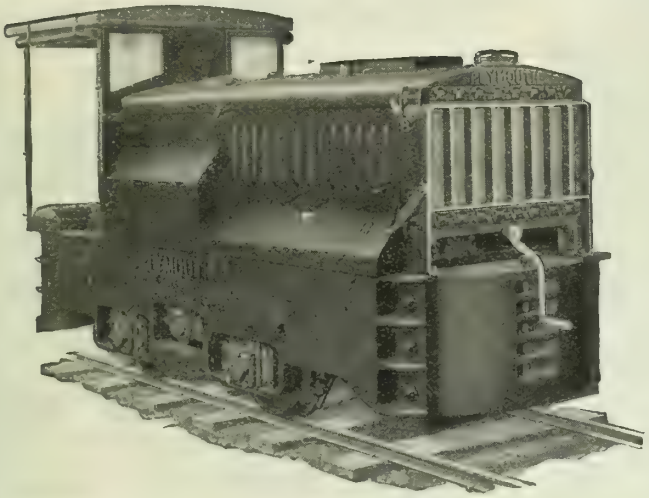

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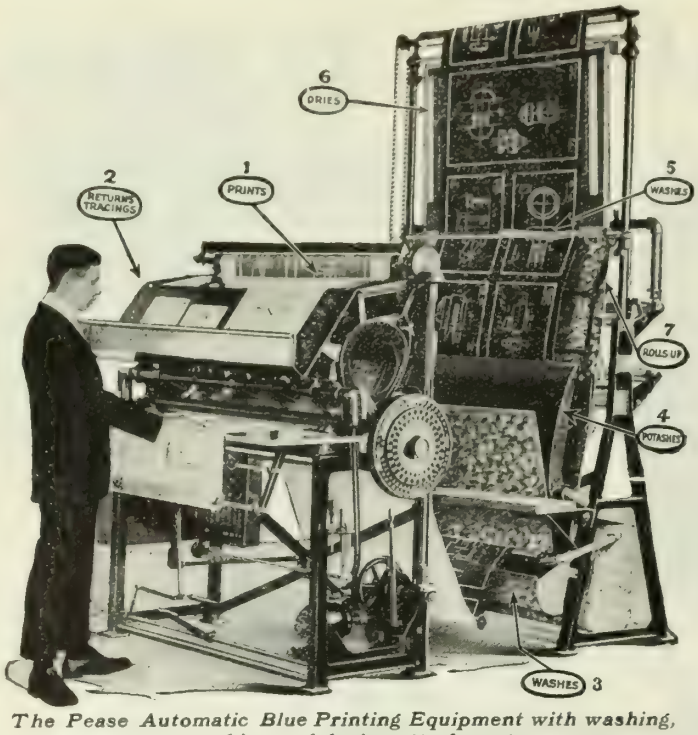

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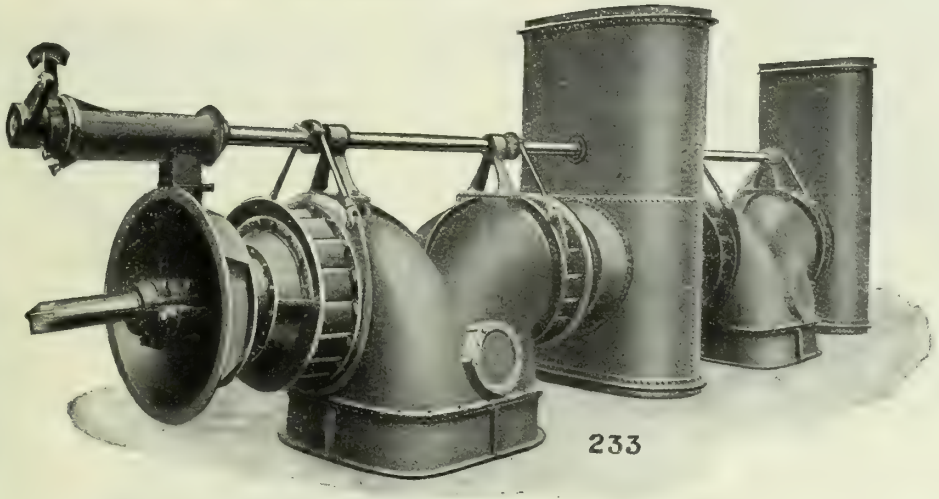

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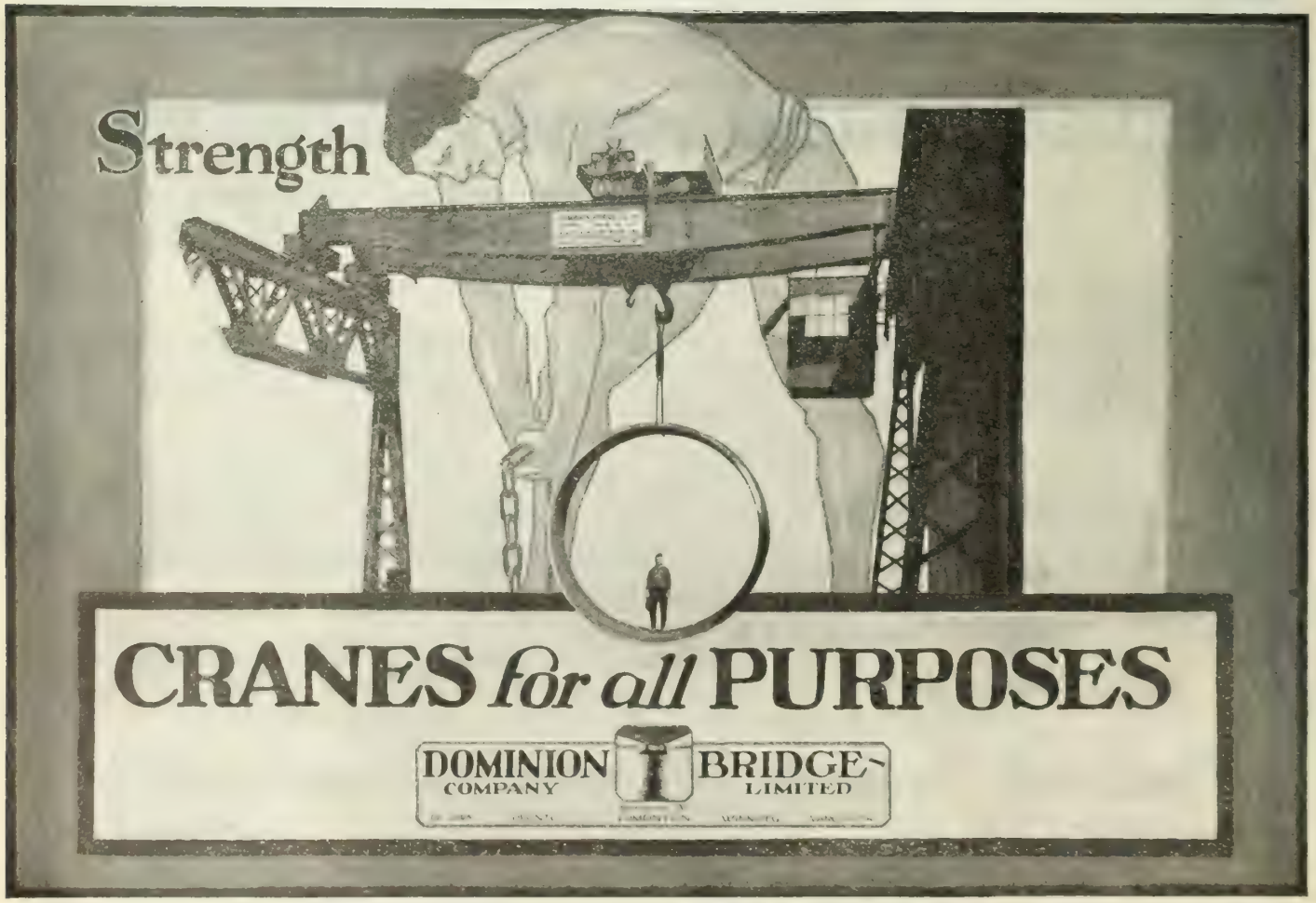

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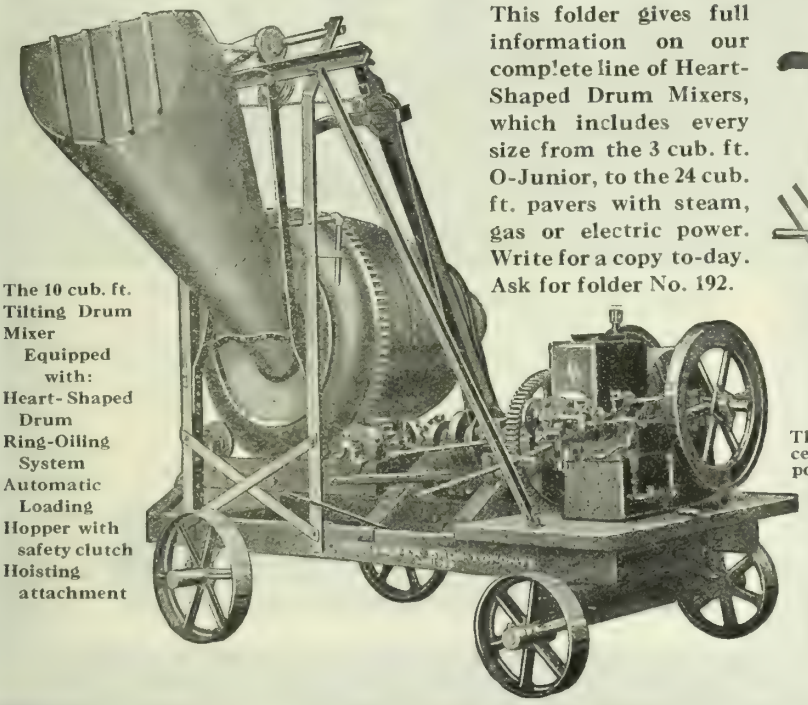

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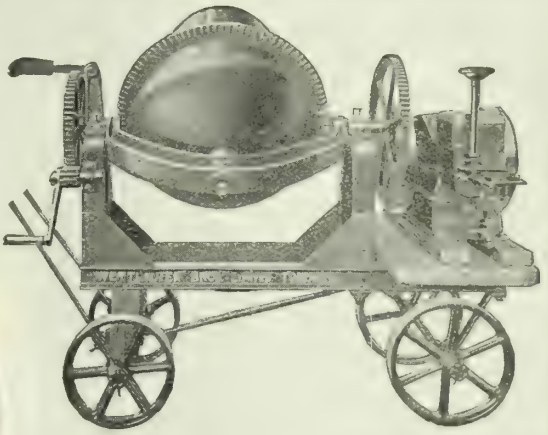

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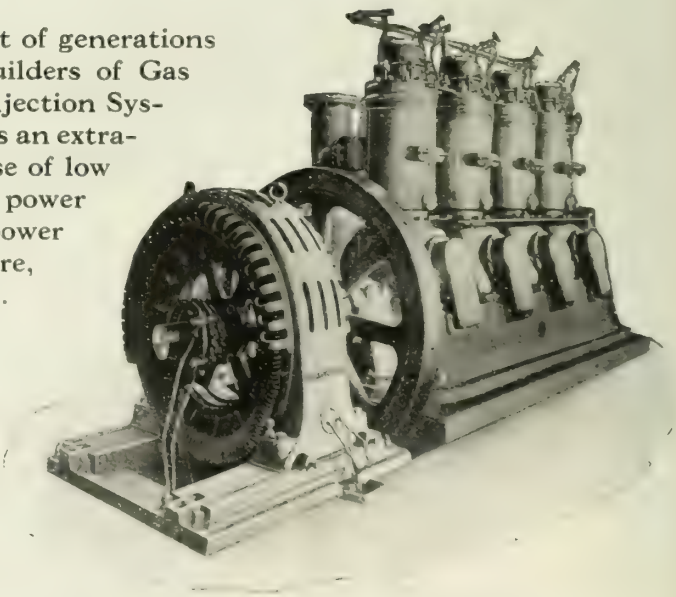

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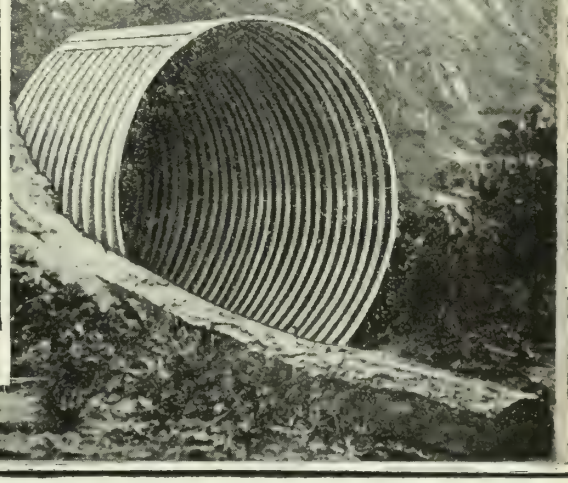

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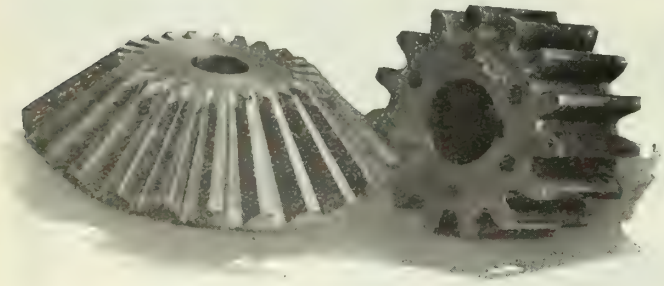

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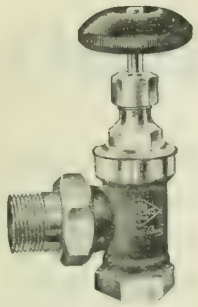

Fig. 494
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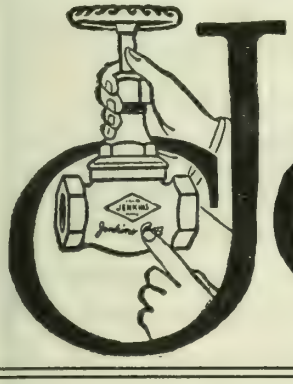

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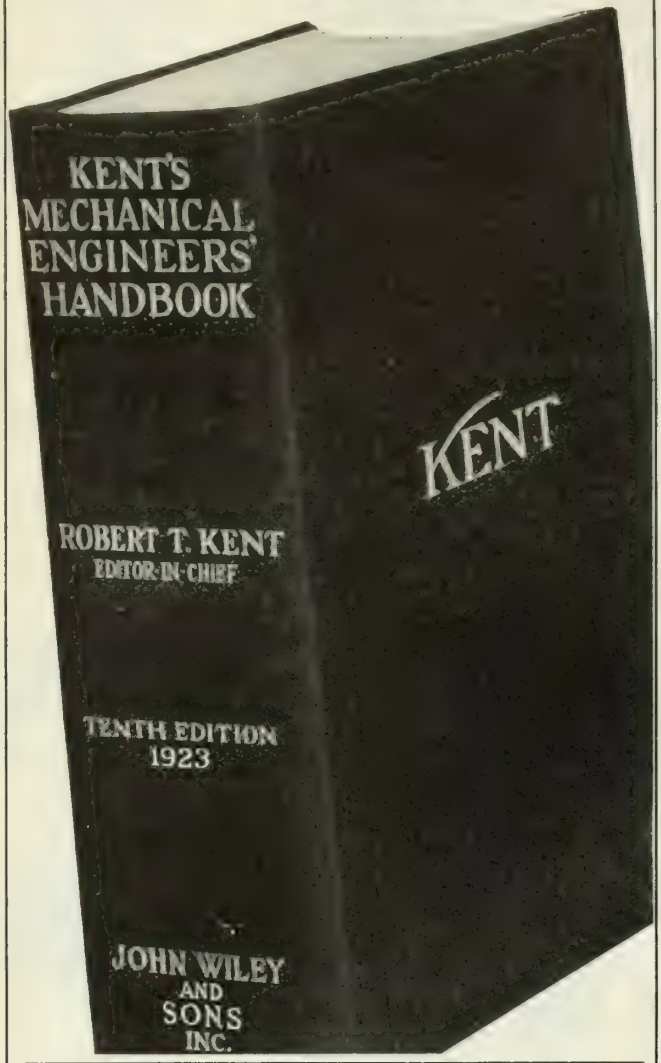

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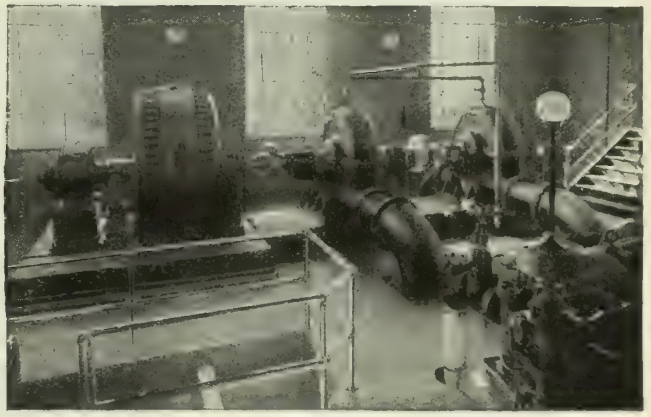

IN 1917 specifications were issued by the City of Hamilton, Ont., for a 10,000,000 gal. steam turbine driven centrifugal pumping unit and a 10,000,000 gal. electrically driven centrifugal pump, and contracts were ultimately signed for a De Laval geared steam turbine driven two stage centrifugal pumping unit and a De Laval centrifugal pump driven by electric motor.

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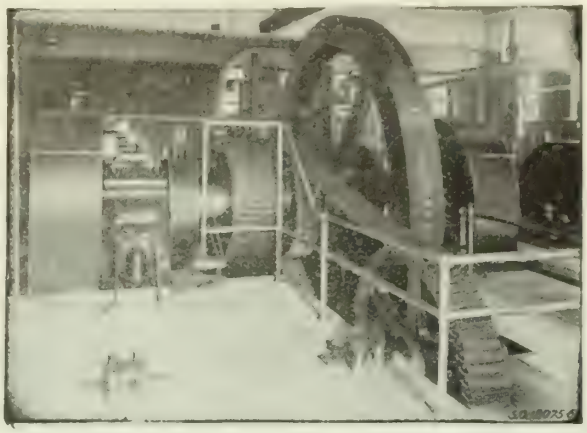

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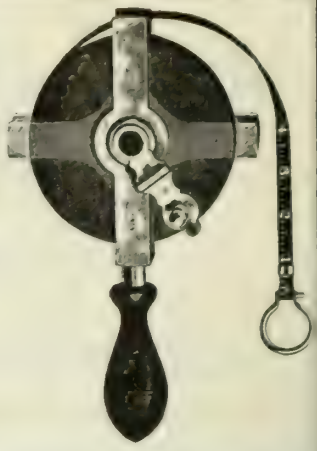

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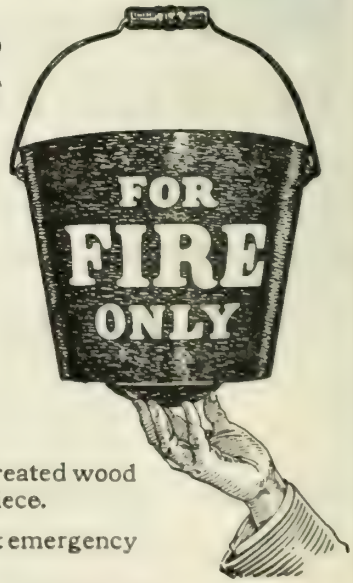

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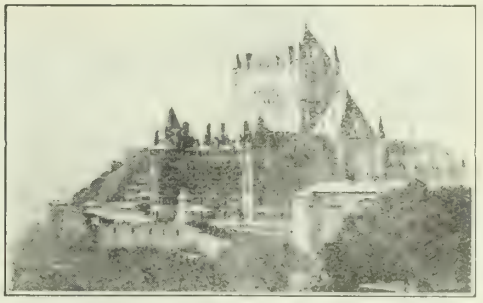

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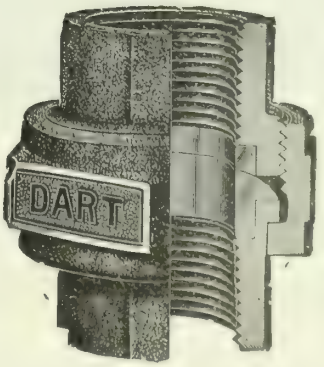

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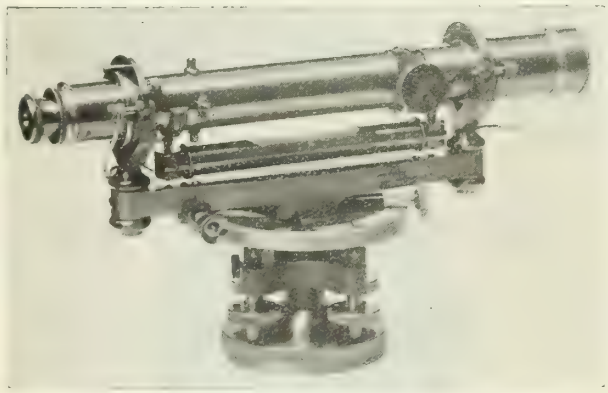

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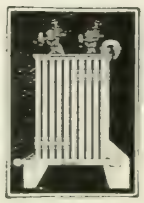

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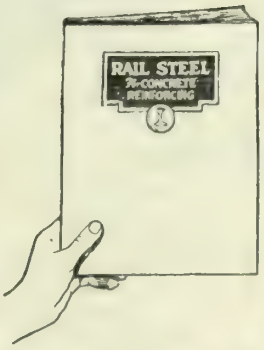

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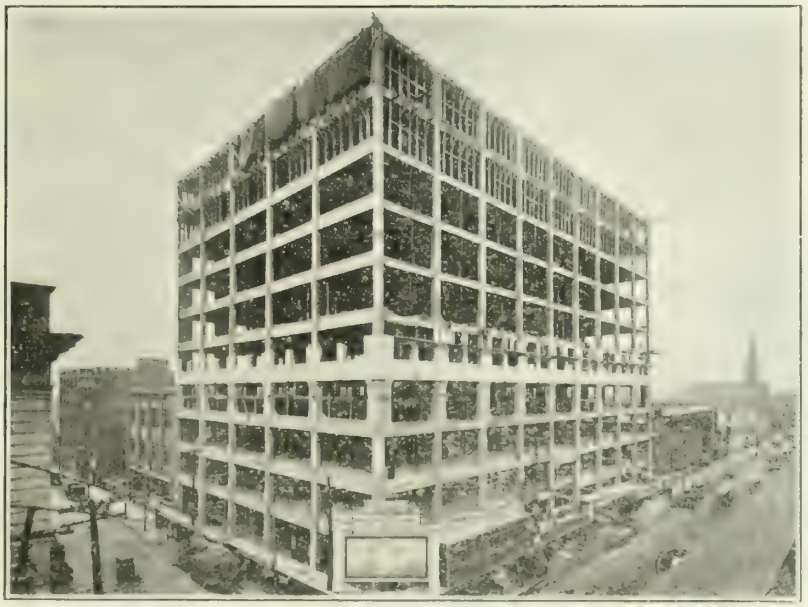

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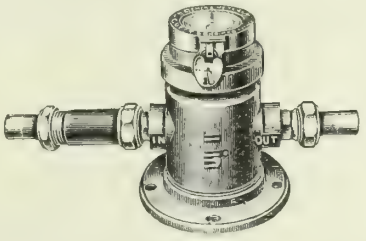

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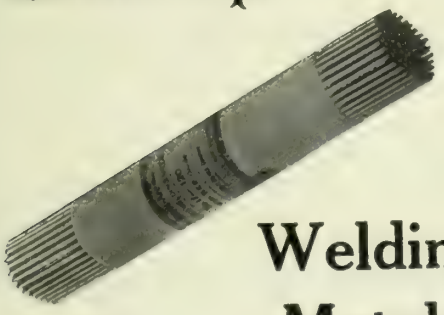

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The determination of the people to have roads equal to the traffic they bear, has led to a yearly increase in the yardage of Concrete Paving constructed in Canada.

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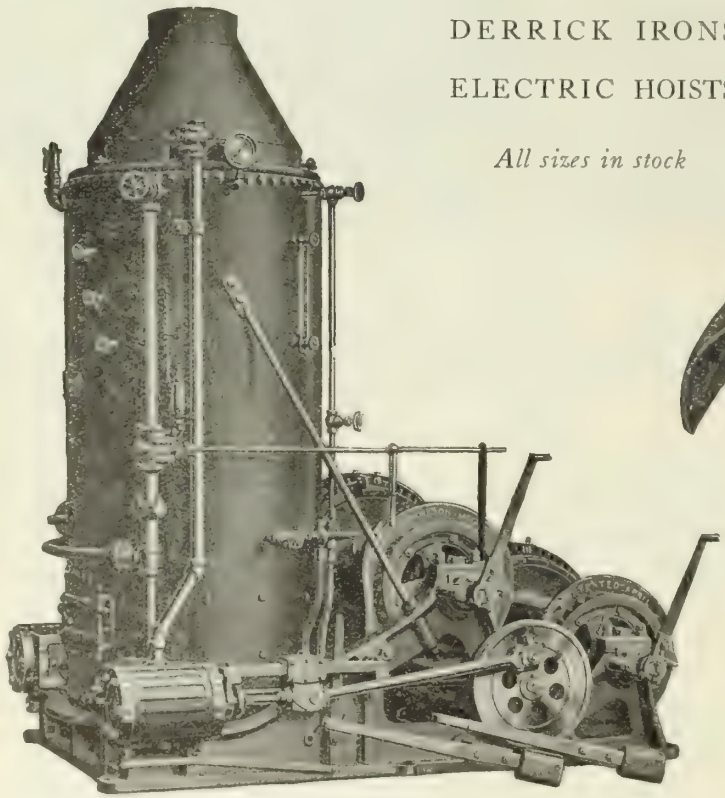
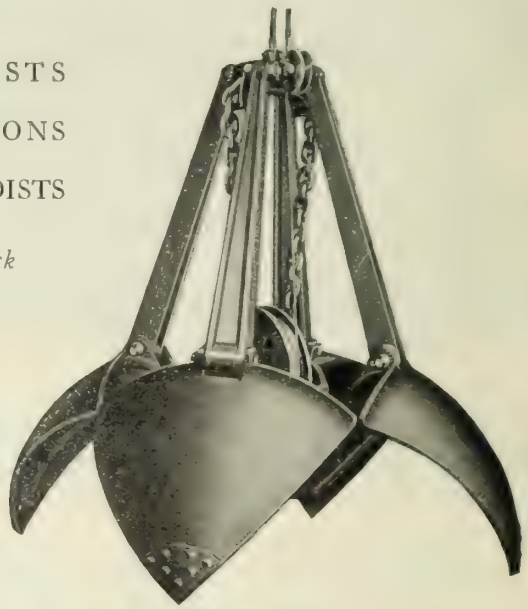


Double Drum Steam Hoist



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INAUGURATION OF THE SAGUENAY BRANCH

SEPTEMBER 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VI No. 9

You should certainly have a copy

This "Sales Inventory" of the Construction Equipment, Accessories and Supplies, which can be released from the Queenston-Chippawa Development, has been specially prepared solely as a service to—

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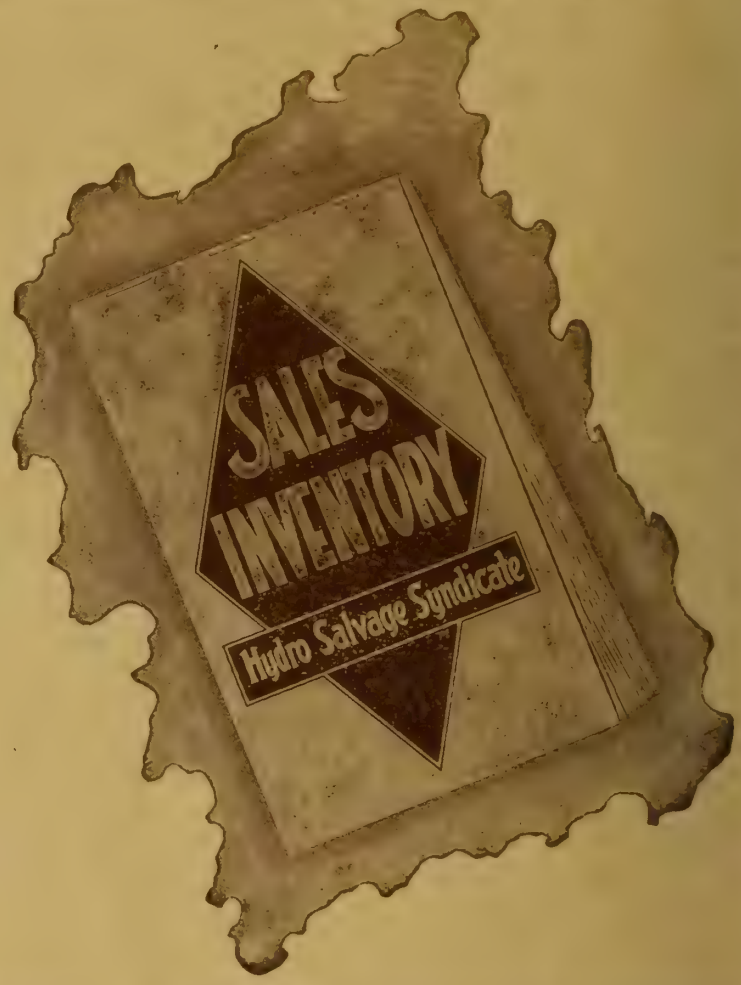

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Your copy is available at our nearest office.

Also, our experience is at your disposal, if you have problems to solve. We have about everything imaginable in Construction Equipment and Supplies at extremely reasonable prices consistent upon the excellent condition.

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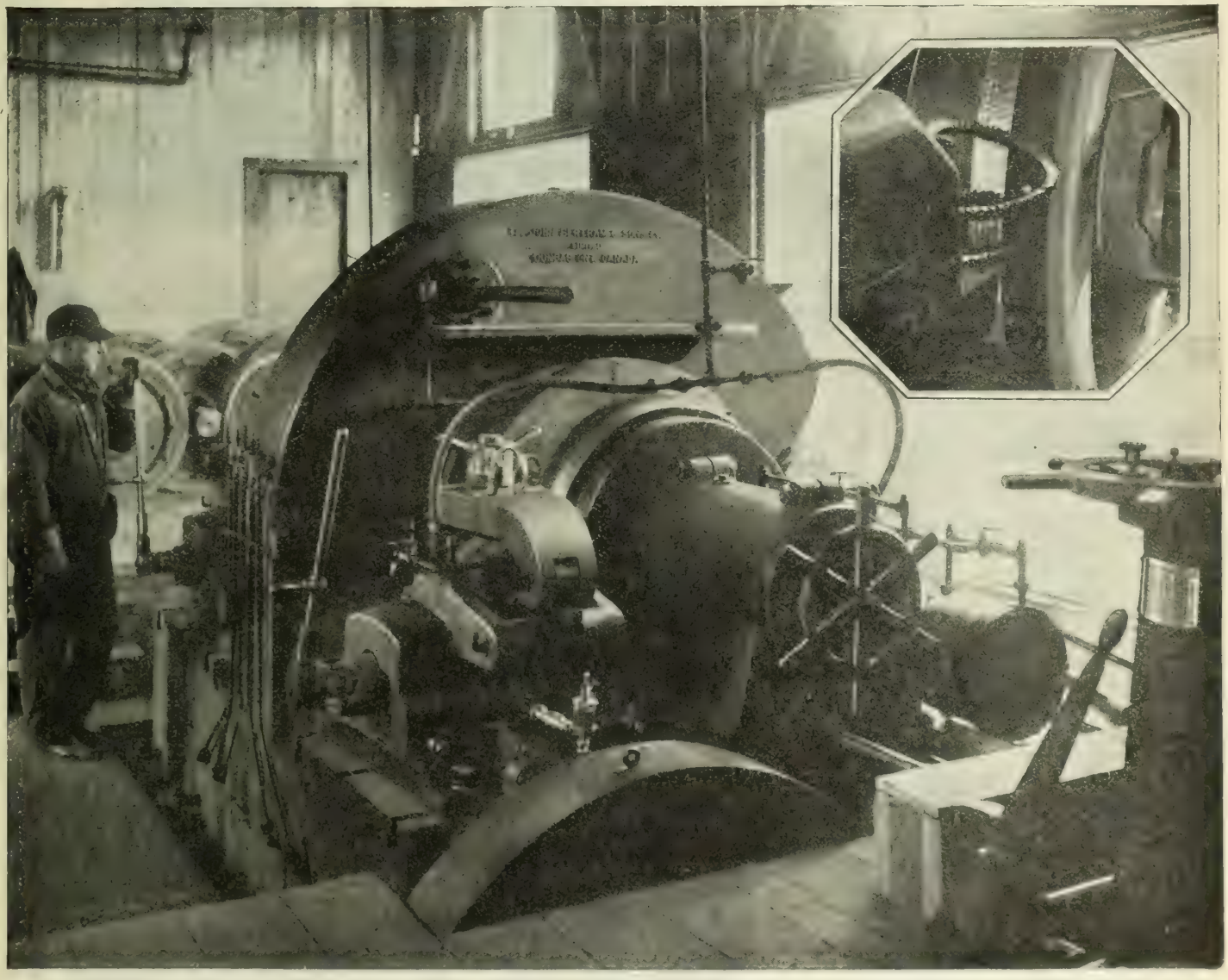

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Note these features:

Pneumatic Tool Clamps.
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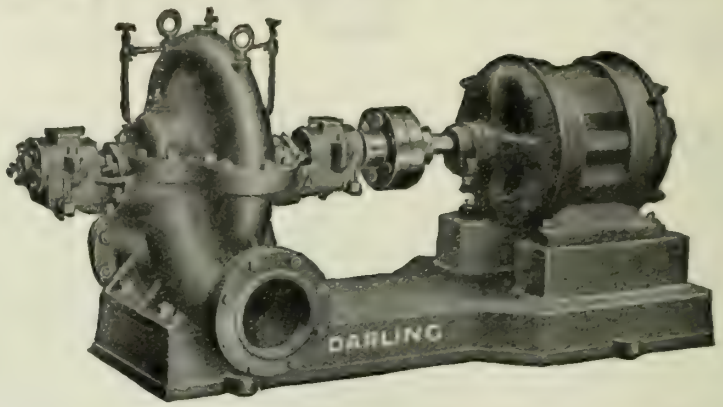
Describing Darling Single-Stage, Double-Suction Centrifugal Pumps of the Horizontal Split-Case Type.



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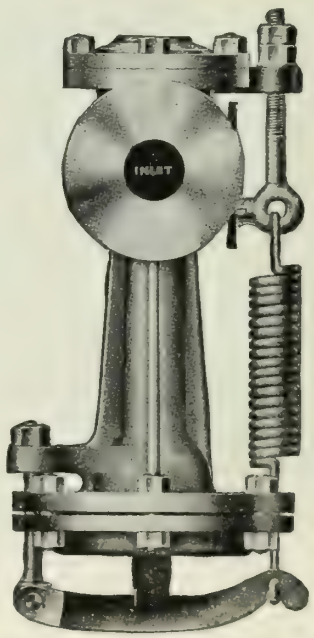

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ANY INITIAL AND FINAL PRESSURES

The Reliance Marine Reducing Valve is suitable to reduce any initial pressure up to 200 pounds and down to any final pressure not less than 25 pounds on the reduced side.

This reducing valve has been developed with a view to supplying a long felt want for a thoroughly reliable valve which will provide reduced pressure steam at a uniform and steady reduced pressure, notwithstanding fluctuations in the boiler pressure and a varying demand for low-pressure steam.

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Another striking tribute to Condensite Celoron

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The Diamond State Fibre Company,
235 Carlaw Avenue,
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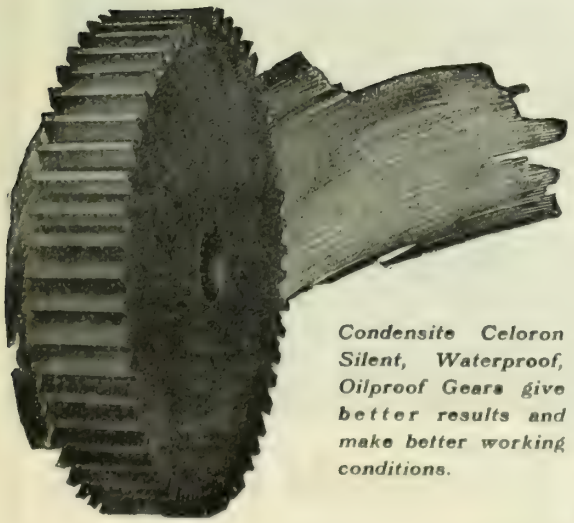
Gentlemen:- Re: Condensite Celoron Pinions.

We have your letter of the 6th instant and wish to state that our Superintendent advises that these pinions are wearing better than the rawhide we have been using and do not spring apart at the joints.

Yours very truly,
INTERPROVINCIAL BRICK CO OF CANADA LIMITED
R. Barden



Condensite Celoron Silent, Waterproof, Oilproof Gears give better results and make better working conditions.

THE above appreciation of Condensite Celoron Pinions is just one example of the many letters we receive commenting on the superiority of Celoron and Diamond Fibre not only for Gears and Pinions but also for other products used in the pulp and paper and power industries such as fish paper, fibre insulation for motors, friction board, friction pulleys, truck wheels, trucks, waterproof insulation, etc.

Send for further information about Diamond Fibre and Condensite Celoron.

CONDENSITE CELORON

DIAMOND STATE FIBRE COMPANY of CANADA Ltd.
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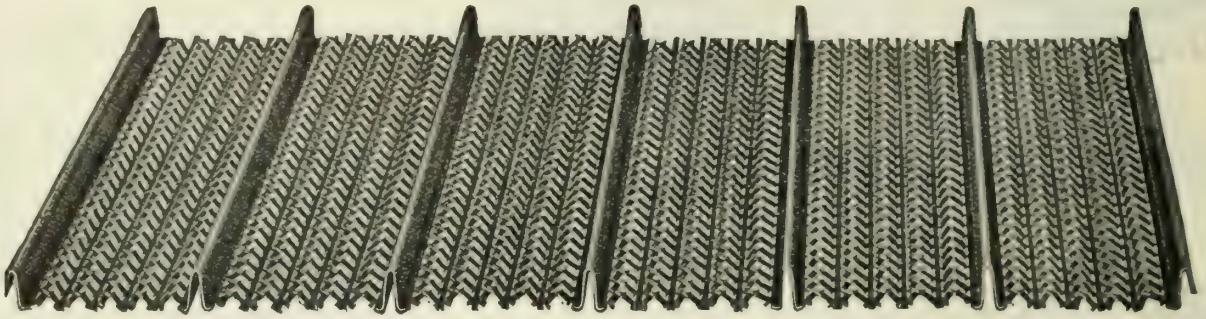
PULP MILL OWNERS

ROOFS, WALLS and PARTITIONS can be constructed more economically with

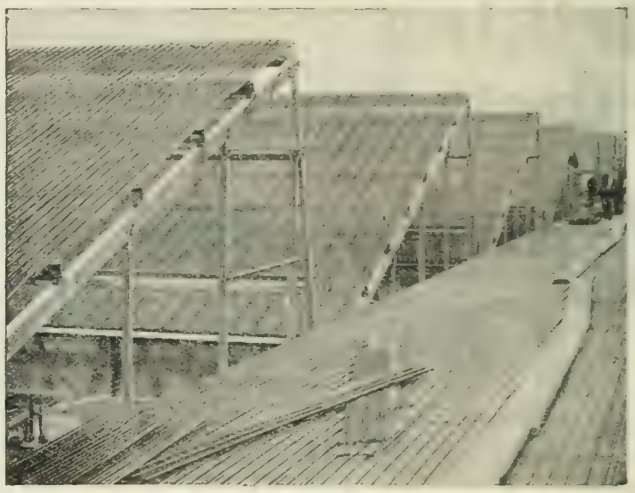
Hyrib



Why Use Hyrib?

BECAUSE HYRIB

Eliminates all forms for concrete.
Saves channels and wiring.
Reinforces the concrete and plaster.
Insures fireproofness and permanence.
Permits wide spacing of supports.
Reduces weight of construction.
Increases available floor space.
Saves time, labor and material.



Hyrib Walls and Sidings

are much less expensive than other types of permanent construction, and more economical than old-style constructions which require constant maintenance on account of rust and decay.

A solid two-inch Hyrib concrete wall is as solid as a 12-inch brick wall. It conducts no more heat. It is as fireproof. It costs much less. It is more quickly erected and more easily adapted to special framing.

Our Hyrib Book is free to all who write for it.

Trussed Concrete Steel Co. of Canada Limited

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McCRACKEN SEWER PIPE
Is Winning Canada's Favor

Renfrew Town Engineer Says

"I may state that we have been using concrete pipe in sewers and storm drains for a number of years. Last year we laid down over 8000 feet of concrete sewer pipe and it is giving satisfactory results.

I have in mind a piece of sewer which I built about 20 years ago, when I first became engineer for the Town of Renfrew. This sewer seems to be in as good condition to-day as when first constructed and we never had trouble with it. As far as I am concerned I would prefer CONCRETE tile, as I find there is not near the loss in breakage as there is in the vitrified tile, and there is not the same trouble in laying pipe, as every pipe is true to shape."

Very truly yours,
(Sgd.) J. R. STEWART, Town Engineer.

Results are, after all, the safest guide to Sewer Pipe quality. You know McCracken Sewer Pipe is sound in *principle* because it is manufactured in accordance with standard specifications issued by the American Society for testing materials for Cement Concrete Sewer Pipe, every pipe is of the same uniform high quality. It is inspected by the Canadian Inspection and Testing Company, Limited.

Write for complete information and quotations.

JNO. E. RUSSELL CO., Limited
General Sales Agents
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McCRACKEN SEWER PIPE
"The Pipe That Endures"

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EVERY phase of industrial lighting is covered by Benjamin Industrial Lighting Equipment. From all quarters have come the highest recommendation concerning Benjamin Lighting because of the accuracy of its design whereby the highest illuminating efficiency is obtained and the quality of manufacture made to withstand the severest conditions over long periods of service. We can prove these statements in the fullest degree and would like to submit for your approval our offer to co-operate with your engineers, your architect or contractor to work out the installation best suited to your needs. Why not get in touch with us now?

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Elliptical Angle Reflector Socket

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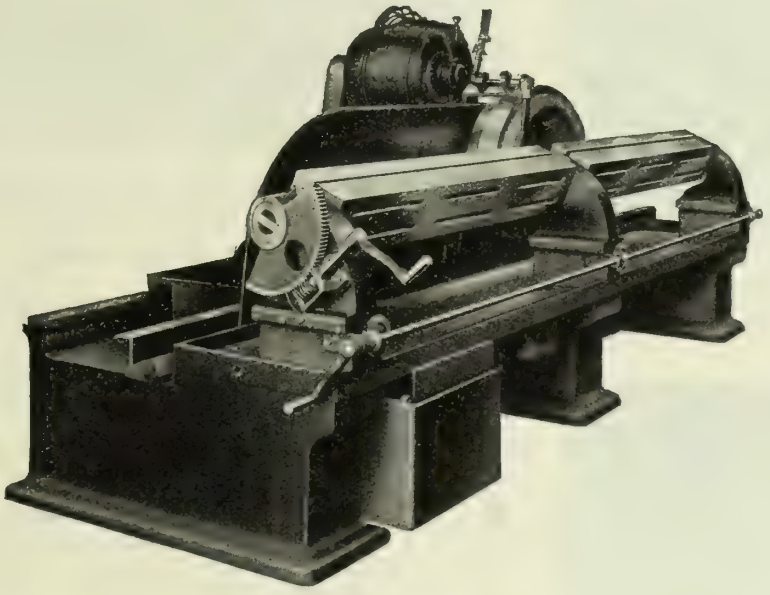
PAPER KNIFE GRINDING



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REQUIRES one-half the floor space, unkeep expense and original investment of the old style grinders. Our latest developments in full automatic grinding of paper knives embody the most compact, massive, and lasting type of construction yet developed in this class of service. Simple design, few parts to wear, yet full automatic and accurate to the highest degree.

We are specialists in all saw and knife fitting requirements. Send for catalog and prices.

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ONE MACHINE!

Three Operations!
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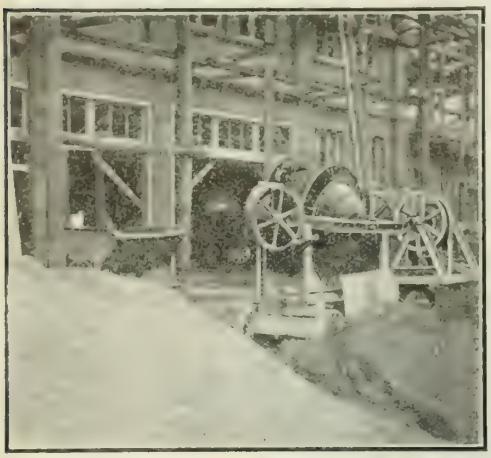
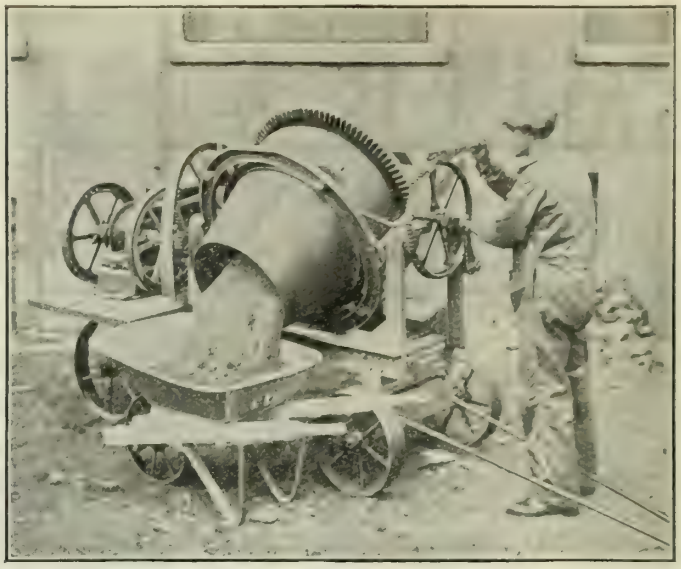
AT WORK ON THE WORLD'S LARGEST STADIUM



Mixing Concrete at the rate of from 3 to 6 cub. yds. an hour at the Aston Villa Stadium, at Birmingham, England. One man operates the machine. Loads or discharges on either side. Note the second machine indoors.

The same machine mixing cement mortar. Not only is the work done faster and with fewer men, but also a more perfect mix is secured. The cream of the cement is saved!

A handy hoisting rig that saves time, needs no rest, never lays down on the job, and cannot be crowded too hard.



Wettlaufer Mixers have only modern, improved engines of horizontal, hopper-cooled type, equipped with dependable magneto. Fuel consumption less than a gallon a day. Engine is covered with dust-proof Steel Housing.

CAPACITY 5 CUB. FT.

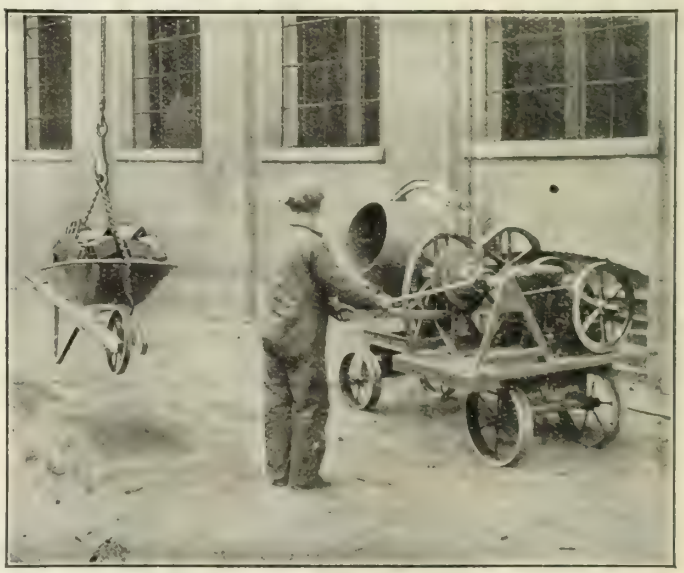
This is the machine you need if you want to make money in this year's contracts

The Wettlaufer O-Power Mixer shown in these pictures will enable you to make money out of small jobs and to finish-up on bigger jobs in record time at less cost. Prices and full particulars on request. Write for folder No. 193.

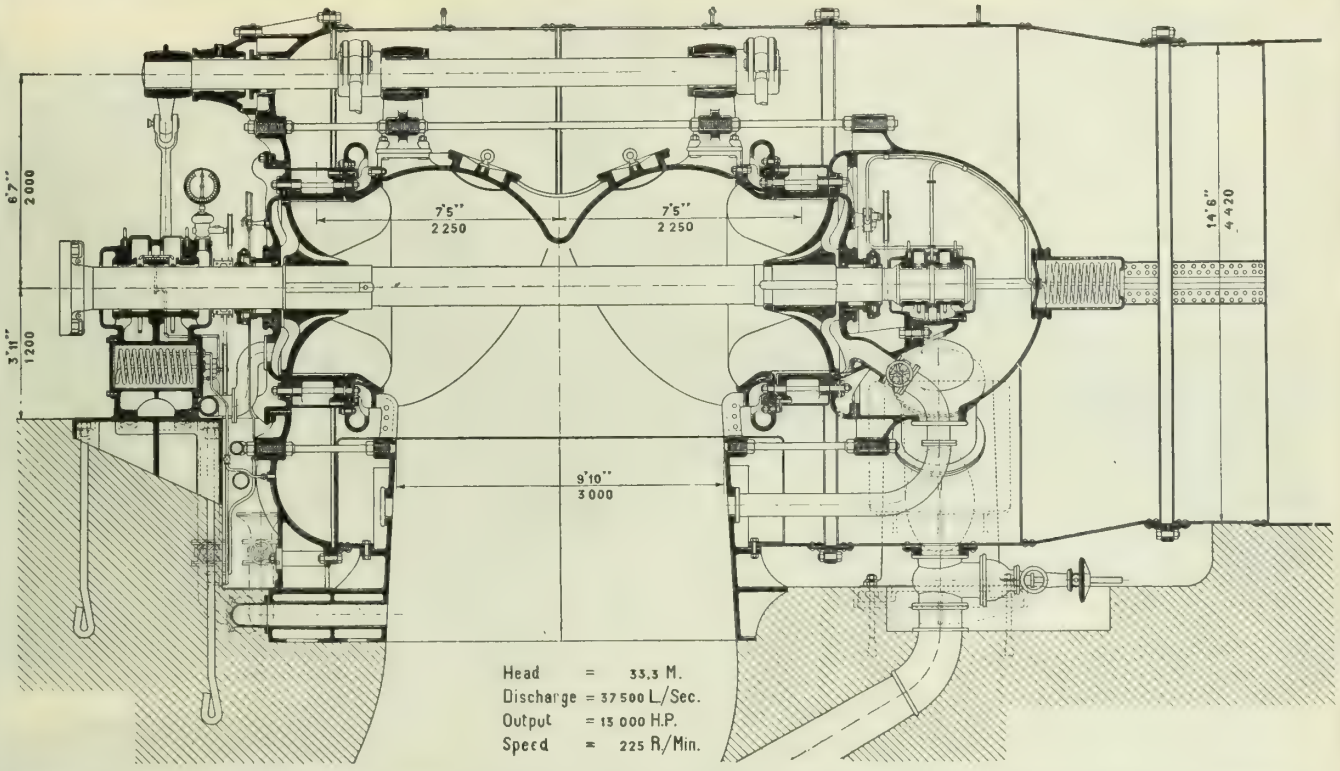
WETTLAUFER BROS., LIMITED

Concrete Machinery and Contractor's Equipment
Head Office: 198 Spadina Ave., Toronto

Wettlaufer Machinery is sold by all branches and agents of Canadian Fairbanks-Morse Co., Limited.



The O-POWER with Hoisting Attachment. Note that it is equipped with Roller Bearings and Centre Oil Feed System—giving longer life. The machine can be drawn around by one man taken through an ordinary doorway drawn behind or loaded on an ordinary cart.



CROSS SECTION ESCHER WYSS FRANCIS HORIZONTAL ENCLOSED DOUBLE RUNNER TURBINE

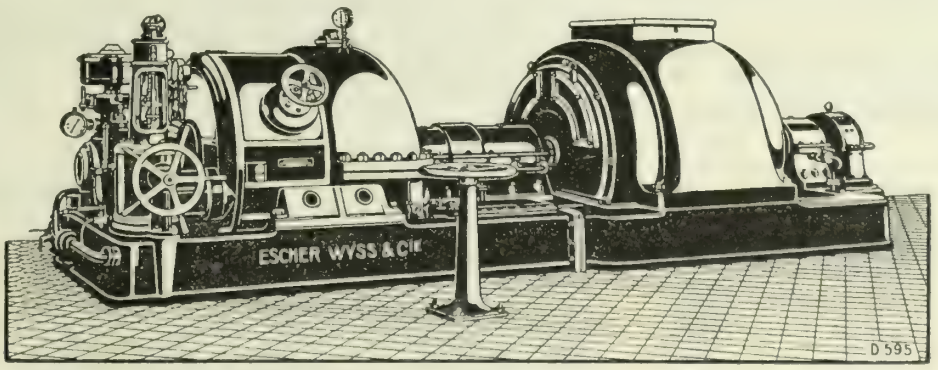
OPEN TYPE		ENCLOSED TYPE		TANGENTIAL WHEELS
3.28′ to 65′	HEAD	9.8′ to 690′	HEAD	38′ to 3,280′
HORIZONTAL SINGLE, Double and 4 Runner VERTICAL SINGLE Three and four Runners	ARRANGEMENTS	Horizontal and Vertical Spiral, Central and Frontal Casings, Single, Double and Twin Runners.	ARRANGEMENTS	Horizontal and Vertical Single Runner. Single and double Needle Nozzle and Jet Deflectors.
4 to 10,000	— H. P. —	1.3 to 22,000	— H. P. —	8 to 19,000

STEAM CONSUMPTION FULL LOAD

6,500 H. P.
3,000 R. P. M.
8.32 lb.
Steam H. P. Hr.

19,500 H. P.
1,000 R. P. M.
9.15 lb.
Steam H. P. Hr.

Includes Steam Used in Auxiliaries



6,500 H. P.
1,500. R. P. M.
8.38 lb.
Steam H.P. Hr.

2,600 H. P.
3,000 R. P. M.
9.03 lb.
Steam H.P. Hr.

10,400 H. P.
3,000 R. P. M.
8.14 lb.
Steam H. P. Hr.

Steam For Main Turbine Only

ZOELLY STEAM TURBINE DIRECT CONNECTED TO ELECTRIC GENERATOR

The Range of these Turbines is Clearly Shown by referring to this Table.

— R. P. M. —	— H. P. —	— R. P. M. —	— H. P. —
1,000	4,000 to 22,000	3,000	900 to 12,000
1,220	1,500	3,600	500 to 2,000
1,500	1,500 to 20.000	6,000 } Gear Reduced	
2,000	250	7,500 } to 3,600	Any Desired Power

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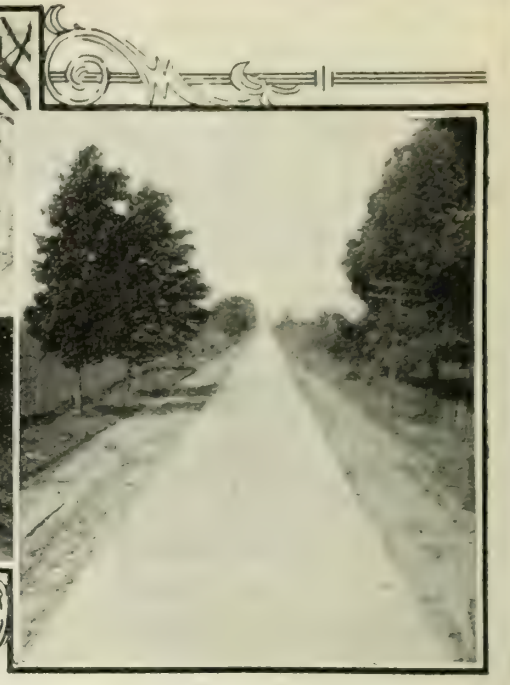
MONCTON, MONTREAL, TORONTO, NORTH BAY, WINNIPEG, VANCOUVER

Part of Longueuil-Boucherville Road, Que.



Concrete Pavement on 16th Sideroad, Chatham Township, Ont.

Each Year Sees an Increase in Canada's Concrete Paving Yardage

The revolution in road traffic, due to the automobile and the heavy laden truck has created a positive use for permanent, skid-proof, fuel saving highways of Concrete. Governments, Municipal and Provincial have come to this realization.

Permanent highways of Concrete pay for themselves. They lessen the taxpayer's burden by reducing upkeep to a minimum. They lower haulage costs, attract tourists and promote the comfort and well-being of every community they serve.

Evidence of the increasing popularity of Concrete is found in the following figures of total yardage year by year in Canada.

CONCRETE PAVING COMPLETED IN CANADA
Square Yards laid each year and Total Yardage year by year.

Year	Western Provinces	New Brunswick and Nova Scotia	Ontario and Quebec	Total
Prior to 1912	197,083	——	145,101	342,184
During 1912	45,794	——	168,374	214,168
" 1913	146,421	1,190	321,389	469,000
" 1914	90,520	10,670	449,125	550,315
" 1915	37,480	17,439	627,495	682,414
" 1916	52,010	9,742	446,998	508,750
" 1917	——	16,740	432,530	449,270
" 1918	——	——	131,118	131,118
" 1919	10,560	4,500	608,180	623,240
" 1920	95,624	8,000	660,044	763,668
" 1921	55,711	11,734	1,237,878	1,305,323
" 1922	74,465	——	1,549,468	1,623,933
Total end of 1922	805,668	80,015	6,777,700	7,663,383

"It's the little they cost to maintain that makes Concrete Pavement economical".

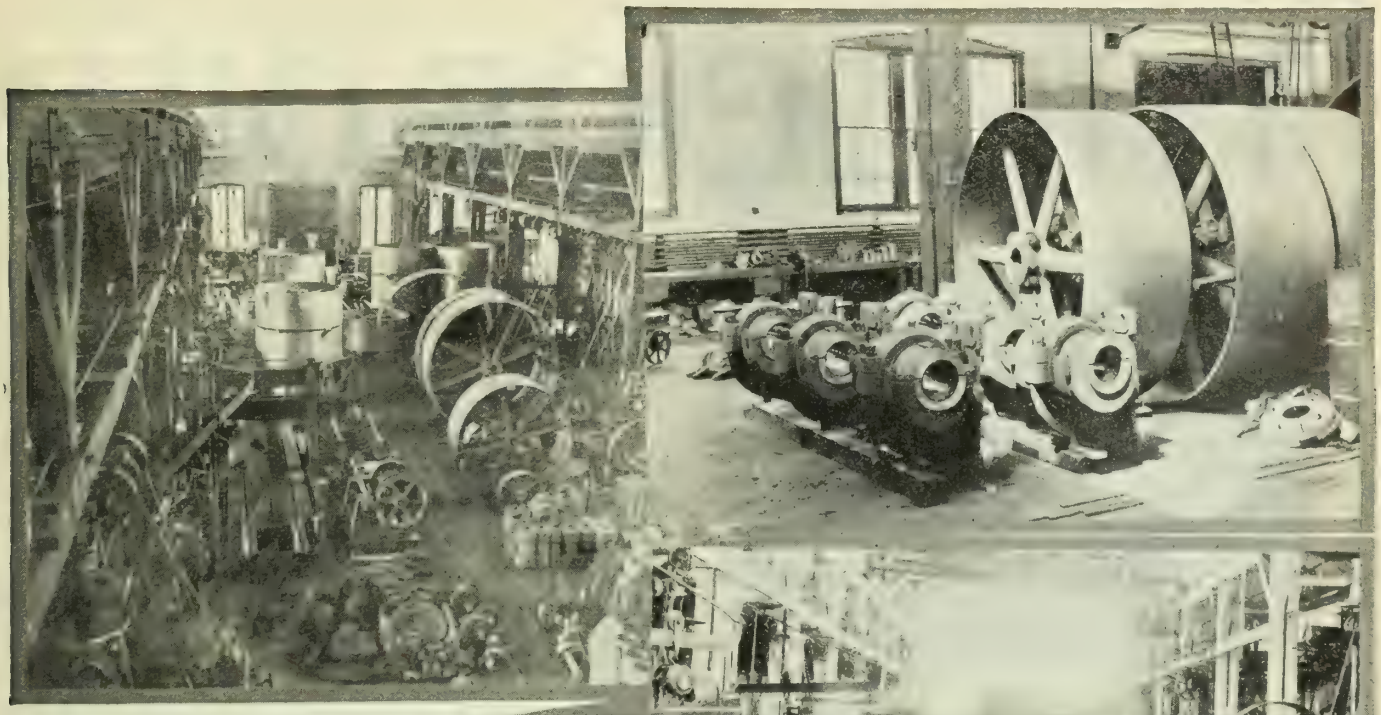
SPECIFY
CANADA CEMENT
UNIFORMLY RELIABLE

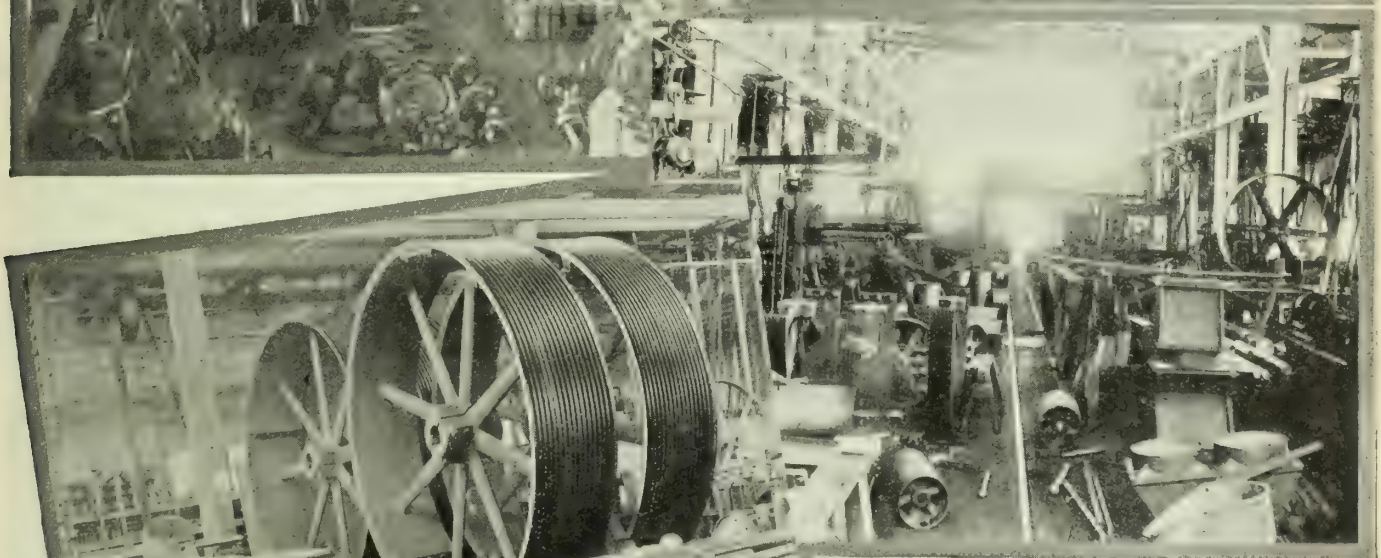
CANADA CEMENT CONCRETE FOR PERMANENCE

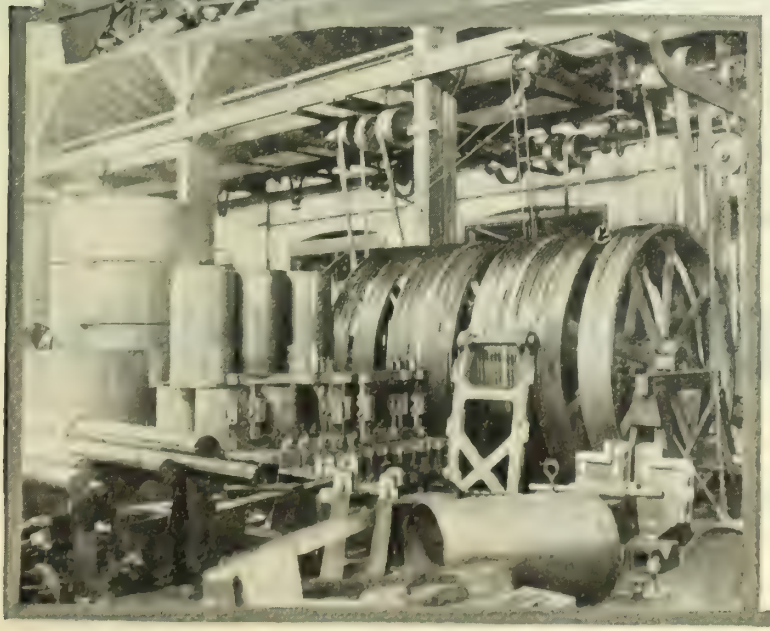
We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

CANADA CEMENT COMPANY LIMITED
CANADA CEMENT COMPANY BUILDING
Phillips Square - MONTREAL

Sales Offices at:
MONTREAL TORONTO WINNIPEG CALGARY







Busy in the Foundry and Engineering Shops

These photographs recently taken in our Engineering Shop show the quality and quantity of work going through.

The reason is worth noting. It is this: Buyers know that Dodge equipment is efficient and Dodge Service absolutely reliable when it comes to fulfilling promises of delivery.

DODGE

Manufacturing Co. of Canada Limited

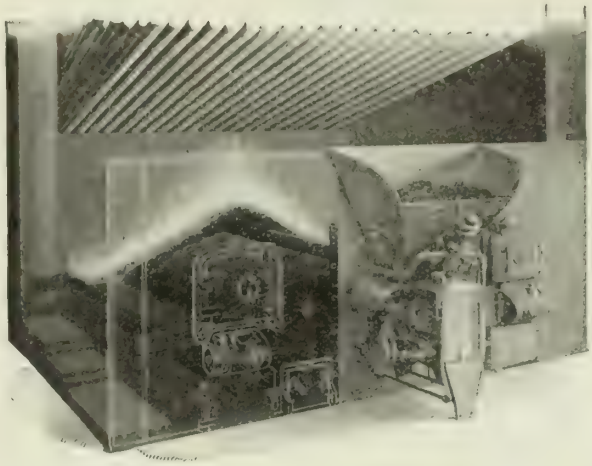
Head Office and Works: - TORONTO

Branch Warehouse: 770 St. Paul St. West MONTREAL

DISTRIBUTORS CHAPMAN DOUBLE BALL BEARINGS EX OUR STOCK

Valuable suggestions appear in the advertising pages.

THREE OF OUR



TYPE E STOKER

TYPE E STOKER the pioneer self-clearing single retort stoker. Easily installed and operated. Particularly successful with coals suitable for the underfeed type of stoker.

LOPULCO PULVERIZED FUEL SYSTEMS

Burns coal --- oil --- gas in the same furnace. A big saving in the economical production of steam in large plants.

LOPULCO SYSTEMS hold the world's record for high efficiences and size of boilers equipped.

Write for the Condensed Advance Bulletin with descriptions of these and other products offered through this company.

COMBUSTION ENGINEERING CORPORATION LIMITED

A. J. T. Taylor, President **John T. Farmer, Chief Engineer**

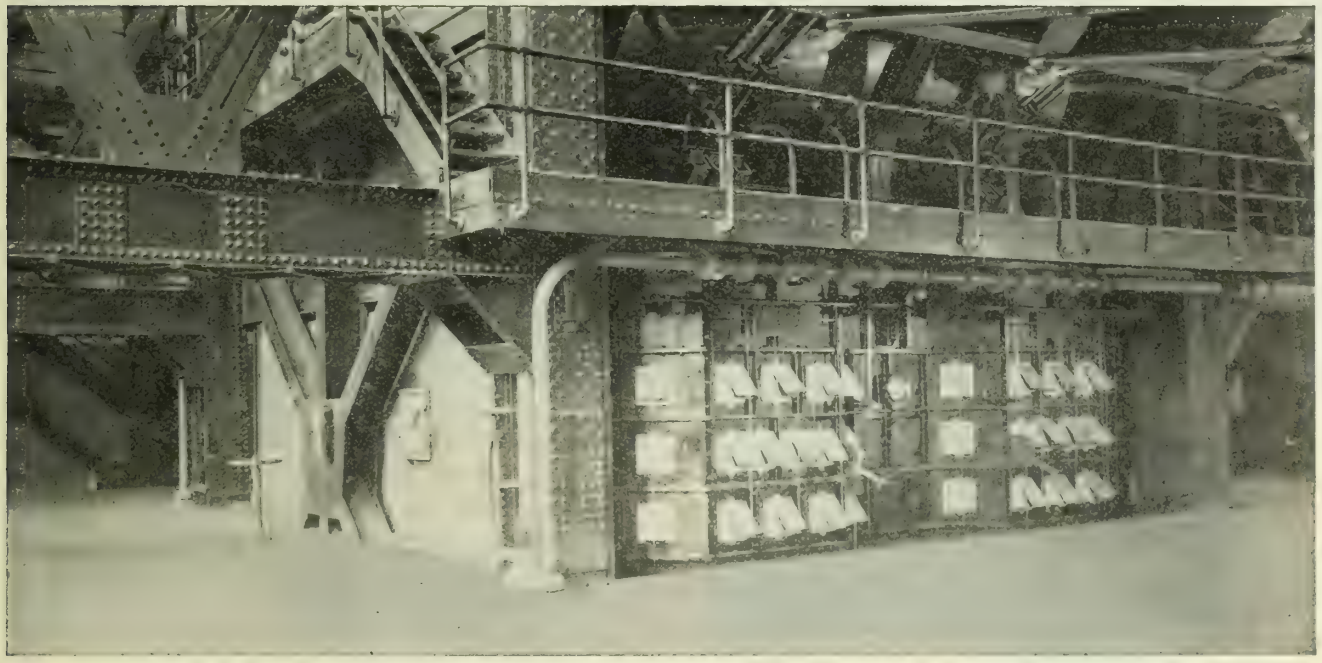
MAIN OFFICE: TORONTO

VANCOUVER **MONTREAL** **WINNIPEG**

LEADERS

COXE STOKER

Coxe Stoker the leading traveling grate stoker for burning anthracite screenings, buckwheat, bone coal, bituminous or coke breeze. The stoker with the reputation of "Burns anything that's black."



Furnace Front of a Lopulco Installation.

Write for the Condensed Advance Bulletin with descriptions of these and other products offered through this company.

COMBUSTION ENGINEERING CORPORATION
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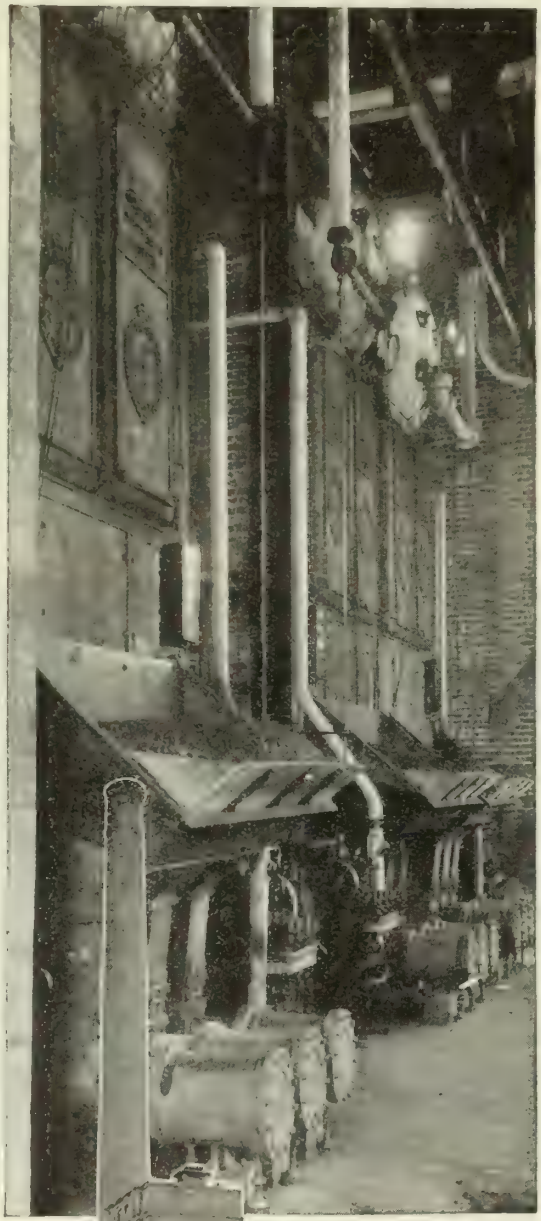


Interior and Exterior of the Provincial Paper Mills' Mille Roche Plant.

Provincial Paper Co. installed "Jones A-C" at this plant, too—

YEARS ago, the Provincial Paper Co., installed two "Jones Standard" Stokers at their Port Arthur plant. The service given by these stokers was so dependable that since then the high duty multiple retort "Jones A-C" has been installed in several plants.

At the Mille Roche plant, the two "Jones A-C" stokers shown in the photograph opposite were installed in 1922. Mr. Imbleau says that operation is extremely satisfactory, the efficiency averaging 72% over all ratings. The boilers are equipped with the Craig Damper Regulator and the CO_2 never drops below 12%.

Provincial Paper, like so many other firms, installed the "Jones A-C" because they have found that "it pays for itself—then pays dividends." They have found that its high efficiency saves fuel and eliminates smoke—that its high capacity saves investment in standby equipment—that its automatic cleaning and freedom from clinker troubles cut labor costs—that its simplicity lowers maintenance charges.

Repeat orders are the best evidence of stoker worth. The new bulletin gives the reasons for them. Write the Under-Feed Stoker Co. of Canada, Limited, 146 King St., West, Toronto, for your copy.

The UNDER-FEED STOKER COMPANY of CANADA LTD

"Jones" Stokers
"Riley" Stokers
"Murphy" Furnaces

Alta. & West Sask.: Mr. J. Twomey, Camrose, Alberta.

Man. & East Sask.: W. W. Hicks & Co., Winnipeg.

British Columbia: E. A. Earle, Ltd., Vancouver, B.C.

Quebec: Cleaton Co., (Canada) Ltd. Montreal, Que.

"It paid for itself by saving on material."—Burlington Steel Co., Hamilton, Ont.

A Modern Necessity

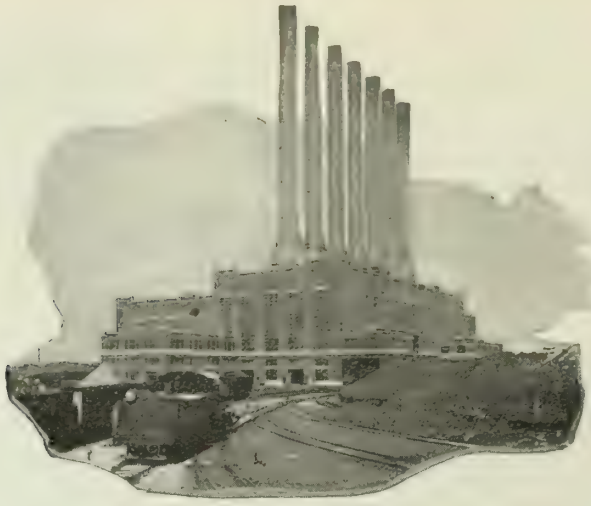
Property Protection Fence is as much a part of the Progressive Manufacturers' plant as buildings and machinery. Its growth in the last few years has been enormous, and when the real service which this fence renders is better known, no manufacturer will want to be without it. Ask the manufacturer whose plant is enclosed with this Wall of Woven Steel and you will take steps to protect your own.

Complete information can be had for the asking by writing to

Frost Steel and Wire Company, Limited

Hamilton - Canada

"Makers of Fence for Every Purpose"



The Connors Creek Station of the Detroit Edison Co.,—36,400 rated b. hp. all Taylor Stokered.

The Vital Part in Detroit's Daily Life

Performed by The Taylor Stoker

And Detroit, whose watch-word is Efficiency, has chosen the most efficient of all combustion systems,—the TAYLOR Stoker,—to convert its coal into steam, to heat its buildings, drive the turbines that light its homes, streets and public buildings, move its trolley cars and turn the wheels in scores of industrial plants.

The Detroit Edison, supplying all the domestic and commercial lighting of the city, much of the current used by the Detroit United Railways and all industrial power and lighting not generated by insolated plants, now has 83,000 horsepower Taylor-Stokered in its five plants including the very recent and up-to-the-minute Marysville Stations.

The Detroit Public Lighting Commission plant, lighting the streets and public buildings is Taylor-Stokered.

The principal motor plants,—Lincoln, Ford, Dodge, Hudson, Studebaker,—have chosen the Taylor Stoker.

Multiplied boiler output, fuel and labor economies, lessened upkeep, smoke elimination, extreme flexibility and absolute dependability are the reasons why the Taylor Stoker is so universally chosen.

New York, Philadelphia, Baltimore, Washington, Providence, Springfield, Dayton, Toledo are among the other cities lighted and moved by Taylor Stokers.

Such general selection brings home forcibly the realization that the Taylor Stoker is a superior combustion machine from every point of view.

Whatever your power problem—whether it be to obtain higher efficiencies, greater boiler output, greater flexibility, ability to burn the poorer grades of fuel or to cut down firing labor and costs—you will find it worth while to investigate the Taylor Stoker. A line brings our literature or a representative.

THE TAYLOR STOKER COMPANY, LTD.

TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

P · A · X

Private Automatic Exchange

CONFIDENTIAL

The Automatic Telephone

Turn the Dial and immediately your call not only reaches the engineer, the shipping room, any executive—but the call is for yourself only.

Use P. A. X. to quicken confidential transactions, to lessen irritation, to create better understanding and thus maintain greater co-operation throughout the extended plant.

The P. A. X. is the reliable friend of executives.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest home.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
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"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
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Construction Material
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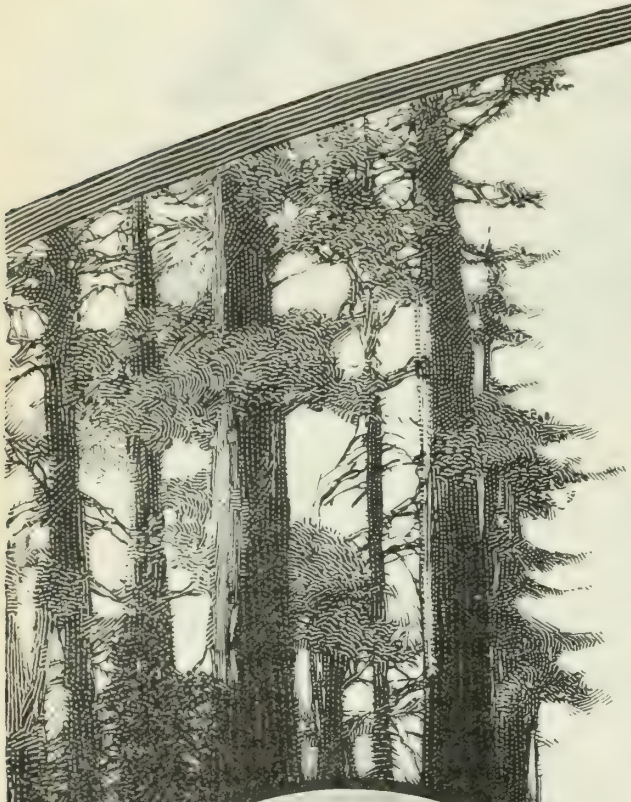
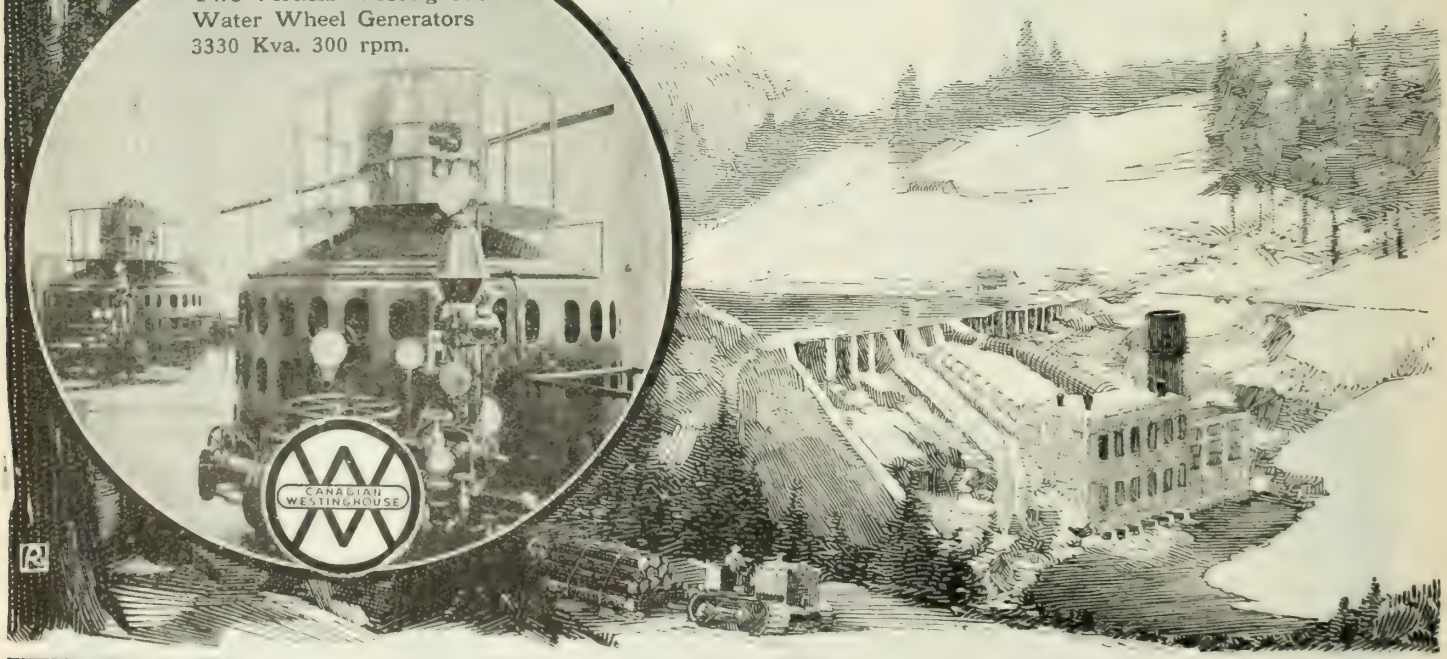


The superiority of electric drive over steam drive for paper mill operation is a fact generally acknowledged. The older plants which have changed over completely, have soon paid for the installation by the increased profits that motor drive affords.

For new mills, electric drive affords even greater possibilities, because the requirements and the best functioning of paper making processes entirely govern the selection and arrangement of equipment.

Whether for laying out complete electrical equipment for a new mill, or for calculating the most profitable drive for an old one, the Canadian Westinghouse Company has been of marked assistance to pulp and paper manufacturers. This company has advocated from the very beginning the use of electric drive for paper mill operation. It has studied the power and speed requirements of every machine, to determine just what type of motor should be used for

Two Vertical Westinghouse
Water Wheel Generators
3330 Kva. 300 rpm.



Westinghouse

Paper Industry

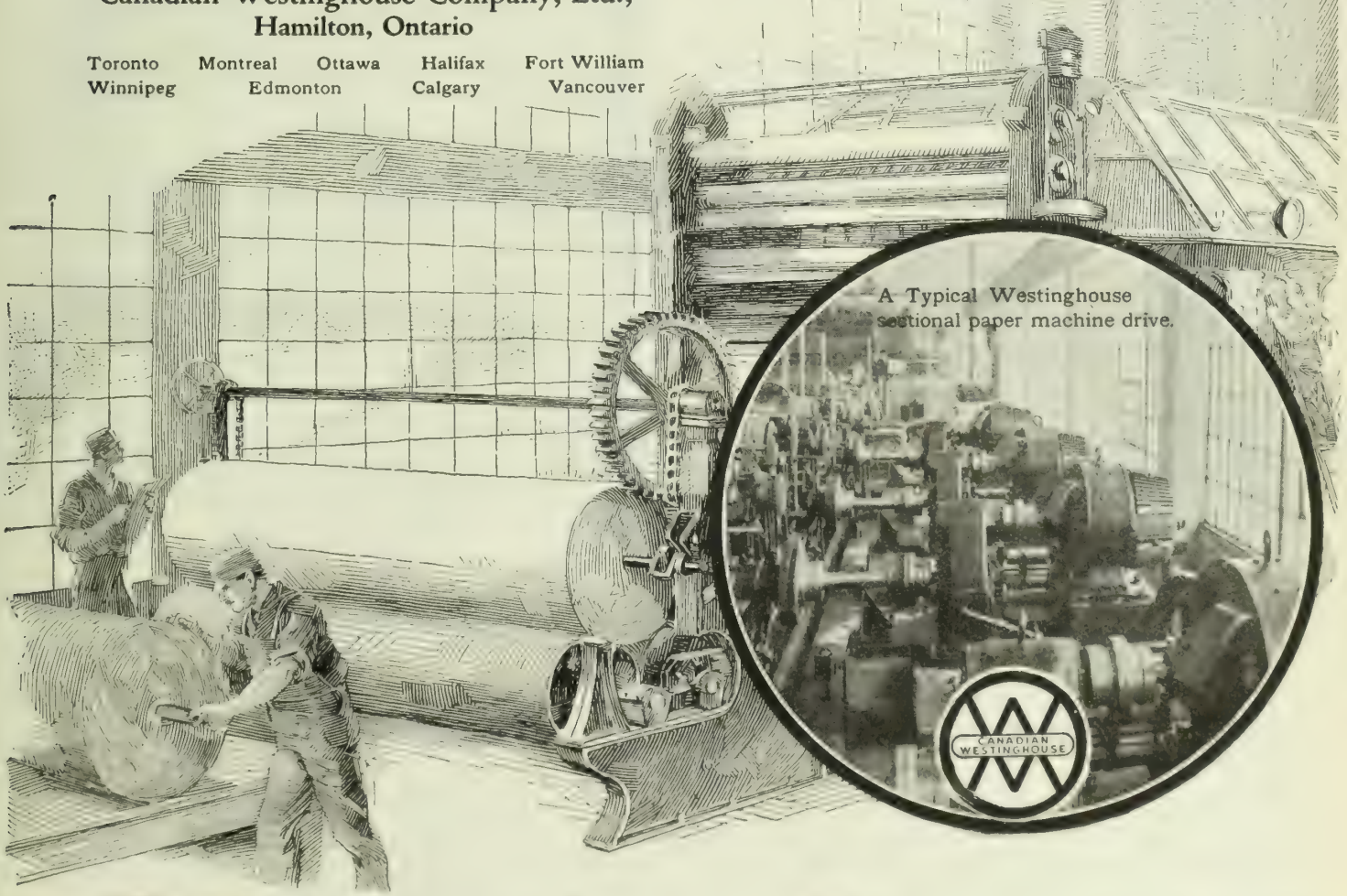
each; and, where particular advantages could be obtained, has designed special apparatus.

The paper machine was one of those that needed special study. To meet the requirements of this rather complex machine, the Westinghouse Company has recently developed and successfully marketed a sectional paper machine drive.

This worthy achievement is only one of the many notable developments that Westinghouse has made. It is carrying on its study in an effort to promote still further progress in the paper industry.

Canadian Westinghouse Company, Ltd.,
Hamilton, Ontario

Toronto Montreal Ottawa Halifax Fort William
Winnipeg Edmonton Calgary Vancouver



A Typical Westinghouse sectional paper machine drive.

Westinghouse

Peirce
EVERY requirement of the pole line is met by the Peirce. The same uniformity of material is used throughout. New rolled open-hearth steel, rigidly inspected in all manufacturing processes, and then hot-dip galvanized to the four-immersion test.
IT'S THE QUALITY IN THE PEIRCE THAT PROTECTS.
— ASK YOUR JOBBER —
N. SLATER CO., LIMITED
HAMILTON, ONTARIO

Peirce

THE consistent reliability and strength of an entire system equipped with Peirce Pole Line Hardware assures permanence.

The drop-forgings and stampings of the Peirce are made with every margin of safety allowed for — and hot-dip galvanized to preserve that uniformity of super-strength.

THE QUALITY IS IN
BEFORE THE GALVANIZING
GOES ON.

— *ASK YOUR JOBBER*

N. SLATER CO., LIMITED
HAMILTON, ONTARIO

LT. COL. R. G. STEWART, PRESIDENT
E. A. LARMONTH, VICE PRESIDENT
E. O. LEAHEY, MAN. DIRECTOR
J. D. CUNNINGHAM, SECY. TRES.

E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:

OTTAWA,

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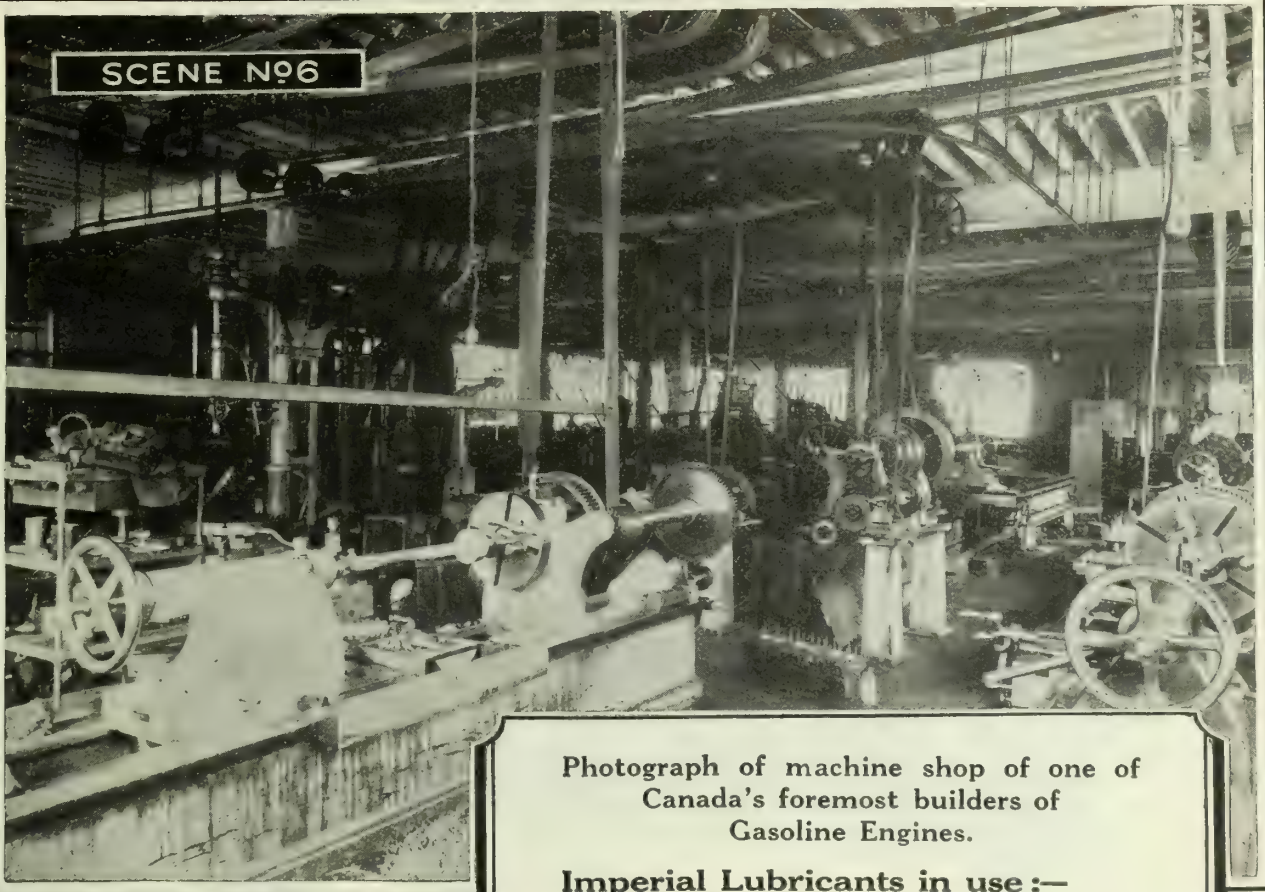
Consult the advertiser, his information is valuable.



Photograph of machine shop of one of Canada's foremost builders of Gasoline Engines.

Imperial Lubricants in use:—

Imperial Renown Oil.
Imperial Capitol Cylinder Oil.
Imperial Atlantic Red Oil.
Imperial Arctic Cup Grease.
Imperial Cutting Compound Antiseptic.
Imperial Polarine Motor Oils.

IMPERIAL LUBRICANTS

FOR MANUFACTURING, MINING AND MILLING

CYLINDER OILS
Imperial Cylinder Oil
Imperial Valve Oil
Imperial Capitol Cylinder Oil
Imperial Beaver Cylinder Oil

ENGINE AND MACHINE OILS
Imperial Solar Red Oil
Imperial Atlantic Red Oil
Imperial Renown Oil
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Imperial Ario Compressor Oil
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FOR VARIOUS INDUSTRIAL USES
Imperial Black Oils
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Imperial Greases.

Hundreds of Canadian firms have used Imperial Lubricants exclusively for years. The fact that we manufacture a grade of oil or grease for every lubricating requirement and always maintain the same standard of quality and service, makes it easy and profitable for you to standardize on Imperial Lubricants.

Write our nearest branch for the advice or service of an expert lubrication engineer.

IMPERIAL OIL LIMITED

Don't Scrap Machinery—Save it!

THE ready convenience and quick work of oxy-acetylene cutting and welding is saving innumerable dollars' worth of valuable machinery for others—might it not do the same for you?

The purity of Dominion Oxygen and Prest-O-Lite Acetylene assures the hottest flame and the utmost fuel economy.

Dominion Service, through a wide-spread system of distributing points, provides quick shipments of supplies and short hauling distances.

A representative will welcome the opportunity to explain Dominion Service to you.

Dominion OXYGEN

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DOMINION OXYGEN COMPANY LIMITED

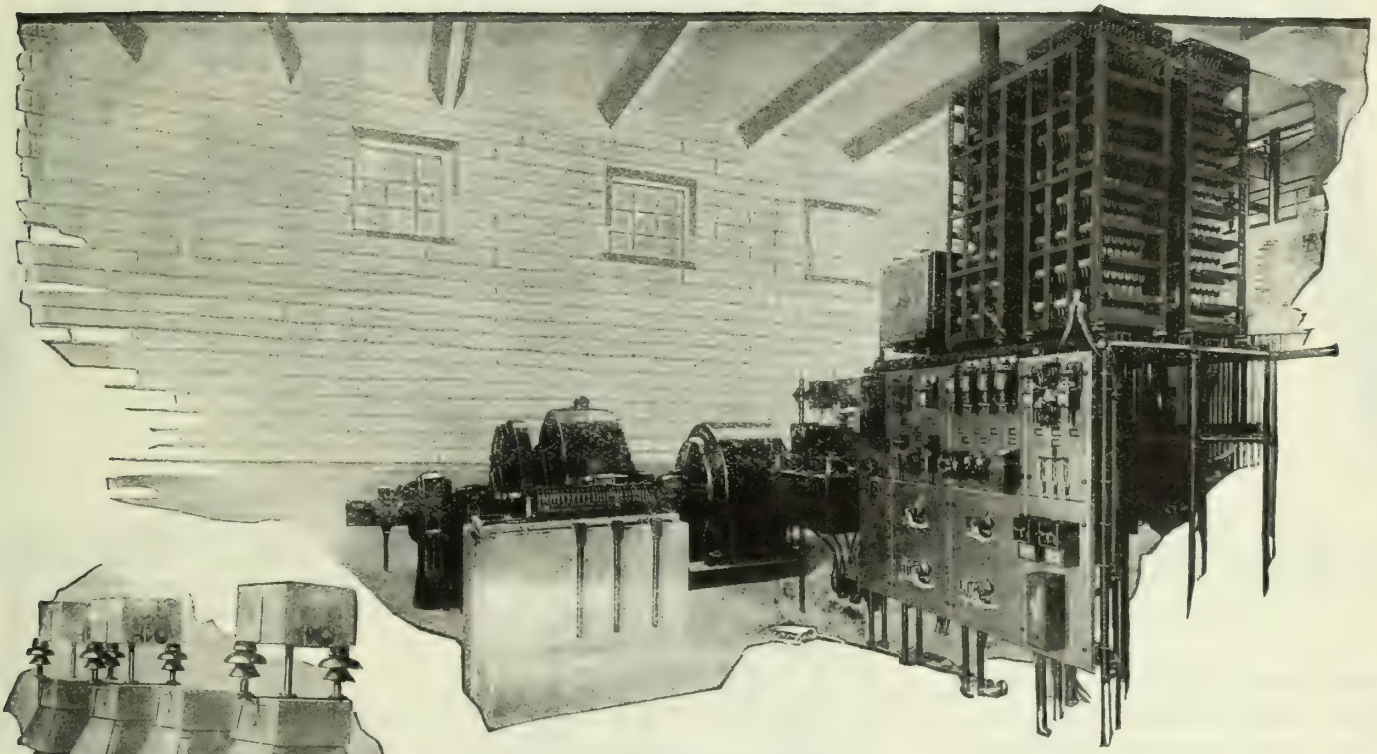
General Offices: 80 Adelaide St. East, Toronto

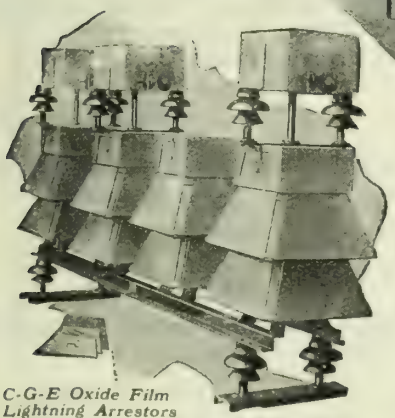
Distribution Points: Hamilton, Merritton, Montreal, Quebec, Shawinigan Falls, Toronto, Welland, Windsor and Winnipeg.

Prest-O-Lite DISSOLVED ACETYLENE

Operating the Welding and Cutting Gas Division of Prest-O-Lite Company of Canada, Limited.

Save Money and Improve Service





C-G-E Oxide Film Lightning Arrestors

C-G-E Type H Transformer "The Standard of Quality"

C-G-E Automatic Substations Produce Results.

Automatic Railway Substations start up and shut down as the demand for power appears or disappears. The expense for operators is eliminated so that cost for attendance is minimized.

Automatic Substations can be more closely spaced because of the lower cost of operation. This saves feeder copper and improves the trolley voltage. By shutting down under no load "running light losses" are saved for a large part of the day.

Let the automatic station engineer in the nearest C-G-E office tell you how much your savings would be with C-G-E automatic control.

Canadian General Electric Co., Limited

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Branch Offices: Halifax, Sydney, St. John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

ALGOMA STEEL
CORPORATION LIMITED
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THE ALGOMA STEEL CORPORATION LIMITED

announce to their customers and the Canadian trade that they can supply American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼", ZEE BARS for car builders and general purposes; small and large ROUNDS, SQUARE and FLAT BARS. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process, and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

MARK OF ALGOMA O.H. QUALITY

Order from us and you will get both quality and prompt service. A trial is convincing.

Our extensive warehouse facilities ensure prompt delivery.

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Nova Scotia: F. J. Owen Connolly, The Maritime Trust Building, 91 Hollis St., Halifax, N.S.

Open Hearth - Alloy Steels

Chrome-Vanadium,
Chrome-Nickel,
Nickel Steel

All of these steels we supply in Hot Rolled Bars or Billets.

WE ALSO FURNISH

Blooms, Billets, Slabs,
Structural Steel,
Merchant Bars,
Concrete Reinforcing Bars,

STEEL RAILS, Open Hearth quality, all sections from 12 lbs., to 105 lbs., per yard.

Angle Bars, 100% Joints,
Continuous Standard Joints,
Steel Tie Plates

PIG IRON

Basic, Foundry, Malleable,

Sulphate of Ammonia
Sulphuric Acid Nitre Cake

Charles Walmsley & Co. (Canada) Limited.

ARE NOW MANUFACTURING IN CANADA AND RECEIVING ORDERS

— FOR —

WALMSLEY
COMPLETE PAPER MILL EQUIPMENT
HITHERTO MADE ONLY AT BURY, ENGLAND.

TREMOR SCREENS
PREVIOUSLY IMPORTED FROM WATFORD ENGINEERING WORKS, LTD., ENGLAND.

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PATENTED BY J. J. WARREN OF BROWNVILLE, N.Y.

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CANADIAN BRANCH OF
SIR W. G. ARMSTRONG WHITWORTH & CO., LTD., LONDON, ENG.,
AND BRANCHES;
ALSO CHARLES WALMSLEY & CO., LTD., BURY, ENGLAND.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

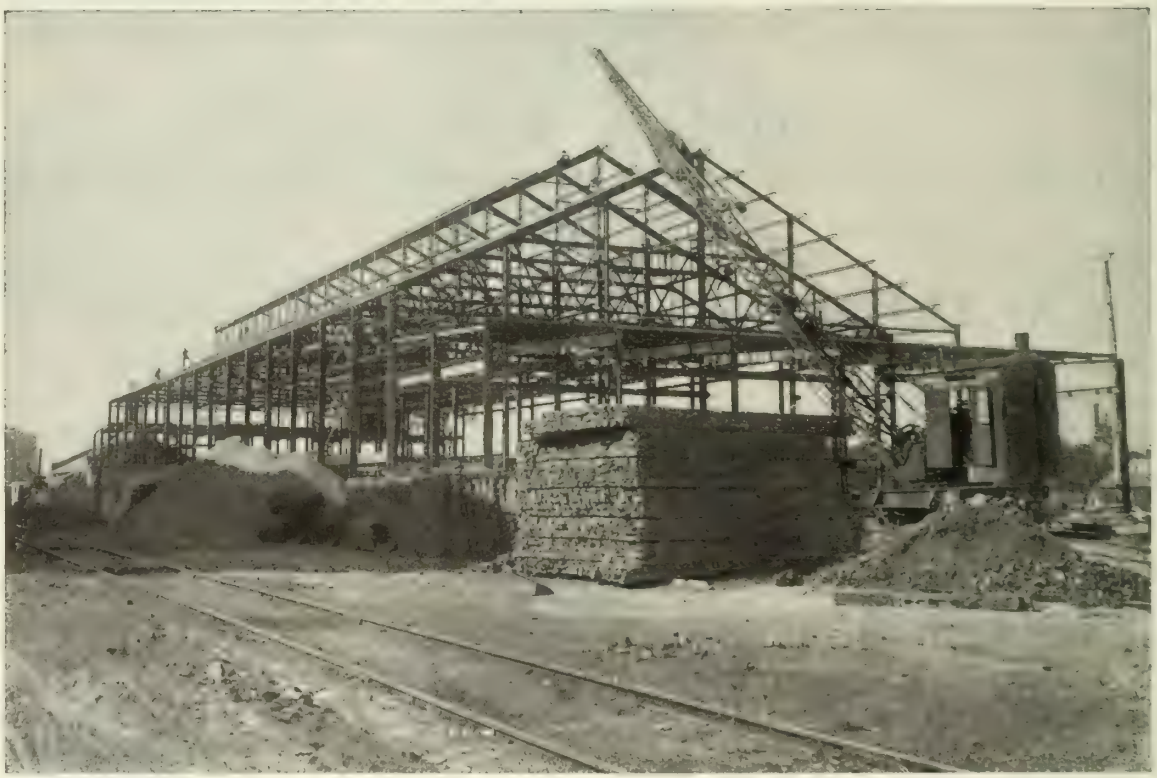
ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.

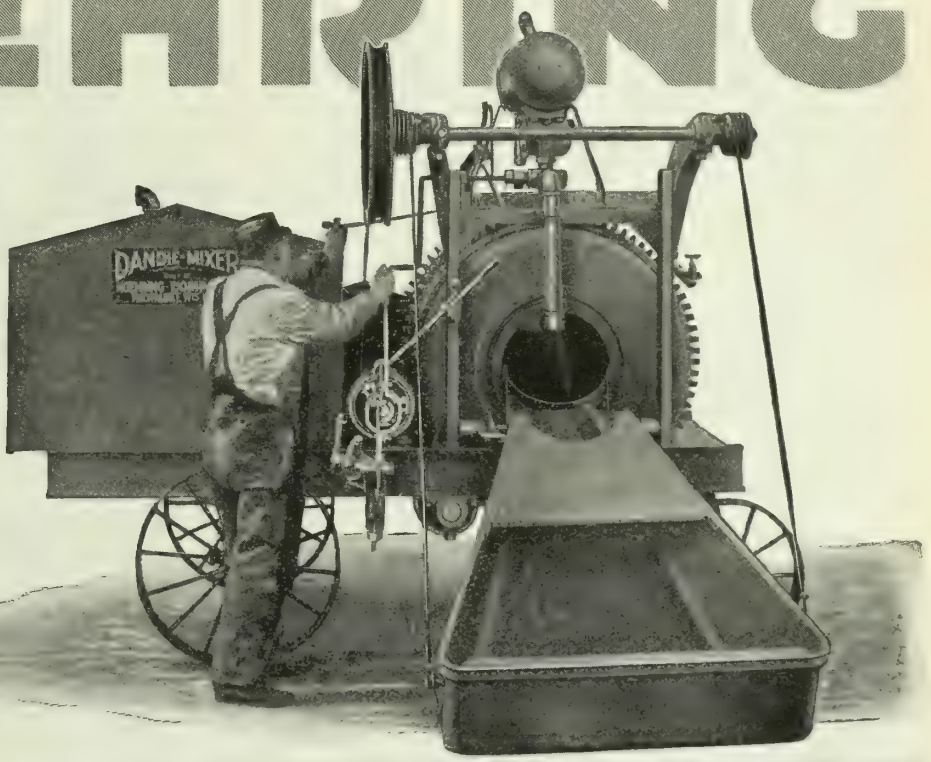


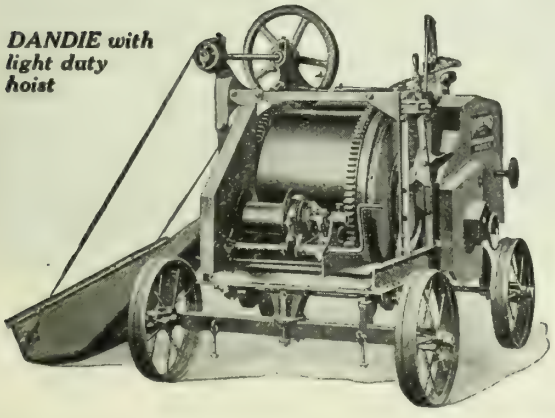
We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

Every advertisement is a message to you.

KOEHRING

DANDIE Light Mixer

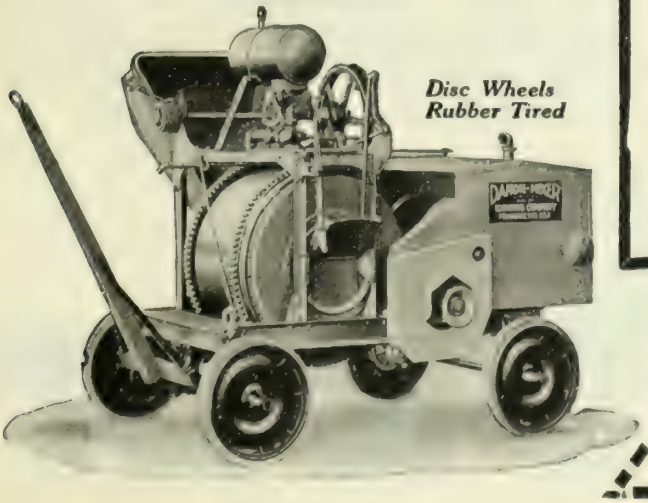




DANDIE with light duty hoist

Capacities

4 and 7 cu. ft. mixed concrete, steam or gasoline. May be equipped with light duty hoist, power charging skip, low charging platform, automatic water measuring tank. Send back the coupon.



Disc Wheels Rubber Tired

Send back the coupon

GET the details of Dandie mixer construction, and find out why the Dandie is the most remarkable value in the light mixer field — not the cheapest mixer in price — but the strongest built mixer with greatest yardage per day performance.

The Dandie catalog will give you a new basis for judging light mixer values—a new standard for trouble-free dependability, and long service life. Send back the coupon today.

KOEHRING COMPANY OF CANADA, LIMITED.

105 Front St., East, Toronto, Ont. Phone Main 1498
616 Canada Cement Bldg. Montreal, Que. Phone Uptown 3026
E. N. & W. E. SOPER, 63 Sparks Street, Ottawa, Ont. Phone Queen 3435

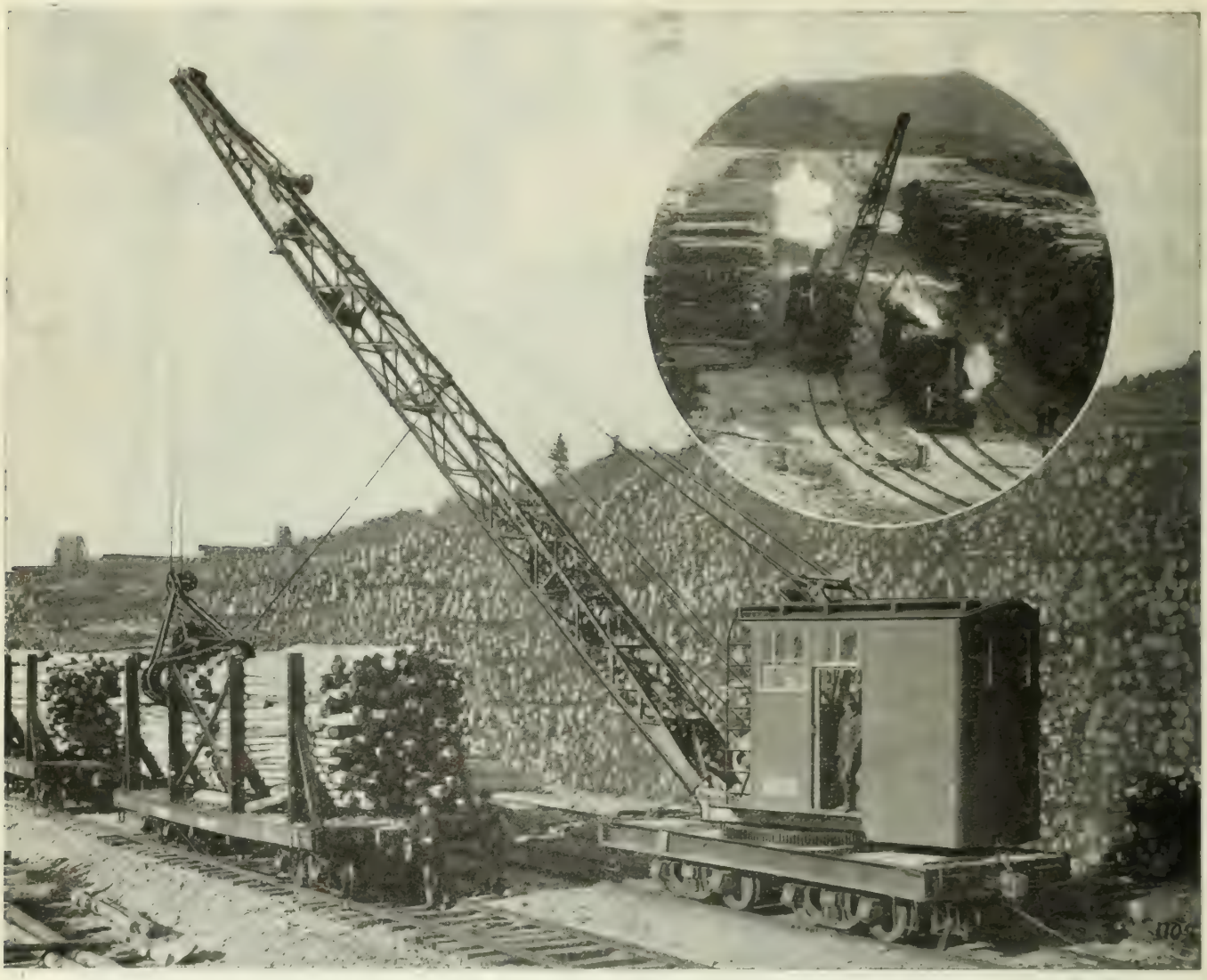
KOEHRING COMPANY OF CANADA, LTD.
Toronto, Ont.

No. 35. Please send, without obligation to me, full information about Dandie Light Mixer.

Name .....

Address .....

Every advertiser is worthy of your support.



FOR handling pulpwood in and out of storage, quickly and economically, use a Link-Belt locomotive crane equipped with a wood grapple.

The modern design and all around rugged construction of the Link-Belt crane fit it perfectly for the exacting demands of this work. Its serviceability makes it the owner's choice; its large and powerful clutches, and brakes, and convenient arrangement and accessibility of all working parts, make it the choice of the operator.

The Link-Belt crane can cut your handling costs in other work also—handling miscellaneous loads with grab bucket, hook-block, sling or magnet—switching cars, etc. In fact there is always useful and profitable work for a locomotive crane, at almost every industrial plant.

Send for our book No. 370

LINK-BELT LIMITED

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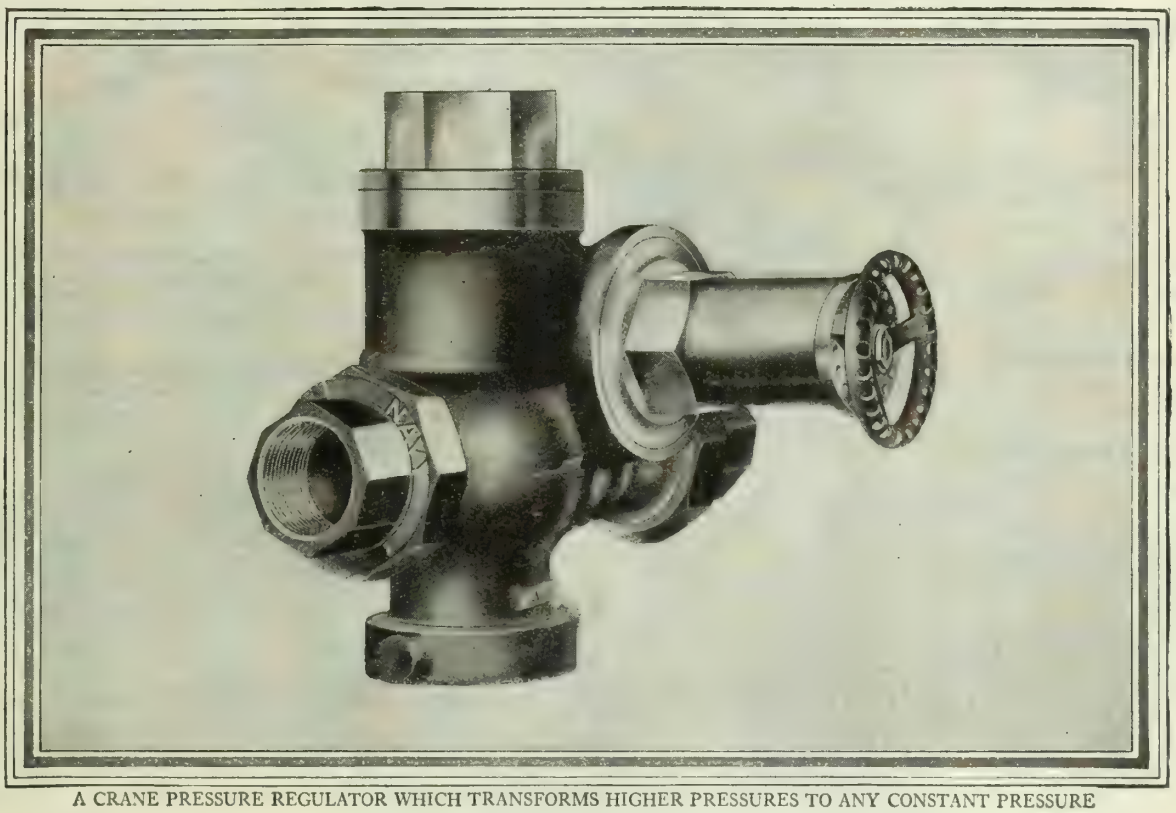

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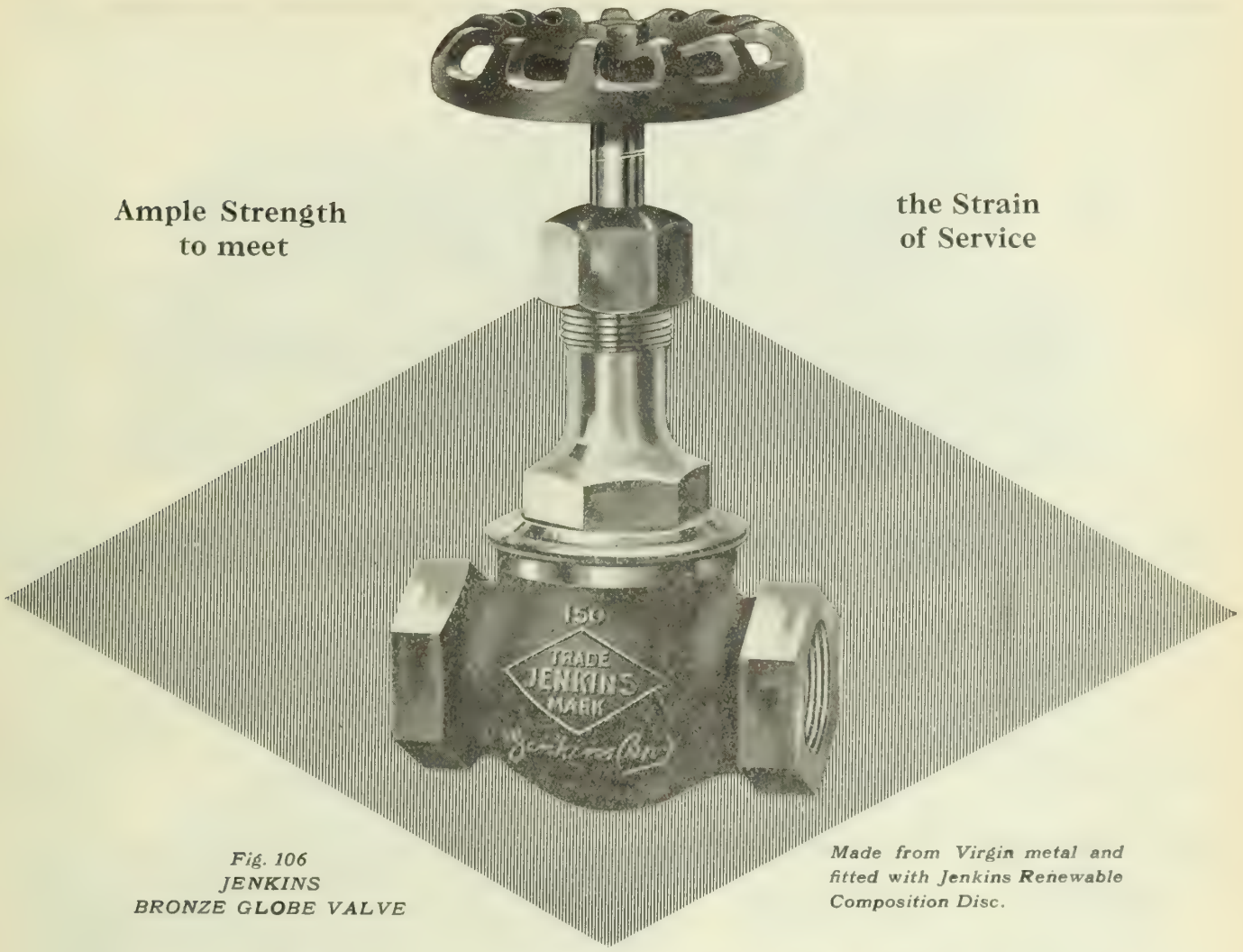

Fig. 106
JENKINS
BRONZE GLOBE VALVE

Made from Virgin metal and fitted with Jenkins Renewable Composition Disc.

Jenkins Bronze Globe and Angle Valves

Suitable for 150 pounds working steam pressure or 250 pounds working water pressure.

These valves can be supplied in Anti-Acid Bronze if desired and are so constructed as to provide ample strength throughout to meet the strains of contraction and expansion.

The spindle in these valves is powerful and accurately threaded. The non-heat hand wheel is made of Malleable Iron, lacquered green.

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Bring true valve economy to your plant by installing these "Jenkins" Models wherever valves of this type are required. Freedom from costly repairs and replacements make Jenkins Diamond-Marked Valves the least expensive.

Get a copy of our latest catalogue No 9, wherein we have devoted a section relating to Cast Steel, Monel Metal, Mounted, Globe, Angle and Gate Valves so often required for Pulp and Paper Mills.

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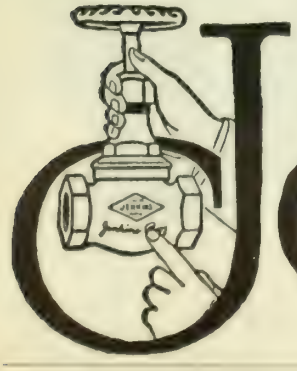
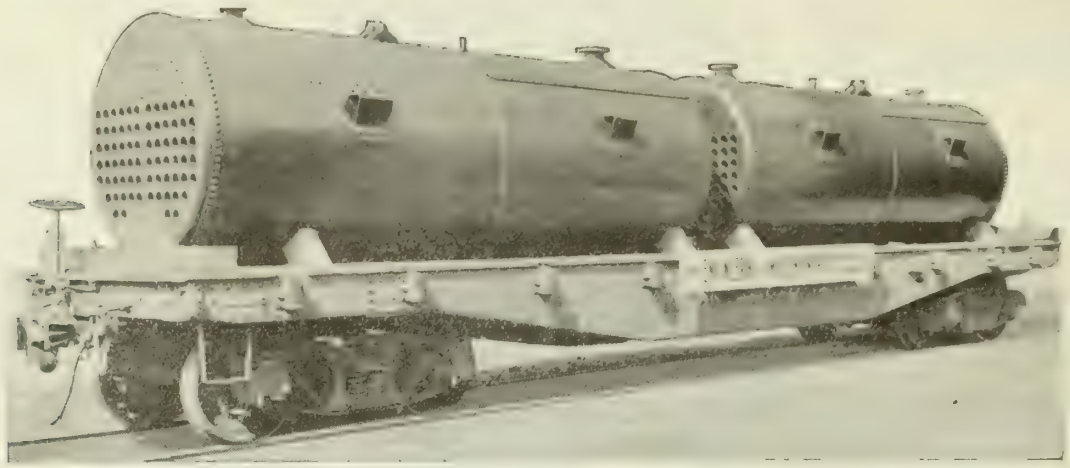


Always marked with the "Diamond"

Jenkins Valves

SINCE 1864



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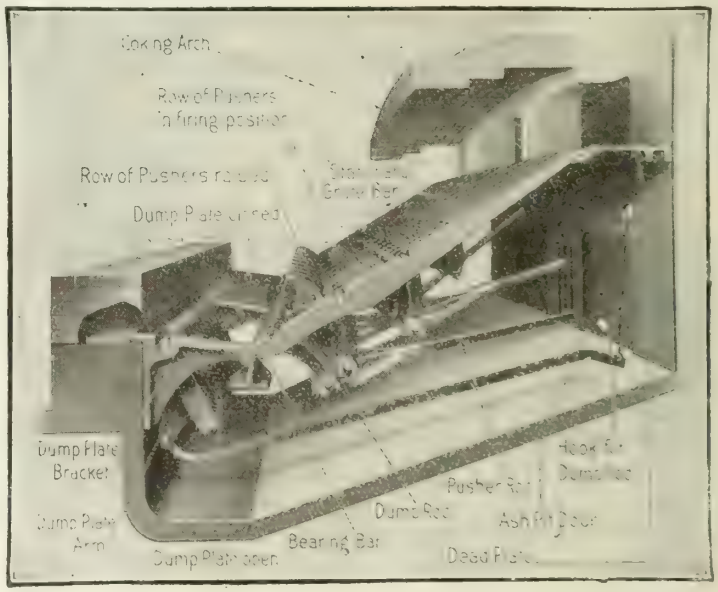

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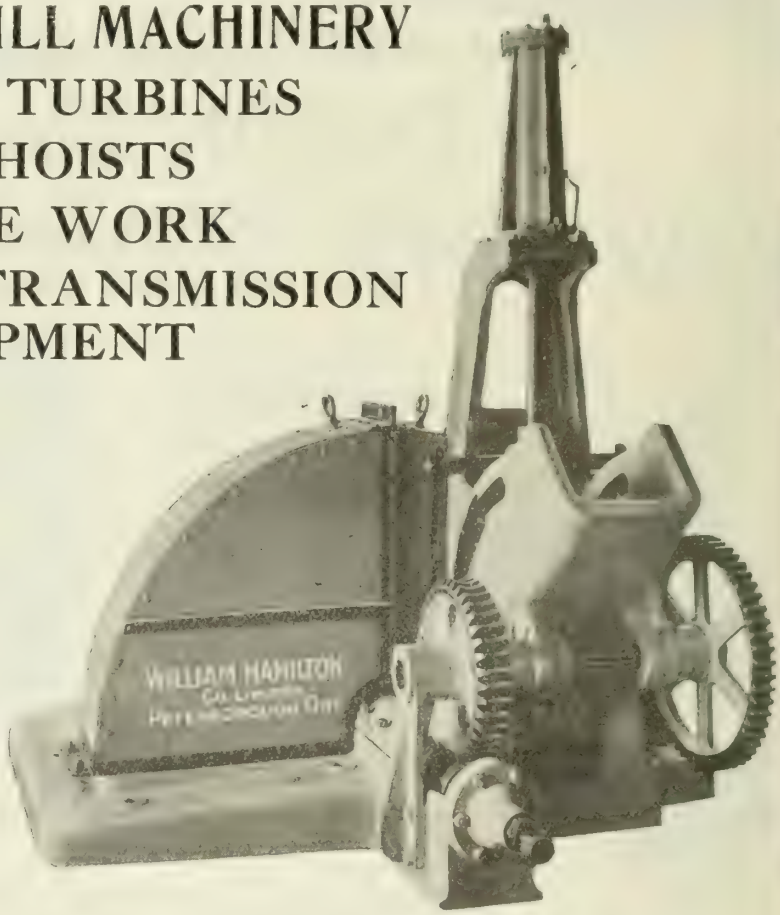

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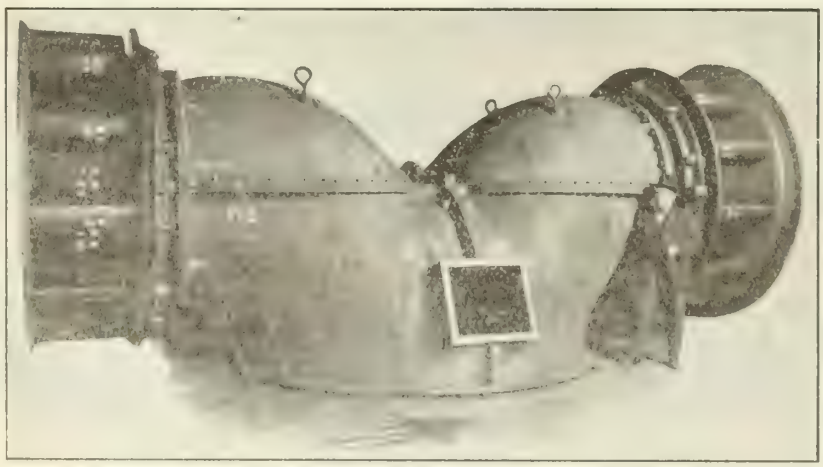

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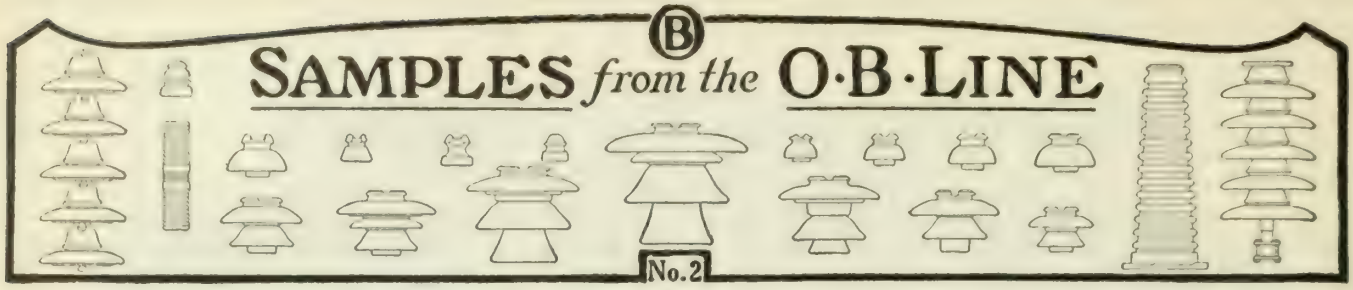

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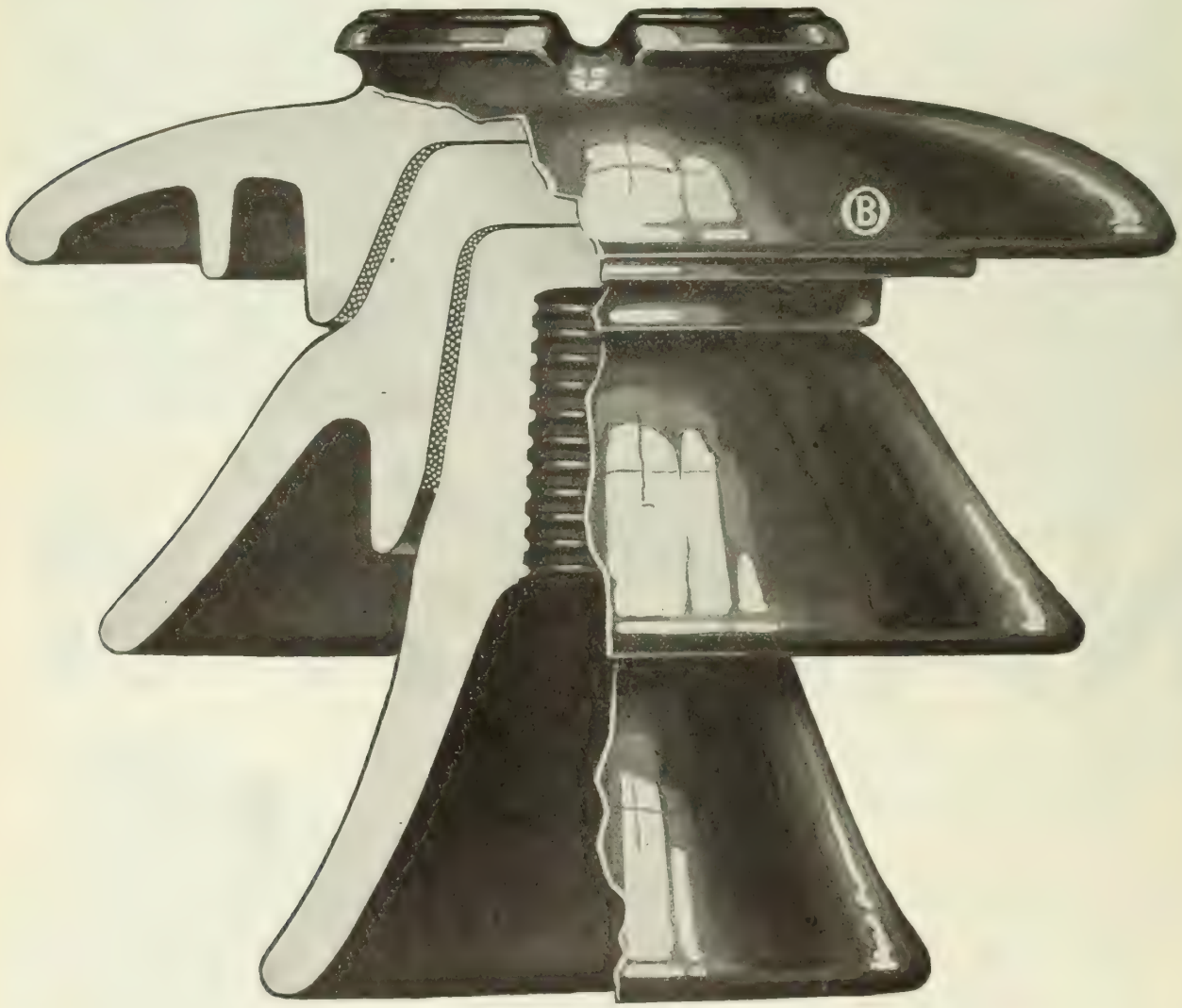

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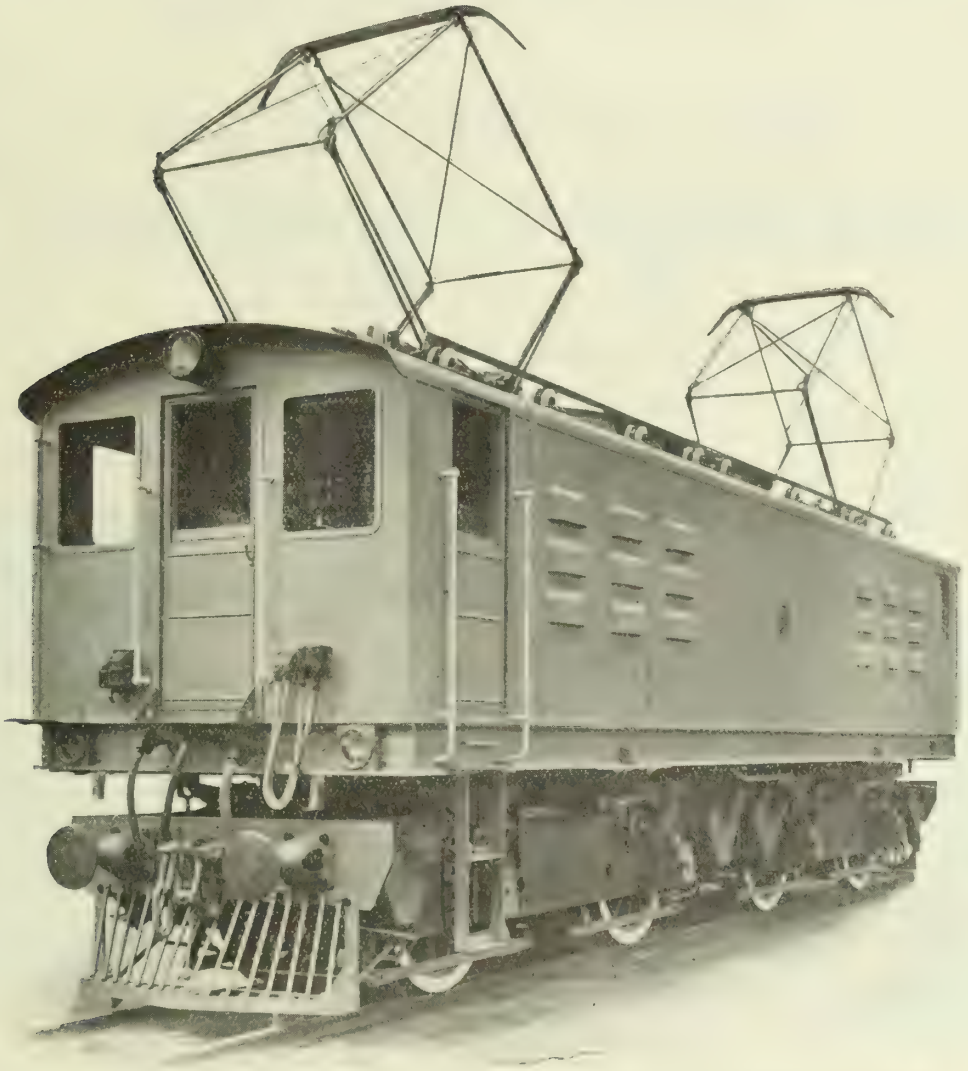

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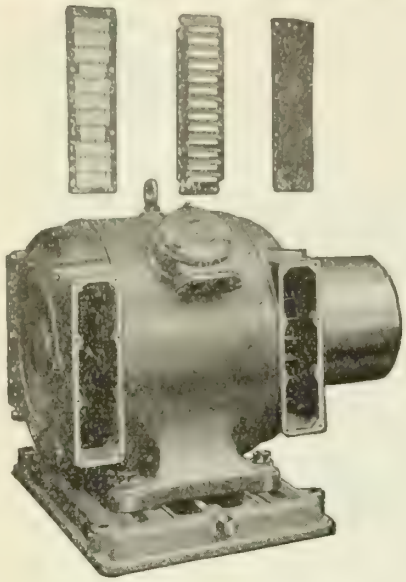

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LATEST TYPE

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Built to withstand the severity of the Pulp Mill Service. As seen from the cut they may be readily made a drip-proof machine by fitting the cover shown in the centre.

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Each standard "LANCASHIRE" motor is also fitted with a ROLLER BEARING at the pulley end and a BALL BEARING, at the opposite end, eliminating all trouble from oil throwing and rotor rubbing on the stator. Complete stocks of these machines are carried at Montreal, Toronto and Vancouver.

LANCASHIRE DYNAMO & MOTOR CO.

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Chipper and Barker Knives

THE Steel the Temper and their cutting qualities are features which go toward making Simonds Chipper and Barker Knives the most efficient for use in the Pulp Industry.

Careful attention to details of manufacture and Steel which is made especially for this style of cutting tool in Simonds Steel Mills, result in uniformity and proper temper. Consequently Simonds Knives stand more work and give longer service.

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WHETHER the architectural treatment of Toronto church detail has specified stone, brick, or stucco, the elements of super insulation, reduced cost of erection and flexibility have found their best expression through the use of Interlocking Tile.

A large hollow brick of patented design for load-bearing walls or for backing-up brick and stone facing.

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The continued use of the Interlocking Tile is a testimonial of its superior merits.

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INTERLOCKING TILE COMPANY
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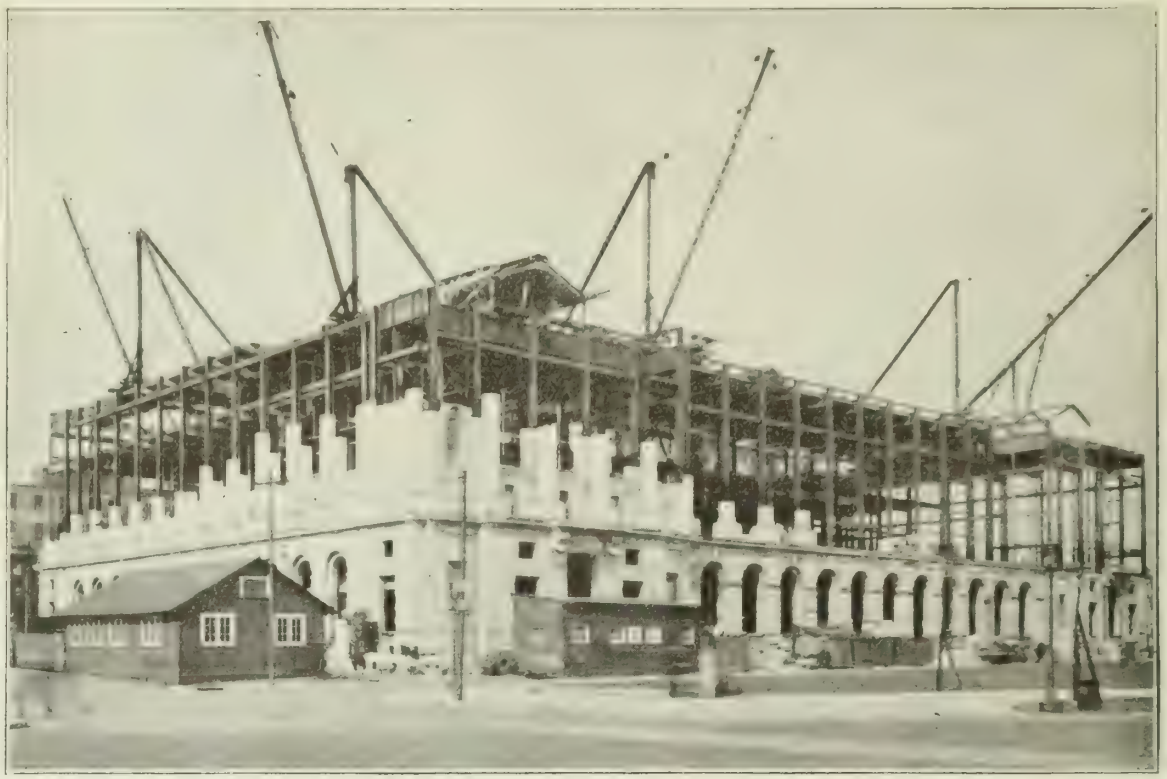

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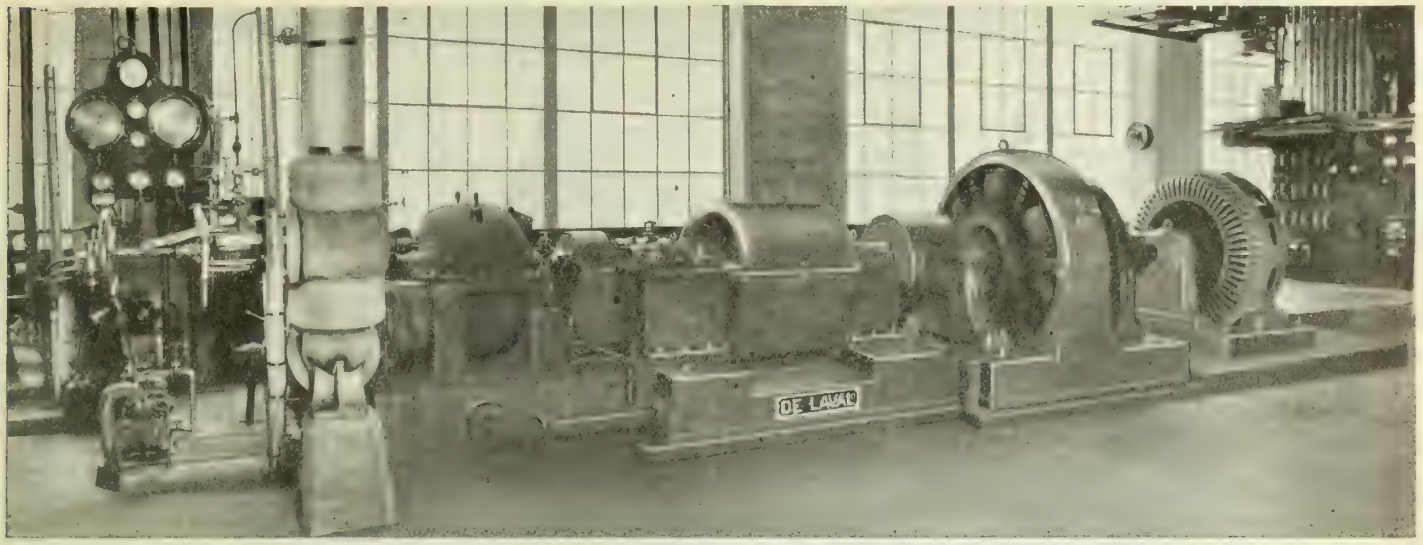


De Laval Direct Current Generators for Paper Mill Drive

DIRECT CURRENT generators have advantages wherever a wide range of speed adjustment is desirable. For supplying direct current two methods are available, either turbine driven direct current generators may be used or the current may be obtained from an alternating current distribution system by means of rotary converters or motor generators. The production of direct current by turbine driven generators is the most economical of steam, as well as most simple and lowest in first cost and operating expense.

The photograph shows a De Laval 600 K. W. geared turbine driven direct current generating set supplying current for the operation of a paper machine. Each set of rolls is driven by an individual motor, the speed of which can be adjusted independently of the other motors, so that each set of rolls can be run at the correct speed to take up the "draw" of the paper. The speed of the turbine is held within close limits by an oil relay governor, but the voltage can be adjusted by varying the excitation. There is, of course, no cyclical speed variation, as with a reciprocating engine.

After this unit was installed a 500 K. W. alternator was also coupled on in order to increase the amount of exhaust steam, while incidentally producing more power for use in the mill.

De Laval steam turbines are built with velocity stages for small and medium size units where the exhaust can be used in heating, drying or other processes. Where high efficiency is desired and for large sizes, pressure stage turbines are used. They may be designed for back pressure, bleeder, mixed flow or vacuum service.

By means of the **De Laval speed reducing gears**, De Laval turbines are adapted for driving all classes of machinery, for rope and belt drive, and for direct connection to shafting.

Our Engineering Department will gladly study your pump and power requirements with a view to suggesting the most economical and suitable equipment and arrangement.

The De Laval High Efficiency Pulp Pump

HIGHLY efficient pumps for handling water containing pulp rags and waste are now obtainable. The open type impeller used in the **De Laval pulp pump** is shown in the accompanying photograph. The knife-like sides of the impeller blades running close to the side plates shear or cut stringy material.

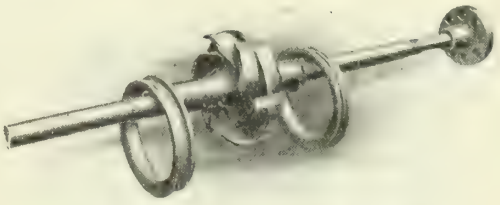
This type of impeller gives practically no trouble from clogging under the most adverse conditions, and when handling materials which quickly clog closed impeller pumps. The side plates, which surround the eye of the impeller, are removable parts held in recesses in the pump casing and cover. Like the impeller they are made of bronze.

The pump shaft is protected from strings, rags, etc., wrapping around it by stationary sleeves. It is also encased in bronze sleeves which extend from the impeller out through the packing glands, preventing wear by the latter upon the shaft itself.

The De Laval pulp pump runs at speeds which permit direct connection to standard speed motors and turbines. A recent test on an 8 in. pump driven by synchronous motor showed an efficiency from wire to water of 64%, and a 10 in. pump an efficiency of 66%.

The De Laval pulp pump, like all other De Laval centrifugal pumps, is built on the split casing principle, being divided horizontally in the plane of the center line of the shaft. All internal parts are at once accessible upon lifting the casing cover, and can be removed after loosening the bearing caps. The suction and discharge connections are in the lower part of the casing and need not be disturbed.

All parts of De Laval apparatus are made to limit gages on an interchangeable basis, and replacements can be inserted by men of ordinary intelligence, using parts ordered from the factory by means of the identification symbols which will be found stamped upon each part. Special metals are used where required to withstand corrosion.



Impeller and wearing rings of De Laval special pulp pump.

For handling water in paper mills, De Laval centrifugal circulating pumps, service pumps, boiler feed pumps, fire pumps, etc., etc. are superior.

Ask for Catalog C-103

De Laval

Steam Turbine Company

Turbine Equipment Co., Ltd., 73 King St. West, Toronto.
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C-103

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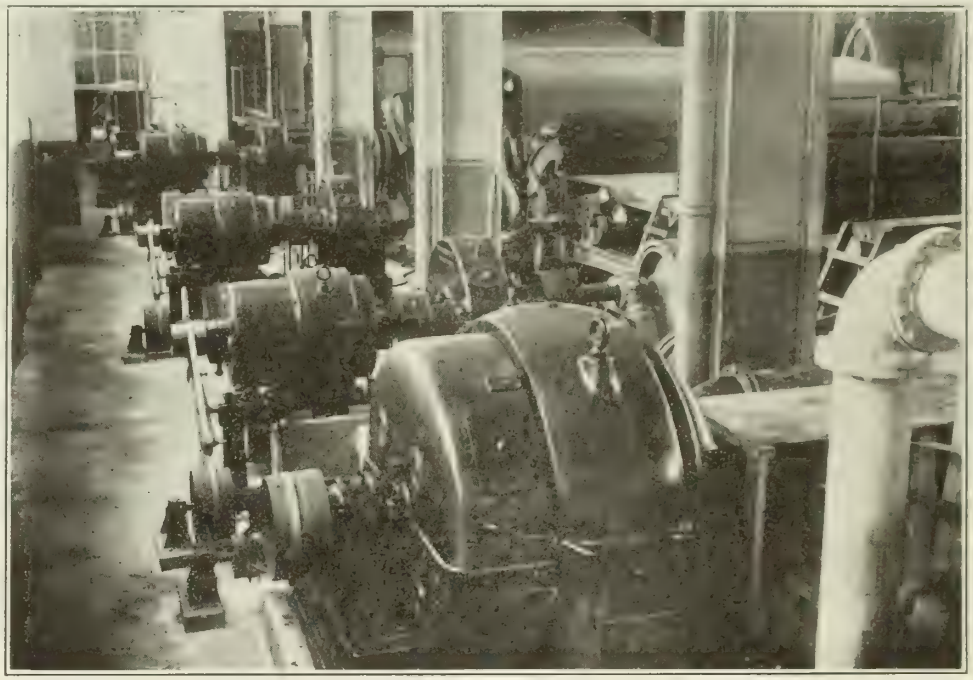

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These simple rugged power plants are the result of generations of study and experiment by the pioneer builders of Gas Engines. Their entire freedom from Water Injection Systems, Hot Bulbs, Igniters and Timers guarantees an extraordinary low upkeep cost, while their efficient use of low grade fuel oils ensures a dependable supply of power at minimum expense. And they develop power day-in-and-day-out independent of temperature, weather, coal shortage or failing electric supply.

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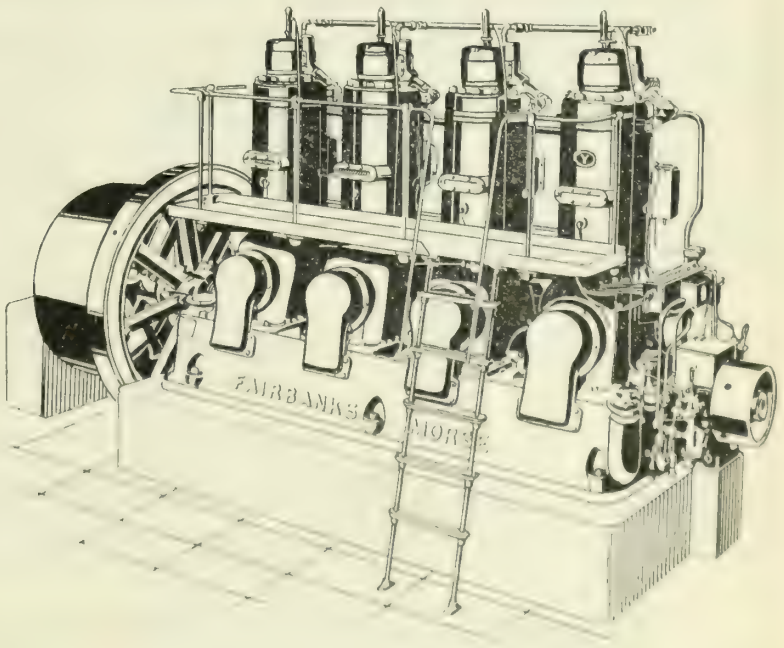

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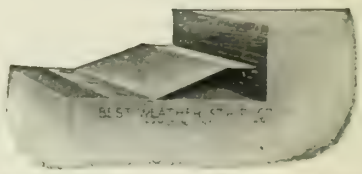
Helping To Solve The Fuel Problem

WHILE THE FUEL COMMITTEE OF THE INSTITUTE AND THE FUEL COMMITTEES OF THE BRANCHES ARE ENGAGED IN STUDYING THE FUEL PROBLEM, A MEMBER OF THE INSTITUTE SUGGESTS TO HIS FELLOW MEMBERS THAT YOU TAKE IMMEDIATE ACTION IN EQUIPPING YOUR HOMES WITH BEST'S MADE IN CANADA WEATHER STRIP.



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It will save from fifteen to forty per cent of your fuel bills and thus offers a partial solution of your own fuel problem.

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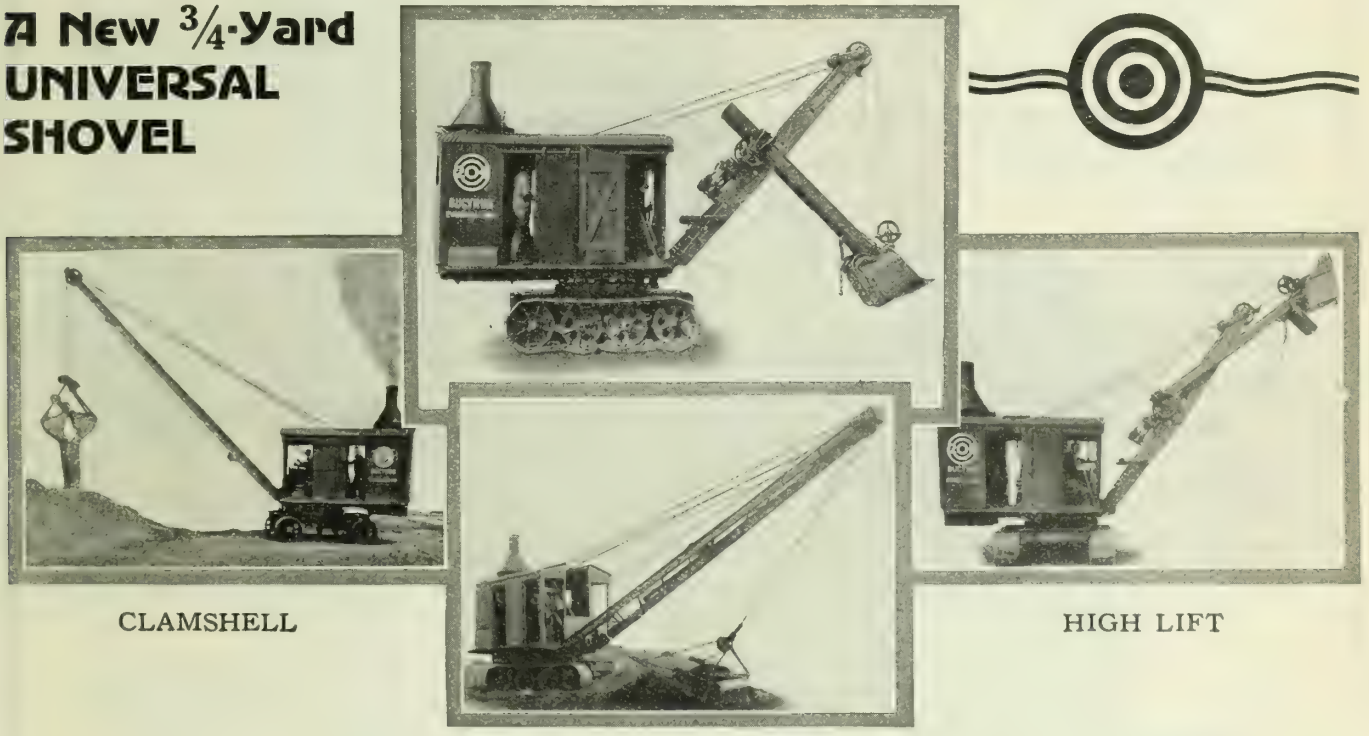

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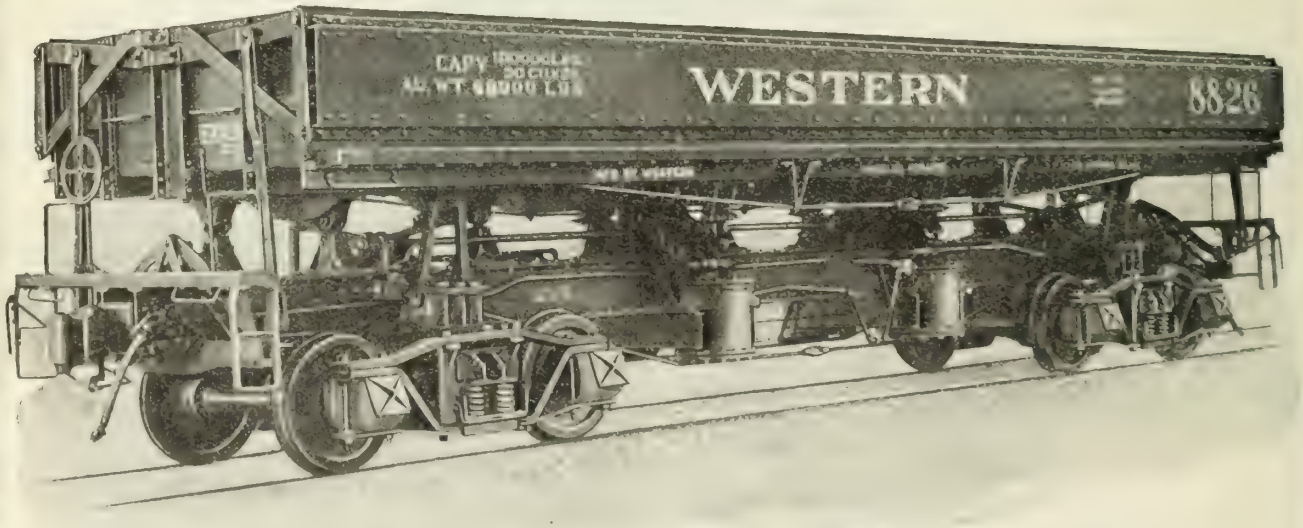

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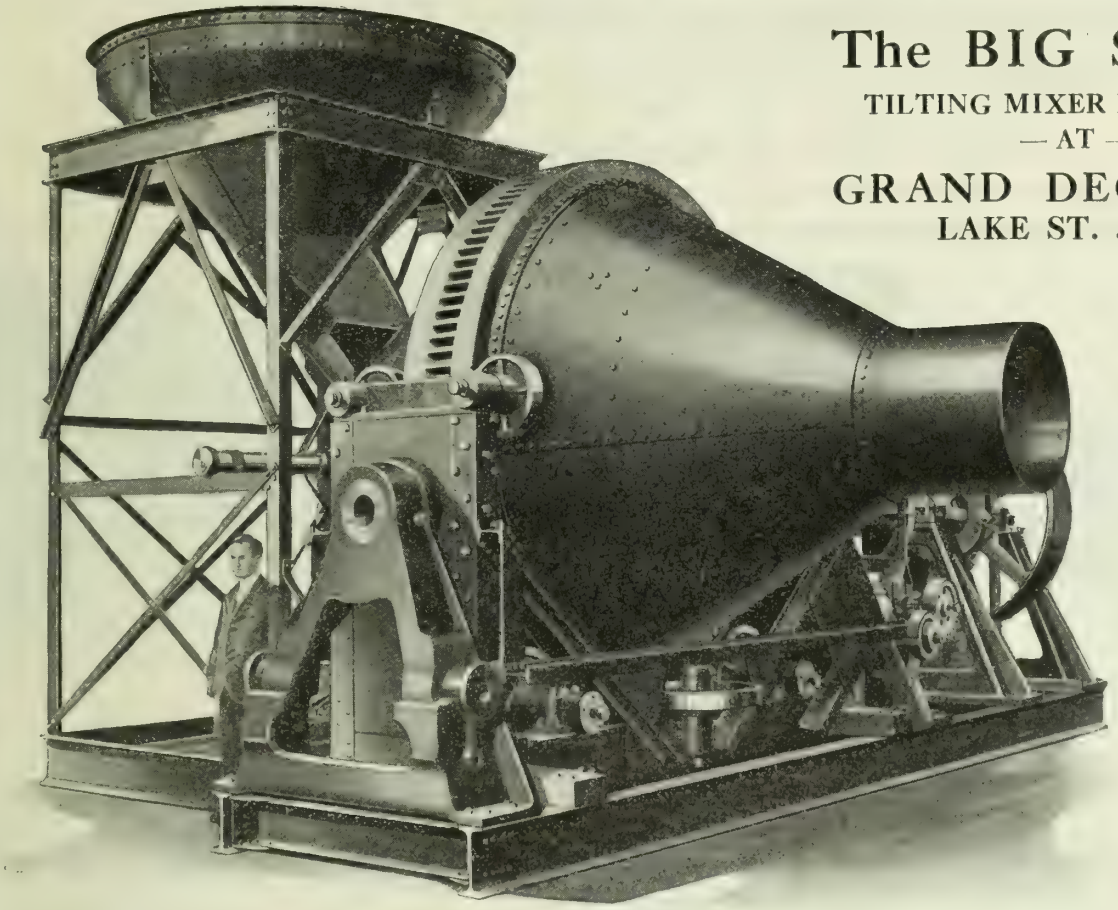

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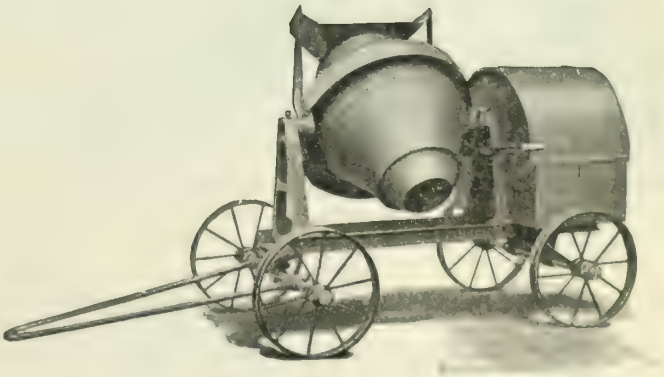

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To Perform the Work for which it was especially designed and constructed.

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ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

SEPTEMBER 1923 Volume VI, No. 9

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The Valley of the Saguenay

Saguenay Branch inaugurated August 10th, 1923. A prosperous district with great industrial possibilities. Huge power developments under way.

Viewed from the policy of ever expanding the scope and usefulness of the profession, it was abundantly evident, on the evening of Friday, August tenth, nineteen twenty-three, by the large number of engineers in attendance, and from the enthusiasm prevailing, that the Council of *The Institute* had acted wisely in authorizing the establishment of a branch in the Saguenay valley, which extends from the river St. Lawrence to the shores of lake St. John, and includes Kenogami and other picturesque lakes and rivers heretofore noted particularly for the beauty of their scenery and their excellent fishing, but now through industrial enterprise and engineering genius are being made more subject to the use of man. Probably no other district in Canada offers a greater study in contrasts. A lover of nature finds joy and relaxation in the beautiful natural scenery, mighty rivers and towering hills, smaller streams, lakes and valleys in large numbers, rolling, undulating country, broadening out to prairie stretches about the shore of lake St. John with a happy contented people, thrifty and prosperous, leading that quiet, pastoral existence immortalized by Louis Hémon in "Maria Chapdelaine", the scene of which lies within this district. In striking contrast we find an area of intense industrial development; huge hydro-electric power

The Saguenay River.

W. G. MITCHELL, M.E.I.C.
Chairman of the Saguenay Branch.

projects under way, an industrial city with model homes, embodying every modern convenience, and a firm belief that the valley of the Saguenay has a future second to none in the field of industry and commerce.

In connection with inaugurating the branch, the local members of the profession arranged in advance a magnificent programme of sightseeing and visits to the important engineering undertakings that proved a revelation to the non-residents, a source of satisfaction and profit, and left a lasting impression not only of the importance of the work being done, but of the courtesy, consideration and breadth of hospitality of the resident hosts.

The various points included in the itinerary provided for the visitors will be described later, and include a trip to Portage des Roches, where the dam is under construction by the Quebec Streams Commission; Price Brothers' dam and power plant, nearing completion at the mouth of the Chicoutimi; lunch in the hangar at Chicoutimi; Kenogami mills of Price Brothers, to which large additions are being made; an exhibition of the Price Brothers' film showing the process of paper making from cutting the logs to the finished paper; a trip to Pibrac dam, Quebec Streams Commission, and on Saturday, an excursion to the Grand Discharge at St. Joseph d'Alma, where the party were guests of the Quebec Development Company.

Saguenay Branch Inaugurated

Fifty-one engineers, together with Sir William Price, president of Price Brothers and Company, Limited, made up the personnel of the enthusiastic gathering at the Staff House, Kenogami, on the evening of Friday, August tenth, called for the purpose of inaugurating a branch of *The Engineering Institute of Canada* to be known as the Saguenay Branch. The chair was occupied by President Walter J. Francis, who called the meeting to order at eight-thirty. As a preliminary to the meeting the members present indulged in a few songs from *The Institute* song sheet, including number eight, "As We Go Boosting Along," led by Councillor Frederick B. Brown, who acted as song leader during the evening, the songs being frequent and entered into most heartily by those present.

The chairman asked Secretary Keith to read the minute of the meeting of Council of May twenty-ninth, authorizing the establishment of the branch, which was read as follows:

> "The following application for the establishment of a branch of *The Institute* to be known as the Saguenay Branch was presented:
>
> Chicoutimi West, May 14th, 1923.
>
> Gentlemen:
>
> We, the undersigned corporate members of *The Engineering Institute of Canada*, hereby make formal application for the establishment of a branch of *The Institute* to be known as the "Saguenay Branch":
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> G. E. Lamothe, A.M.E.I.C., Price Bros. & Co., Chicoutimi W.
> P. E. Rosenorn, A.M.E.I.C., Price Bros. & Co., Chicoutimi W.
> J. F. Grenon, A.M.E.I.C., Chicoutimi, Que.
> G. B. Snow, A.M.E.I.C., Chicoutimi, Que.
>
> It was unanimously resolved that the application be heartily approved. The Secretary was instructed to proceed with arrangements for holding the inauguration meeting."

As Sir William Price, who was present for the purpose of addressing the meeting, had a later appointment, he was called upon before any business in connection with the meeting was commenced. Sir William expressed his great pleasure at the formation of a branch of *The Engineering Institute of Canada* in the Saguenay valley. Speaking from the viewpoint of the industrialist he was keenly

C. N. SHANLY, A.M.E.I.C.
Vice-Chairman of the Saguenay Branch.

H. B. PELLETIER, S.E.I.C.
Secretary-Treasurer of the Saguenay Branch.

alive to the benefits which the engineering profession was conferring upon industry. Although the district in which the new branch was being started had hitherto been little known, it was now being opened up on account of the immense amount of latent water power, together with raw material for the manufacture of pulp and paper, which would give scope for every branch of engineering, including civil, mechanical, electrical, chemical and forestry. Great strides have been made in the last few years in his own particular business due to the application of technical knowledge. He naturally took a great pride in the Saguenay country on account of the fact that his own people had so long been associated with it, and therefore he welcomed the formation of a branch as he could see that it would be of great value to the district. He paid a high tribute to the engineering profession, making particular reference to members of his own staff, of whose great worth he was fully aware. He knew the engineers were hard workers and could be trusted to carry out the details of anything entrusted to them. He concluded by wishing the branch every success, and promised the hearty co-operation of Price Brothers towards that end.

Nominations for the election of officers were the next order of business, as a result of which the following were unanimously elected to the various offices in the branch: chairman — W. G. Mitchell, M.E.I.C.; vice-chairman — C. N. Shanly, A.M.E.I.C.; secretary-treasurer — H. B. Pelletier, S.E.I.C.; executive committee — J. F. Grenon, A.M.E.I.C., N. F. McCaghey, Jr.E.I.C., G. E. LaMothe, A.M.E.I.C., H. V. Bignell, A.M.E.I.C., A. Duperron, A.M.E.I.C.

Following the announcement of the officers of the branch, Mr. Francis declared the branch duly established, and called upon W. G. Mitchell, assistant to the president, Price Brothers and Company, the newly elected chairman, to take the chair. Mr. Mitchell expressed thanks at the honour done him, and although busy, promised to do all he could to promote the interests of the branch. He called on a number of the members to address the meeting.

President Francis said it gave him great pleasure to be present at the inauguration of the branch, and it was the first time as president he had been called upon to attend such a function. He explained this was the twenty-fourth branch to be opened, and thought it a matter of great congratulation that there were so many branches, and that they were all doing so well. He referred to the formation, years ago, of the Montreal Branch, and to its early struggles and progress, and dwelt on the value of co-operation, particularly warning his auditors against co-operation in the wrong direction, illustrating his meaning by the work of labour unions. The engineering profession is a valuable asset to the community in general, and in congratulating them on the formation of the branch, suggested that the members, among other matters for consideration, should take up that of the fuel situation which is an acute question to-day. During his remarks he referred feelingly to the death of the last president of *The Institute*, whose place he was called on to fill.

John T. Farmer, M.E.I.C., chairman of the Montreal branch, said he bore a letter of congratulation from his members, and wished to offer his own personal good wishes. The work going on in the Saguenay district, not only in the paper industry, but in hydro-electric development, was on a scale to be known and admired throughout the whole country. The engineering material he saw around him gave promise of forming a very well rounded out branch. In illustration of the fuel situation, last winter he was able to obtain only three tons of anthracite coal for his own use, and had to use wood and other fuel at the expense of a great deal of discomfort and personal labour. As a result of this, and similar experiences of other members of the Montreal section, it was decided to take up the question practically, and a committee was formed under Mr. F. A. Combe, which had the various kinds of fuel analyzed, and drew up a report subsequently published in the papers, which brought forward favourable comment. They were going still further into the matter, and hoped within the next six or eight weeks to get out a further report. This will contain general simple directions as to the use of different fuels, and should be of much value to householders. He mentioned this as an instance of the services the engineering profession could render to the community at large without personal aggrandisement.

Messages of congratulation were read by Secretary H. B. Pelletier, as embodied in a letter from the Montreal Branch and in telegrams of felicitation and greetings from the following branches — Niagara Peninsula, Lakehead, Ottawa, Halifax and Victoria, all of which were gladly received.

Councillor Frederick B. Brown, M.E.I.C., felicitated the branch on its selection of officers, pointing out that in the formation of a branch they were being given an opportunity of greater service as citizens, and to be successful in their operations there should be not only the heartiest co-operation, but they should be ever on their guard against limiting the usefulness of the branch's work by internal jealousies or misunderstandings. He believed there was nothing like friendly co-operation to secure effective results.

A. F. Dyer, A.M.E.I.C., vice-chairman of the Halifax Branch, conveyed the greetings of the branch to the gathering in addition to the telegram previously read, considering it a great honour to be present on this occasion, and as he was a temporary resident in the district, he hoped to have an opportunity of taking part in the deliberations of the branch, and of rendering any assistance he could towards its success.

H. S. Van Scoyoc, M.E.I.C., in addition to telling a contracting story, said that the formation of a branch embodied a healthy outlook for the engineering profession in the district, and also for the development of the district itself. He prophesied a great future for the branch and offered his hearty congratulations.

Secretary Fraser Keith, M.E.I.C., expressed the belief that Sir William Price had a greater appreciation of the engineering profession than any other man in the room, that the importance of the engineering profession was being more and more recognized by captains of industry, and that the meeting was an important historic event in the development of the district.

J. F. Grenon, A.M.E.I.C., of Chicoutimi, addressed the meeting in French, pointing out the importance of the district in an engineering sense, and expressing his willingness to do his share to make the branch a success.

A discussion followed as to where the meeting should be held, it being finally left to the decision of the executive committee.

The meeting was formally closed by the singing of "O Canada" and "God Save the King", being later followed by the various college yells, all present agreeing that the Saguenay Branch had been inaugurated under favourable circumstances, that it had a promising future, and that the members personally were all willing to take an active interest towards making the branch a powerful influence in the district.

There were present — President Walter J. Francis, M.E.I.C., Sir William Price, Councillor Frederick B. Brown, M.E.I.C., John T. Farmer, M.E.I.C., H. S. Van Scoyoc, M.E.I.C., W. G. Mitchell, M.E.I.C., Frase- S. Keith, M.E.I.C., C. N. Shanly, A.M.E.I.C., H. B. Pelletier, S.E.I.C., J. F. Grenon, A.M.E.I.C., N. F. McCaghey, Jr.E.I.C., G. E. LaMothe, A.M.E.I.C., H. V. Bignell, A.M.E.I.C., A. Duperron, A.M.E.I.C., H. D. Boyle, H. G. Cochrane, A.M.E.I.C., C. E. Legris, E. L. Zealand, S.E.I.C., P. G. Gauthier, Jr.E.I.C., C. Ben Bate, A.M.E.I.C., J. W. H. Ford, A.M.E.I.C., L. A. Dubreuil, A.M.E.I.C., A. F. Dyer, A.M.E.I.C., G. B. Snow, A.M.E.I.C., F. A. Price, F. W. Bradshaw, S.E.I.C., R. M. DeCew, A. S. Cook, Jr.E.I.C., J. P. Chapleau, Jr.E.I.C., O. Graham, R. Bourbeau, A. A. Richardson, A.M.E.I.C., J. L. Delisle, E. Lavoie, F. L. Darrell, A.M.E.I.C., G. H. Kirby, S.E.I.C., C. G. Malcolm, J. Shanly, Jr.E.I.C., G. F. Layne, A.M.E.I.C., N. D. Paine, H. B. Van Every, J. C. Depocas, S.E.I.C., M. Ricard, S.E.I.C., J. Joyal, M. Doye, K. O. Elderkin, Jr.E.I.C., G. W. Warner, S.E.I.C., H. Monro, N. A. Guay, W. Hamilton, C. R. McCort, A.M.E.I.C., O. O. Lefebvre, M.E.I.C.

Map of Lake St. John and Lake Kenogami District.

Power Development in the Saguenay District

Construction of Power Plants and Storage Works progressing rapidly.

The Saguenay River

At the head of the Saguenay river, a distance of 105 miles from its mouth, lies lake St. John, which has a tributary drainage area, above its outlet, of 30,000 square miles, the principal tributaries being the Peribonka, the Mistassini, and the Ashuapkuchuan. From the limited data available it is estimated that the mean flow at the outlet of the lake is 33,000 cubic feet per second. This flow varies widely, falling to a minimum in the late winter and attaining a maximum during the spring flood, the ratio of maximum flow to minimum flow being about twenty to one. Records from May, 1913, to May 1915, show a range from 12,000 to 220,000 cubic feet per second.

developments, one on the Grand Discharge at Ile Maligne, six miles below the outlet of the lake, and the other a few miles above the mouth of the Shipshaw river, where a head of about 200 feet is available.

Isle Maligne Development

H. G. Cochrane, A.M.E.I.C., Resident Engineer.

The Quebec Development Company, who are undertaking the development of approximately one million horse power on the Saguenay River between Lake St. John and Kenogami, have made excellent progress since permission was received from the Quebec Government last December to commence this work.

Grand Discharge Lake St. John, Que. Piers for Railway Bridge under Construction.

The Saguenay river flows out of lake St. John, through two main channels, the larger and more northerly being known as the Grand Discharge and the smaller as Little Discharge. These channels unite at a distance of nine miles from the lake, the land enclosed between them and the lake being known as Alma island. Lake St. John has an elevation above sea-level which varies from 314 feet at extreme low water, to 341 feet at extreme high water, and its corresponding surface-area from about 300 square miles to nearly 400 square miles.

The upper Saguenay descends to high-tide level in a distance of about 28 miles, below which the river runs in a deep U-shaped valley to its mouth at Tadousac and is properly an estuary of the fiord type. In the upper stretch it is proposed to concentrate the fall in two power

The Isle Maligne station, which is the first of the two developments to be constructed, is to have a capacity of 480,000 horse power. Work was started on this development on January 8th last. The first step was the construction of a coffer dam across the left channel of the Grand Discharge half a mile above the site of the power house, which is situated at the lower end of Isle Maligne. This coffer dam, which is a rock filled crib bulkhead with plank sheeting on the upstream side, was built during the low-water period of winter, and was completed early in April.

Work was also commenced on the construction of eleven miles of railway from Hebertville station on the Canadian National Railway, to the site of the work. This line which crosses two channels of the Little Dis-

charge, is now completed and in operation, and the bridge over the right channel of the Grand Discharge, at the site, will shortly be erected. The piers for this bridge were built during the winter.

The Isle Maligne development consists of a power house, four spillways on the Isle Maligne, a dam at the head of Isle Maligne controlling the right channel of the Grand Discharge, one earth dam, and three spillways at the head of the Little Discharge.

The power house, which itself is the largest of the dams, and will contain twelve 40,000-h.p. units, is the first part of the work to be built. It will be 700 feet long, 150 feet high from sub-foundation to top, and inclusive of wing walls will require 235,000 cubic yards of masonry.

Construction Plant Equipment

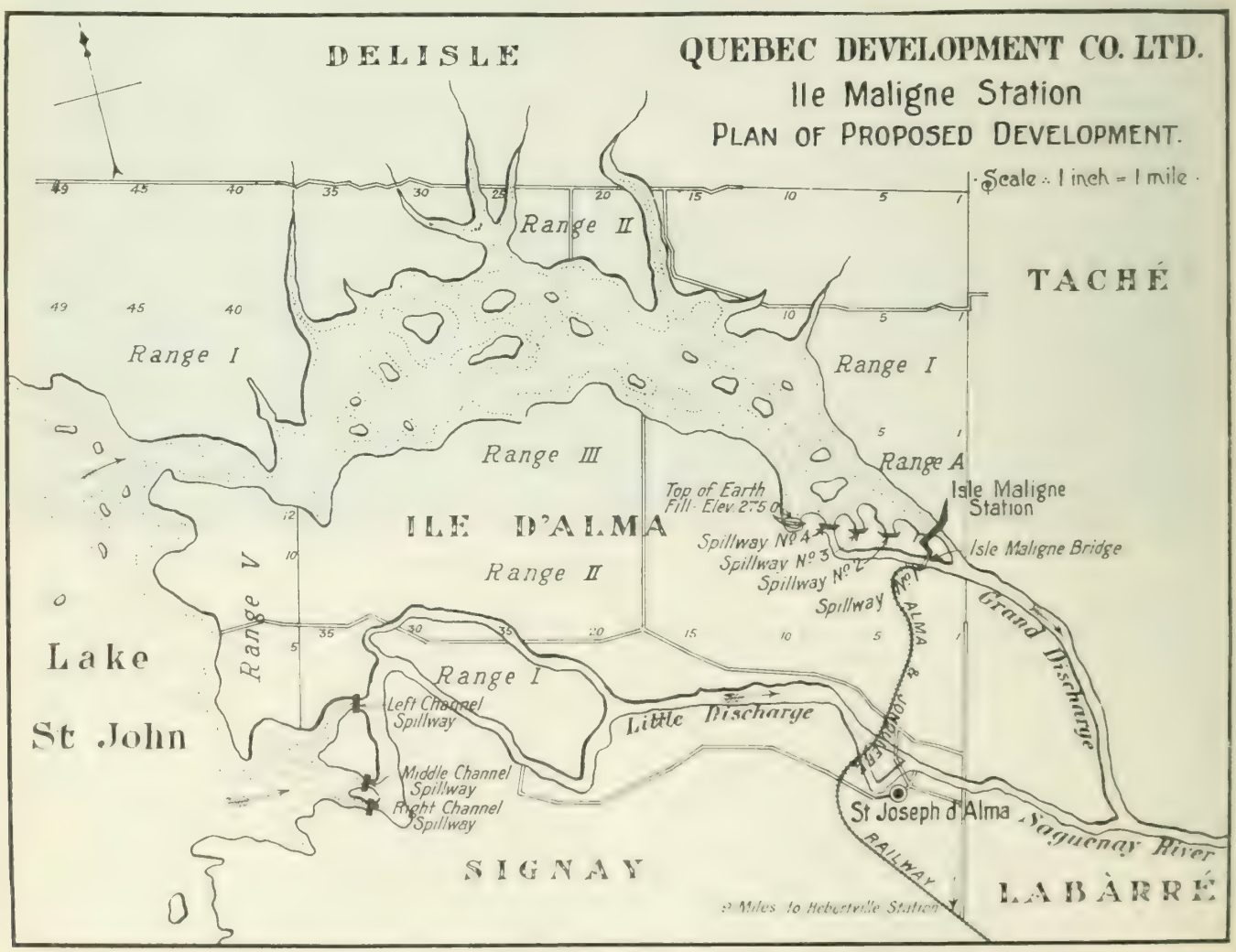
As the total concrete yardage in this development is more than half a million yards, heavy and up to date equipment is necessary. The plant consists of an 84-inch by 66-inch Allis-Chalmers jaw crusher, one No. 15 Style "N" Allis-Chalmers gyratory crusher, two Allis-Chalmers No. 6 Style "N" secondary crushers, a cement house to hold 100 carloads of cement, two 4-yard Smith mixers, standard equipment for transportation of rock and concrete, numerous 20-ton 115-foot boom, and 15-ton 85-foot boom, steel derricks and two industrial travelling cranes.

The rock is quarried in the tailrace excavation, dumped from cars into the jaw crusher and transported by belt conveyors, through the secondary crushing plant and into the bins in the mixing plant, which have a capacity of 1,000 cubic yards. The cement will be unloaded in bulk direct from the cars into the cement house, by blowers, and conveyed to the mixer by a belt conveyor. All this machinery, as well as the derricks, compressor plants and machine shop, will be run by electric power which is furnished for the purposes of construction from Kenogami.

A steel construction trestle 55 feet high will run the length of the power house, carrying three tracks, surmounted by three travelling cranes with two 85-foot booms, each of which will handle the excavation for the power house proper and place all the concrete therein. This trestle will eventually be concreted in and left in the structure.

Three miles of yard tracks are now graded and partly laid with rails, and foundations for all machinery and half the construction trestle ready. It is expected that the placing of concrete for the power house foundation will be commenced by November.

Work will be carried on throughout the winter season regardless of what the temperature may be, in order to take advantage of the low-water period. The programme of construction calls for completion of the Isle Maligne station in 1927. There are at present some 450 men



Map of District Isle Maligne Development.

Construction work Grand Discharge, Lake St. John, Que.

employed on the work, and this number will soon be increased to over 1,000.

The camp buildings are situated on a high plateau immediately above the yard tracks, and are fitted with all modern conveniences. There are also comfortable four-room houses for married employees.

J. B. Duke, the American tobacco magnate, is president of the company, with Sir William Price, W. S. Lee, and F. H. Cothran, as vice-presidents. W. S. Lee, who is a member of the American Society of Civil Engineers and of *The Engineering Institute of Canada*, is chief engineer of the project. F. H. Cothran, also a member of the American Society of Civil Engineers, is resident manager. D. F. Noyes, A.M.A.S.C.E., is superintendent of construction. H. G. Cochrane, A.M.E.I.C., is resident engineer. J. P. Chapleau, Jr.E.I.C., is resident engineer on railroad construction.

Chicoutimi River

The Chicoutimi river is the most important direct tributary of the Saguenay river. Its drainage basin follows a general south to north direction and includes a number of tributaries of which the largest are the Cyriac which flows into lake Kenogami, the Ecorces and the Pikauka which join the main stream above the lake. The courses of all the important tributaries are parallel from south to north until a few miles before they join the Chicoutimi. Heading north of the basin of the Jacques Cartier river, in numerous small lakes, it has a length of 91 miles with a descent of over 1,000 feet.

Lake Kenogami Storage Reservoir*

Lake Kenogami, which is the lowest expanse on the Chicoutimi river is located at a relatively high elevation, in the county of Chicoutimi at about 12 miles west of the town of Chicoutimi. It has a drainage area of 1,450 square miles and its area at present high water is 12 square miles and, on the completion of the dams and dykes at present under construction, the proposed high-water level will increase the area of the lake to 21 square miles.

Present Storage

The present storage on lake Kenogami is provided by timber dams at the two outlets which give a storage depth of 9 feet on the lake, low-water elevation being 83 and high-water elevation 92. Under the proposed development a depth of 32 feet of water will be stored; low-water elevation 83, high-water elevation 115. While this will not permit of the storage of all the flood water, it was considered that elevation 115 was the maximum economical height to which the water should be raised.

Outlets from Lake Kenogami

There are two outlets from lake Kenogami discharging into the Saguenay; the Chicoutimi river, 15 miles in length, running through Chicoutimi, with a total fall of 467 feet, and the Au Sable river, 6 miles in length running through Jonquières and Kenogami with a drop of 440 feet. On the Chicoutimi river the town of Chicoutimi has developed a site utilizing a head of 56 feet, while La Cie de Pulpe de Chicoutimi has a development using a head of 190 feet. A further 60 feet will be used by the power development of Price Brothers, which is at present under construction and which is described in detail below. On the Au Sable river, Messrs. Price Brothers have developed a total drop of 380 feet.

Dependable Flow from Proposed Storage

A dependable minimum flow of 1,800 cubic feet per second will be assured by the proposed reservoir, 1,200 second-feet of which will go to Chicoutimi river, and 600 to Au Sable river, which it is hoped, may be increased.

Under present conditions, (9 feet storage), the maximum possible regulation was 700 (total for both outlets) cubic feet per second, and the reservoir so operated that for a long period during winter a flow of only 400 cubic feet per second frequently occurred.

Proposed Dams

The raising of lake Kenogami will necessitate concrete dams to be built at the two outlets; Chicoutimi and Au Sable. The dam at Chicoutimi will be constructed about 100 feet below the present dam, while at the Au Sable outlet, the proposed dams will be built about one mile above the present dam at Pibrac, where the river divides into two channels.

Besides these, earth dykes will have to be constructed at four different locations: Bay Moncouche, Creek outlet, Coulée Gagnon and Grande Coulée Kaskouia. These dykes are for the purpose of keeping the water from overflowing into adjacent watersheds.

Some of the quantities involved in the above-mentioned works are as follows:

Common excavation	21,000 cu. yds.
Rock excavation	13,000 "
Concrete	52,000 "
Earth fill	78,000 "
Iron and steel	300 tons

About ten square miles of land will be flooded by the raising of lake Kenogami reservoirs.

Twenty miles of road, which will be partly flooded will have to be relocated and rebuilt.

Cost

It is estimated that the whole cost of the proposed storage reservoir will be in the neighbourhood of two millions and a half.

The companies which derive benefits from the additional water have entered into contracts with the Quebec Streams Commission, by which they guarantee to pay to the commission yearly sums which will be sufficient to cover interest charges, sinking fund and operating expenses on the whole expenditure involved in connection with the construction of the reservoir

*Data supplied by O. O. Lefebvre, M.E.I.C. Chief Engineer, Quebec Streams Commission

Dam Construction at Lake Kenogami

A. F. Dyer, A.M.E.I.C., Engineer, The Nova Scotia Construction Company, Ltd.

The storage development work at lake Kenogami consists of a number of concrete dams and earth fill with concrete core wall dykes which are being constructed in order to raise the high water level of lake Kenogami from 92 to 115 thus providing additional storage water for power for use by Messrs. Price Bros., and the Chicoutimi Pulp Company. The work is being carried out for the Quebec Streams Commission under their chief engineer, O. O. Lefebvre, M.E.I.C., who is represented on the ground by Mr. Duperron.

Lake Kenogami lies to the west of the Saguenay river, into which its waters flow by two outlets, the Au Sable river flowing through Jonquiere, and the Chicoutimi river flowing through the town of Chicoutimi. The main dams are across the above two outlets.

The Chicoutimi outlet dam, situated at Portage des Roches, fifteen miles northwest from Chicoutimi is the largest unit. It consists of a gravity section concrete dam 1,575 feet in length having a maximum height of about 55 feet above foundations. Eleven 8-foot by 8-foot sluices and one 4-foot by 4-foot sluice for a 25 h.p. waterwheel are provided in the river section. The spillway consists of twenty openings each 15 feet wide with sill level at 107 and provided with stoplogs. There are also two log sluices each twelve feet wide.

The Au Sable outlet is being dammed at Pibrac four miles from Jonquiere where there are four dams under construction. The dam at West Pibrac consists of 160 feet of earth fill and concrete core wall dyke and 300 feet of gravity section concrete dam in which there will be three 8-foot by 8-foot sluices, four spillway sections and two log sluices. At East Pibrac there will be a gravity section concrete dam 570 feet in length having six 8-foot by 8-foot bottom sluices, one 4-foot by 4-foot waterwheel sluice and seven spillway sections.

Between the east and west channels are being built two gravity section concrete bulkheads spanning two hollows. No. 1 is 440 feet in length and No. 2 is 490 feet long.

In addition to the above, two concrete gravity section bulkheads are being constructed at Creek outlet situated about one mile southeast of Pibrac, also an earth fill with concrete core wall dyke at Coulée Gagnon one mile west of Pibrac, a similar dyke at Moncouche bay one mile south of Portage des Roches and another dyke at Kaskouia about ten miles west of Pibrac. This latter dyke is to prevent the raised waters of lake Kenogami from flowing back to lake St. John.

The contract for these works was let to the Nova Scotia Construction Company, Limited, of Sydney, Montreal and Halifax, in the early part of March of this year. A length of 650 feet north of the river of the Chicoutimi outlet dam has been sublet to Messrs. Gorman and Peckham and the dykes at Coulée Gagnon and Kaskouia have been sublet to D. Desantes; the remainder of the work is being done by the Nova Scotia Construction Company direct.

Chicoutimi Hydro-Electric Development

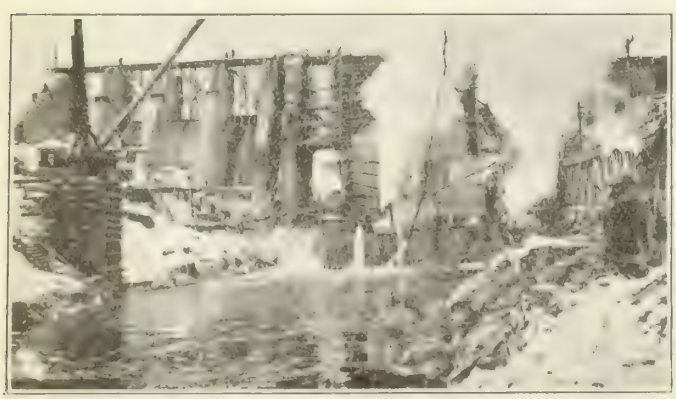
C. N. Shanly, A.M.E.I.C.

The hydro-electric plant which Price Brothers and Company Limited are building at Chicoutimi is now nearing completion. The development is situated on the Chicoutimi river about two hundred yards above its confluence with the Saguenay and about a quarter of a mile down stream from the tail race of the Chicoutimi Pulp Company's plant which limited the height to which water could be raised in the forebay. The elevation of the tail water was fixed by the tides in the Saguenay which have a maximum variation of twenty feet at this point. The variable head which resulted was one of the interesting features of the design.

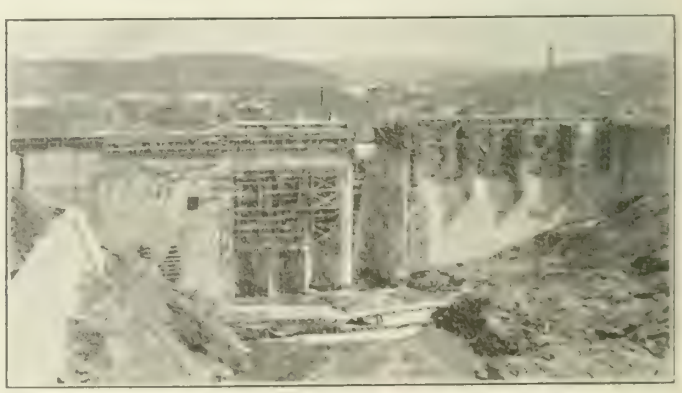
The plant is being built to take advantage of the storage dams which the Quebec Streams Commission is building at lake Kenogami, from which the Chicoutimi river takes its source, and which, it is expected, will increase the minimum flow of the latter to twelve hundred cubic feet per second. The power will be transmitted to Kenogami — ten miles away — where it will be utilized in Price Brothers' pulp and paper mills.

The nature of the site, a v-shaped rocky gorge, about one hundred and ten feet high on one side and sixty feet high on the other presented a good many difficulties to a satisfactory and economical method of unwatering and after some consideration it was decided to commence operations in the fall of the year and carry out the work during the winter months, when the discharge of the river would be at its minimum, even though this meant that the work would have to be completed before the spring freshets — a period of less than seven months.

The site selected was that of an old timber dam which had been in existence for over seventy years. Accurate data on the nature and elevations of ledge rock could not be secured until this dam had been removed. This necessitated the erection of cofferdams both up and



Chicoutimi Power Development Dam, looking upstream.



Chicoutimi Power Development Dam, looking downstream.

Chicoutimi River, summer of 1921. Site of Price Brothers and Company's new development.

down stream as the foundations had to be carried down fifteen feet below extreme low tide. This considerably impeded the design of the main structure which in turn left the contractor in doubt just how to arrange his plant for efficiency and economy. Fortunately the ledge everywhere proved to be an excellent quality of gneiss which afforded satisfactory foundations, presenting no seams to be grouted or friable or weather material to be removed so that all these points were cleared up within six weeks of starting work.

The Power House

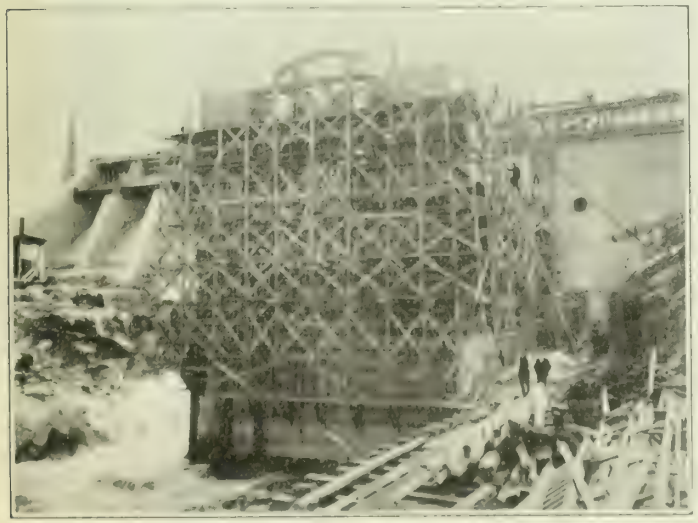
The development consists essentially of a power house and intake, the latter part of the main dam, situated in the bed of the stream. The power house is 46½ feet by 53 feet and is equipped with one 11,000-h.p., I. P. Morris, vertical shaft, single runner turbine, with I. P. Morris lever type governor, set in a Moody draft tube. One 3-phase, 60-cycle, 6,600-volt, vertical shaft, 11,000-k.va., Canadian Westinghouse generator with one 100-k.w., 250-volt, d.c., exciter, mounted on the same shaft. A spare exciter has also been provided, one 10-k.w., 125-volt, S. A. motor-generator set coupled to a 15-h.p. 3-phase, 60-cycle, 550-volt "H. S." motor to be used for starting the plant, and three 3,500-k.va., 6,600-volt to 44,000-volt, water-cooled, Crocker-Wheeler transformers.

The intake is fitted with three Stoney roller gates each 9 feet by 18 feet supplied by the Dominion Bridge Company. These gates are operated electrically either from the power house or from the gate house which is on top of the main dam. The penstock and scroll case are both built of concrete. The main dam and the power house substructure were poured as a monolith.

To the north of the power house is a gravity section, bulkhead dam, 100 feet long, the crest of which is five feet above head-water elevation; beyond this is a short core wall running into the clay bank overlying the ledge rock. To the south of the power house is the spillway section which consists of five openings each 13 feet by 16½ feet. Each opening is fitted with a Taintor gate supplied by the Dominion Bridge Company. The gate nearest the power house being housed in for more convenient operation during the winter time. These gates are also operated electrically. The crest of the spillway, which is a gravity section, is at elevation 87.0 and the top of the gates, are at elevation 100.0. Beyond the spillway section is 700 feet of wing wall averaging about 25 feet high. This wall is partly gravity section and partly Ambursen type. The elevation of the floor of the draft tube is 7.0; extreme low tide is 20.0; extreme high tide 40.0. The center line of the distributor is 39.0; the sill of the intake 50.0; and the elevation of the forebay is 100.0.

The contractor moved on to the job on November 5th, 1922, and the work of clearing and unwatering the site was commenced immediately. Concreting was begun on January 18th, 1923, and was kept up practically without intermission until the middle of April by which time 25,000 yards had been poured. The average temperature during all this time was well below zero. Concrete was successfully poured on more than one occasion with the thermometer registering 40 degrees below zero. Heating was an expensive, and in many ways a troublesome, item but the results were just as good as for concrete made under summer conditions.

The plant was designed by George F. Hardy, M.E.I.C., consulting engineer of New York, the contractor was William I. Bishop Limited, of Montreal, and the resident engineer in charge of construction was C. N. Shanly, A.M.E.I.C., while C. Ben Bate, A.M.E.I.C., was his chief assistant.



Chicoutimi Power Development, Power House Construction.

Chicoutimi Power Development, Power House Sub-structure.

The Valley of the St. Maurice River

With its extensive timber resources and its abundance of hydro-electric power, the valley of the St. Maurice river enjoys a world wide reputation for its rapid development as an industrial centre. Rising in a series of lakes near the height of land between the watersheds of the St. Lawrence river and Hudson bay, the St. Maurice river flows through the Laurentian mountains to its mouth at the city of Three Rivers, midway between the cities of Quebec and Montreal, and in its course of 350 miles it makes a total descent of over 1,300 feet.

Aeroplane photograph of Shawinigan Falls, Que.

In general, the drainage basin, which is 17,000 square miles in area, is well forested, with a predominance of spruce, jack-pine, poplar and birch, mostly suitable only for pulp wood. The geological formation is typically Laurentian, its ruggedness and its many lakes making it most picturesque. The country rock is Archaen gneiss with areas of limestone and granite, except in the lower reaches where outcrops of sandstone, shale, and crystalline limestones are principally found.

From a power standpoint the St. Maurice river is one of the most important tributaries of the St. Lawrence river. Of the total descent of 1,300 feet from the head waters to the mouth 1,125 feet occur mainly in a series of concentrated rapids and falls which lie below the mouth of the Manouar river, a tributary of the St. Maurice, in a stretch of 188 miles in length, the average slope of intervening stretches of water being only about one foot per mile.

Three Rivers

At the mouth of the river is the city of Three Rivers, a rapidly growing manufacturing centre with a population of approximately 22,000. In this vicinity are located the plants of the St. Lawrence Paper Mills, Limited, the St. Maurice Paper Company Limited and the Wayagamack Pulp and Paper Company Limited. The St. Lawrence Paper Mills Limited are equipped to produce 140 tons of groundwood and 160 tons of newsprint. The power for the operation of which is purchased in bulk. The St. Maurice Paper Company, Limited operates a pulp and paper mill at Cap Madeleine, Que; lumber and pulp mills at Charlemagne, St. Gabriel de Brandon, Montcalm and Three Rivers, and is equipped for a daily production of 200 tons of groundwood, 60 tons of sulphite, 65 tons of

Aeroplane photograph of Power Plants at Shawinigan Falls, Que.

sulphate and 115 tons of newsprint. The mill of the Wayagamack Pulp and Paper Company, Limited produces kraft, its capacity being, sulphate kraft pulp 260 tons, glazed and unglazed kraft wrapping paper 125 tons.

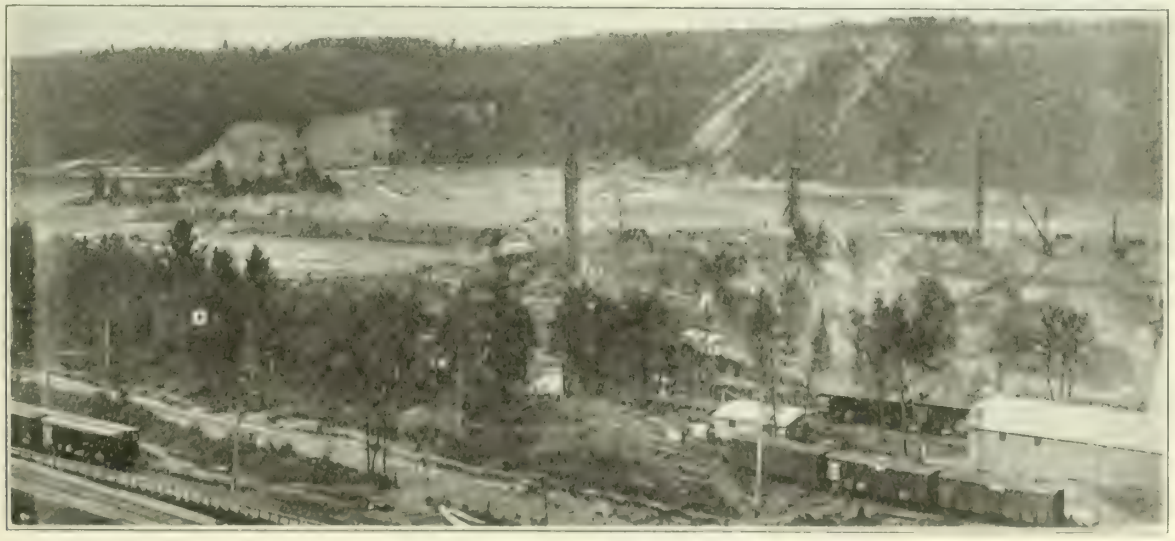
LaGabelle Power Development

Some fourteen miles above Three Rivers is LaGabelle the site of the new development of the St.Maurice Power Company, a subsidiary of the Shawinigan Water and Power Company where the first sod was turned during the first week of November 1922 and where to-day construction work has progressed to the stage shown in the accompanying photograph. The plans for the development of this site provide for a head of 65 feet, which utilizes the drop at Gres falls as well as that at LaGabelle rapids, and the installation of four 33,000-h.p., units, giving a maximum output of 132,000 h.p., which will be fed into the Shawinigan Company's transmission system.

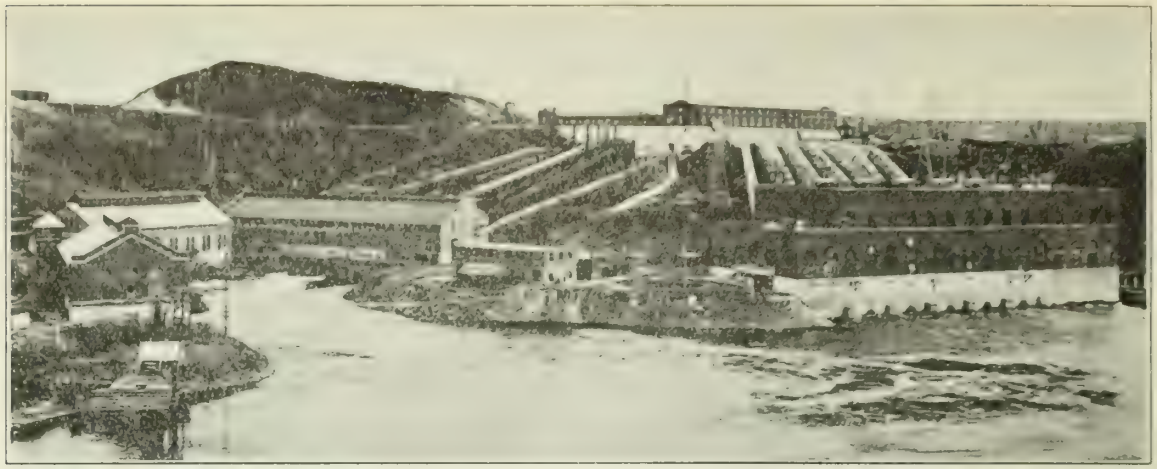
Shawinigan Falls

About six miles above LaGabelle is the town of Shawinigan Falls with a population of about 11,000, where the initial installation of two 5,000 h.p., turbines was completed by the Shawinigan Water and Power Company in 1902. To-day this company has two powerhouses at Shawinigan Falls with a combined capacity of 195,000 h.p., the latest addition being a 43,000 h.p., unit installed during the present year. Provision is also made for two additional 43,000-h.p., units. From Shawinigan Falls the company operates six high voltage transmission lines, eighty-five miles in length to Montreal; two lines ninety miles long to Quebec; and two crossing the St. Lawrence river at Three Rivers, serving the asbestos district and extending to Sherbrooke. The town is essentially an industrial centre and chief among the industries which have located at this source of cheap power are the Belgo-Canadian Paper Company Limited, the Canadian Carbide Company, the Shawinigan Cotton Company, the Northern Aluminum Company, the Shawinigan Electro Metals Company, the Canadian Electro Products Company, the Canadian Aloxite Company, and the Canadian Ferro Alloys Company.

The plant of the Belgo Canadian Paper Company Limited is located at Shawinigan Falls, and is equipped to produce 245 tons of groundwood pulp, 90 tons of sulphite pulp and 285 tons of newsprint per day. The



LaGabelle Power Development. Progress of Construction.



Shawinigan Water and Power Company's Power Plant at Shawinigan Falls, Que.

company develops its own power, the water for which is purchased from the Shawinigan Company, delivered at the power works of the paper company. This water is used to drive twenty hydraulic turbines ranging in capacity from 125 h.p., to 1,100 h.p., with an aggregate capacity of 17,910 h.p., three of which are direct connected to electric generators and the others to mechanical equipment. These turbines operate under an average head of 140 feet. Water is sold in this manner to the Northern Aluminum Company and in all 50,000 h.p., is sold in the form of hydraulic power by the Shawinigan Company to local industries.

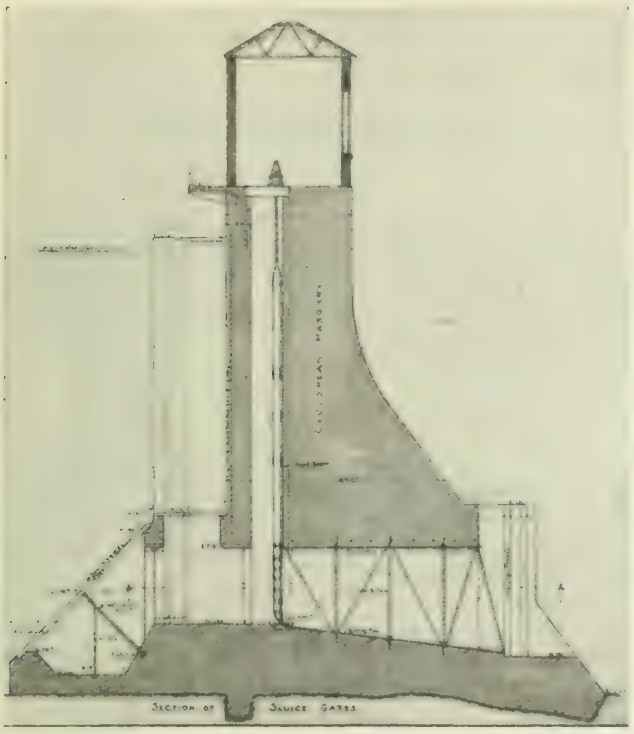
Grand Mere

The town of Grand Mere is located about 31 miles above the mouth of the river, and has a population of slightly over 7,600. Its chief interest centres around the pulp and paper mill of the Laurentide Company Ltd., and the power plant of the Laurentide Power Company, Ltd., a subsidiary company of the paper company. The Laurentide Company's plant has a daily output capacity of 350 tons of groundwood, 150 tons of sulphite, 375 tons of newsprint, and 50 tons of pulpboards, and utilizes about 40,000 h.p., for the operation of its mills. The balance of the power generated is purchased under contract by the Shawinigan Water and Power Company and is transmitted to Shawinigan Falls and thence over the transmission lines of the latter company to outside centres. The average operating head of the power plant is 76 feet, and the power-house, which adjoins a concrete dam, 1,800 feet in length with a maximum depth of 60 feet, contains eight units, six 20,000 h.p., and two 22,000 h.p.

La Tuque

Seventy-three miles above Grand Mere is La Tuque, where the Brown Corporation has utilized a natural fall in the river to develop 3,200 h.p., for the operation of their sulphate kraft mill which has a daily output capacity of 200 tons. The present installation consists of one 1,500-h.p., and one 1,700-h.p., turbine each connected to electric generators. This represents only a very small part of power possibilities of the site, as the profile of the river shows a possible head there of 90 feet and estimates give the ordinary minimum power available as 72,650 h.p., the estimated maximum development 108,000 h.p., and the dependable 24-hour power with storage 84,830 h.p.

Aeroplane view of Grand Mere, Que.



Cross-section of the Great Gouin Dam.

The Gouin Dam

While the St. Maurice river, in its natural state, due to the many lakes in the watershed provided exceptional power possibilities, its value in this respect was greatly increased as a result of the storage dams constructed by the Quebec Streams Commission of the Quebec government. The most notable of these is the great Gouin dam constructed by the commission in the years 1915 to 1917, at the headwaters of the St. Maurice river, 216 miles above Shawinigan Falls, which creates the second largest storage basin in the world. The dam is built of solid concrete on a foundation of Laurentian gneiss and has a total length of 1,646 feet and a maximum depth of 90 feet, with a spillway section of 840 feet. The area of water surface controlled by the dam is 209 square miles when the reservoir is empty and 304 square miles when full, with a range in depth of 47 feet. The capacity is 159.52 billion cubic feet or 3,662,080 acre-feet. It has a tributary drainage-basin of 3,650 square miles and is designed for the complete regulation of the run-off from this area. A small power plant with two 550-h.p., units was installed two and one half miles below the dam for construction purposes and is now used by the commission to supply power, heat and light to operate the dam.

A full realization of the industrial importance and potential possibilities of the St. Maurice river can only be secured by a study of the industries described above which derive power and raw materials from its valley. When it is further considered that the hydro-electric power, not used at the immediate sites of the developments, and representing some 260,000 h.p., is transmitted by the Shawinigan Water and Power Company through its subsidiary and allied companies to over 115 municipalities including Montreal, Quebec, Three Rivers, Sorel and Sherbrooke, some idea will be gained of the importance of this river to the industrial life of the province of Quebec.

Shawinigan Water and Power Company's High-Tension Transmission Lines crossing the St. Lawrence River at Three Rivers.

The Pulp and Paper Industry

Statistics showing its Rapid Growth and Importance to the Engineering Profession.

The last two decades have witnessed a remarkable growth in the pulp and paper industry in Canada, until to-day it occupies a foremost position among the industries of this country. This growth may be attributed to the fact that Canada has extensive areas of readily accessible pulpwood timber located in districts endowed with an abundance of waterpower which is capable of development at a low cost. The combination of these two essentials forms the basis upon which this industry has been developed.

Forty years ago there were only 5 mills in operation in Canada, to-day there are 104 consuming nearly three million cords of pulpwood per annum and using hydro-electric power to the extent of 637,080 h.p.

Statistics for the year 1922

From the most recent census of the Dominion Bureau of Statistics, Ottawa, much interesting information relative to this industry is available. Recent figures (1922 census) show that there are 104 mills in operation in Canada, which total is made up of 43 pulp mills, 33 paper mills and 28 pulp and paper mills. The accompanying map shows the general location of these mills. The total capital invested in these is given as $381,006,324 while the wages and salaries of the 25,830 employees (exclusive of woods operatives) is $32,918,955. The total net value of production is $155,785,388 which is based on the production of 1,241,185 tons of groundwood, 678,878 tons of sulphite pulp, 217,862 tons of sulphate pulp, 12,326 tons of other pulp, 1,081,364 tons of newsprint, 64,808 tons of book and writing paper, 81,793 tons of wrapping paper, 113,200 tons of pulpboards, and 25,650 tons of other paper.

The total cut of pulpwood is reported as 3,923,940 cords valued at $50,735,361 of which the Canadian mills consumed 2,912,608 cords and 1,011,332 cords were exported in the raw state to the United States. Of the exports of pulpwood over 50 per cent was supplied by the province of Quebec. No pulpwood is imported into Canada.

Export Trade

From the point of view of the Dominion's export trade the pulp and paper industry holds a position that is second only to that of agriculture. The figures below give a comparison of the exports of the products (animal and vegetable) of Canada's farms with pulp and paper exports, for the years indicated.

Year	Farm Produce	Pulp and Paper
	(Millions of dollars	
1914	245.9	19.1
1923	467.1	122.6

The export trade of $120 in 1890 for this industry is often contrasted with the present corresponding figure of over $110,000,000 to demonstrate the remarkable expansion during this period.

The rapid progress of the pulp and paper industry as a contributor to Canada's trade is shown in the following table of the exports of pulp and paper for the past twelve years:—

Map showing location of Pulp and Paper Mills using Hydro-Electric Power in Canada.

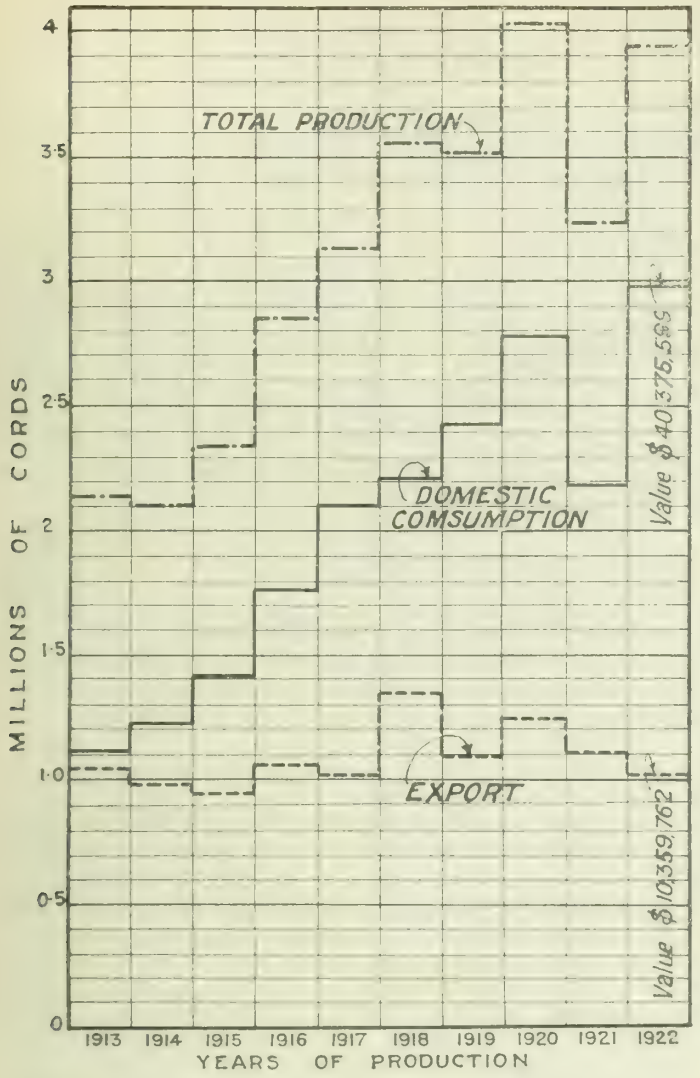
Year	Paper Prod.	Wood-pulp	Total
	Millions of dollars		
1912	3.9	5.1	9.0
1913	6.3	5.5	11.8
1914	12.7	6.4	19.1
1915	15.5	9.3	24.8
1916	20.0	10.4	30.4
1917	26.1	20.4	46.5
1918	37.7	25.6	63.3
1919	47.9	34.7	82.6
1920	63.2	41.4	104.6
1921	92.1	71.6	163.7
1922	69.5	35.9	105.4
1923	79.6	43.0	122.6

The great fluctuations in price in the years 1920-22 affected to some extent the generally steady increase in production. Since that period, however, it will be noted that the increase has been resumed.

Importance of Cheap Power*

The question of motive power in connection with the production of pulp and paper is a most vital one and,

*Data supplied by Dominion Water Power Branch, Dept. of the Interior.

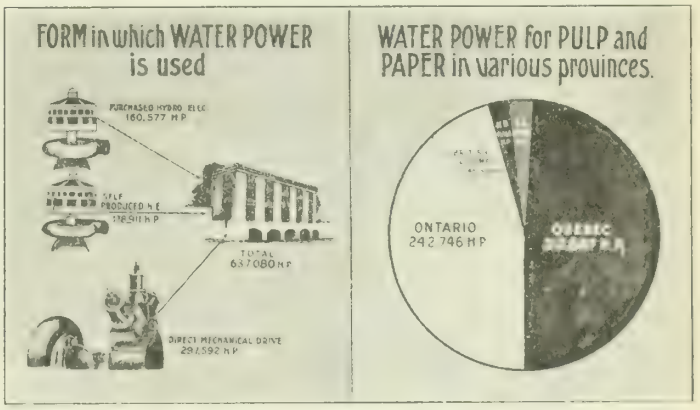


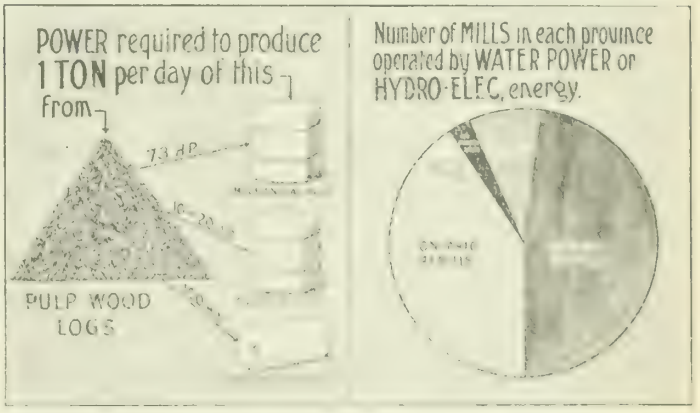
Pulpwood production in Canada during the last ten years.

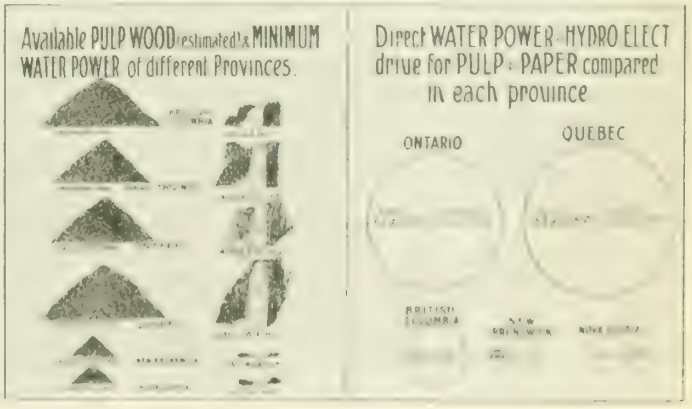
in fact, is almost as important as that of raw material. In any industry the relative necessity of obtaining cheap and adequate power may be gauged by the amount required per dollar of product and with the possible exception of certain electro-chemical and metallurgical processes, the requirements for pulp and paper are among the highest. The importance of cheap power may be judged from the fact that it takes practically 100 h.p. to make a ton of paper per day. It is, therefore, little surprising that motive power used in this industry is practically restricted to hydraulic energy and Canada's supremacy in the pulp and paper field rests on adequate and abundant water powers well distributed among extensive forest resources.

Average figures in connection with a large Canadian mill show that mechanical pulp requires 73 h.p., per ton of daily output of which 67 h.p. is for grinding alone; sulphite pulp requires 8.7 h.p., per ton of daily output, and in other large mills as high as from 20 to 30 h.p., while the production of newsprint from pulp consumes 12 h.p., for the same unit output. The continuous operation of mills in this industry, usually 24 hours per day, permits a very advantageous use of the necessary power and with direct water power or hydro-electric energy further allows a cheap unit cost for the amount consumed. For instance, one of our Canadian sulphite mills with an installation of 1,500 h.p., purchases hydro-electric power on the basis of one dollar per h.p., per month plus a consumption charge on a sliding scale, and it was found that the minimum rate of 0.1 cent per kw.hr., could be taken advantage of for about 75 per cent of the total consumption, thus reducing their unit power cost very materially.

A report entitled "Water-Power in the Pulp and Paper Industry in Canada", issued by the Dominion Water Power Branch in 1922 states that the water-power installation for the operation of pulp and paper mills in Canada aggregates 476,503 h.p., while the additional hydro-electric energy purchased for this industry is 160,577 h.p., giving a total of 637,080 h.p. This covers the energy derived directly or indirectly from water power but does not include mills where steam only is used as motive power. The use of steam as a source of power in this industry is very limited and in most cases is prompted by special conditions such as operation in close connection with the manufacture of lumber when refuse from the latter can be used as fuel under the boilers.







The Development of Papermaking

W. G. MacNaughton, A.M.E.I.C.

Secretary-Treasurer, Technical Association of the Pulp and Paper Industry, New York.

Paper to be read before the Saguenay Branch, The Engineering Institute of Canada.

Until it was discovered that wood was a raw material for papermaking it is an historical fact that there always had been a shortage of paper. Its production was dependent on the relatively small quantity of linen and cotton rags that could be collected, supplemented with pulp made from cereal straw, and waste paper. About fifty years ago it was discovered that if poplar and basswood were cooked with caustic soda a pulp resembling straw pulp could be produced and of which a larger proportion could be used. Shortly afterwards it was found that these white soft fibred woods could be ground to a pulp on a grindstone with water and the product mixed with rag pulp and that the product mixed with rag pulp made a satisfactory printing paper.

The impetus given to the use of wood for pulp and paper making, through this discovery soon made it necessary to look for more abundant species that could be similarly treated and in spruce was found the ideal paper wood of the world. Occurring in large stands practically unmixed with less desirable species, its light colour, even texture, comparative freedom from resins, its fibre longer than that of poplar or basswood and its habitat generally in regions well supplied with the water power necessary, — at the same time possible of low cost of development — all these factors have combined to establish the manufacture of newsprint paper in particular in its present localities.

The discovery that from a wood of such abundance and so readily accessible, a cheap printing paper, as well as the higher grades, could be made, is responsible also for the corresponding expansion in the invention and manufacture of modern printing machinery and the final product in the form of the countless newspapers, magazines and books.

In olden times papermaking was an art dependent on the skill, the training and experience of the paper maker. To a certain limited extent it remains so to-day but to a very large degree it has developed from an art to a manufacturing process in which practically all that is needed is the adjustment of the machines with operators to attend them, very largely assisted by automatic control apparatus.

Newsprint paper used for printing metropolitan newspapers best illustrates the present status of paper manufacture. Before the discovery of the use of wood this paper was made, as before stated, from a mixture of bleached straw pulp or waste paper mixed with a proportion of pulp from rags. The nature of the materials made careful preliminary mechanical treatment necessary before attempting to make it into paper. A beater or hollander, still seen in mills which use rags, was the most important piece of apparatus and its operator the most highly skilled artisan. So much was this so that the statement "the paper is made in the beater" is still by many considered axiomatic.

Two or three tons of paper per day represented large production on the paper machines which were 40 to 50 inches in width and operated at less than 100 feet per minute. To-day the machines making paper used for the same purpose are five times the width and operate at more than ten times the speed, making nearly 100 tons of paper per day.

The largest paper machine operating at the present time is 234 inches in width, making a sheet of paper 219 or 220 inches wide, at a speed of over 800 feet per minute. The fastest machine is somewhat narrower, 164 inches in width, trimming 146 inches, and operating at over 1,000 feet per minute. In the case of both over 80 tons are made every twenty-four hours. At the present time a machine is being built that will combine the width and speed of the two and will make 100 tons per day.

In considering the steps that have been taken to attain these results we find that many men with mechanical genius have contributed to the present development. The development since wood pulp became generally used may be divided into three subjects: first, preparation of the stock or mixture of pulp for papermaking; second, the progressive development of the machine; third, the development of the prime mover and machine drive.

Preparation and Treatment of the Stock

When the speed of the paper machine did not exceed 500 feet per minute, which was the condition generally until fifteen years ago and to a considerable extent in more recent time, the pulp making methods were exceedingly crude. There was little or nothing definitely known of the factors that affect either quality or production. Conditions varied greatly as to the care of the stone used as a grinder, neither its peripheral speed nor the grinding pressure were controlled, and there was little attention paid to the surface treatment of the stone except that it should continue to reduce wood to a pulp. The pulp was passed through screens and the coarser material, which represented a considerable percentage, was wasted.

Under present conditions it is recognized that one of the chief controlling factors in the continuous operation of the paper machine at its maximum speed and the maintenance of satisfactory quality in the product is the care of the pulp produced on the grinders, together with having it in a uniform liquid suspension. To achieve satisfactory results the stones are carefully chosen as to uniformity of grit, the grinding pressure is controlled at the desired point and uniform peripheral speed of the stone is secured either by supplying the power through a synchronous motor or, if from water wheels, by speed governors.

One of the important factors in the operation of the paper machine, as stated, is a uniform density of the pulp suspension. For this purpose automatic apparatus of several different types have been invented and extensively used for controlling this condition. The quality is watched carefully, largely with the assistance of an instrument which measures the freeness or the degree of water retention. This is largely a test for uniform fineness.

Although in former times the hollander, designed for the mechanical preparation of rags, was used on mechanical pulp, it has been found that it was a mistaken idea. Under modern practice the screened mechanical pulp is simply mixed with the proper proportion of sulphite, the

longer fibred chemical wood pulp, and, with its consistency controlled, the mixture passes directly to the paper machine without further treatment.

The old practice was long retained and still is seen in the less up-to-date plants, of adding clay or other loading material to make up for the deficiencies of the pulp, and also size which was supposed to improve the printing quality. Under present practice sometimes a slight trace of blue dyestuff is used to counteract the yellowish shade of the wood pulp and make the paper appear whiter. Sometimes also a quantity of sulphate of alumina is added to promote coagulation of the more finely ground material and prevent its loss in the effluent. In several instances, however, newsprint has been made of nothing but mechanical pulp that had been carefully made. The use of hollanders, jordan refiners and screens in making newsprint is an instance of the persistence of established custom. This is well demonstrated by the success of plants which do not employ them.

The Paper Machine

Equally as great changes are to be seen in the paper machine itself. At 500 feet per minute or less the wire was about 30 feet long, operating on the level, with slices about 6 inches high, set forward of the breast roll, and the machine was equipped with about eighteen drying cylinders, 36 inches in diameter, by which to dry the paper. The wire was already provided with suction boxes to remove more of the water than would drain from the sheet by gravity alone. One of the first steps towards an increase in speed was to increase the length of the wire, thereby to permit of a longer distance for draining or an equal time, considering the increase in speed, until it is now about 100 feet in length.

Instead of two presses, to remove as much water as possible by pressure, leaving less to be evaporated on the driers, one or two additional presses were added and also the bottom couch roll was converted into a revolving suction couch, thereby assisting in the removal of water without increasing the frictional resistance of the wire. The top couch was in consequence made unnecessary.

At the same time the number and size of the drying cylinders were increased until on modern machines there are forty driers each 72 inches in diameter.

To compensate for the greater size and weight of the moving parts made necessary by their vastly increased length, such as the table rolls, press rolls and drying cylinders, ball bearings are customary and in consequence the power required for machine operation, in proportion to the quantity of product, has not increased.

When the speed exceeded 550 feet per minute it was found difficult to secure an even formation of the sheet, due, it was supposed, to the wire travelling faster than the liquid suspension of pulp flowing on it. It was found possible to correct this condition by elevating the breast roll above the level of the couch roll at a height to some extent proportional to the speed of travel. While this patented system of operation without doubt had a very definite influence in making possible the present speed of operation, it has been found that on a level wire a good formation can be secured by delivery of the pulp suspension to the travelling wire at a discharge velocity equal to the speed. This is done by maintaining the head in the flow boxes at the proper level by means of slices sometimes 48 inches high, and placing the slice directly over the breast roll to remove the weight from the wire.

When speeds reached 700 feet per minute it was difficult to secure operators whose reaction time enabled them to pass the paper between the sections as is necessary when starting the machine or after a break. To obviate this difficulty two different systems are used either alone or in combination. One is an ingenious application of air under pressure at the delivery point of each section so that by operating a valve the paper is blown from one section to the next until finally it is delivered to the reel where it is wound up. The other, which is applied to the drying cylinders only, consists of a system of light ropes in contact, which carry the paper through the drier stack when once it is delivered to it at the beginning. These systems were inventions that have contributed greatly to the successful operation of paper machines at their present speeds.

Another important factor mechanically is the suction couch roll mentioned, which not only acts to draw water from the sheet but obviated much trouble caused by the top couch roll which was done away with; also the automatic drum reel without which it would be almost a practical impossibility to wind the paper made at its present speed.

The Prime Mover and Machine Drive

In the progressive increase of the operating speed there have been many changes both in the form of prime mover chosen and also in the arrangement of the machine drive.

It must be remembered that a paper machine is composed of a number of sections. In a modern machine there is the wire with the breast roll, table rolls and couch, the first, second, third and fourth presses, each separately driven, the stack of drying cylinders sometimes driven in two sections, and the calender stack, making a maximum of eight sections. Each section, from the calenders to the wire, is travelling at a slightly greater speed than the one preceding it. This is done in order to keep the paper under slight tension as it is being made, to prevent the development of wrinkles.

The result is that while the sections are operating at different speeds they must be uniform in their relation to each other and to be so devised that not only may the speed of the entire machine be increased or decreased without disturbing their relation, but that the speeds of the individual sections may be independently capable of adjustment.

A direct drive from the water wheel was doubtless first used and a straight line drive on the paper machine. The sections were belted together by straight faced pulleys and any adjustment in relative speed obtained by lagging the pulleys. We will first consider the development of the prime mover and afterwards return to the drive.

From the shaft connection with the water wheel the first change was doubtless to a constant speed engine of the noncondensing type, the exhaust steam being distributed to the drying cylinders to dry the paper. Where other grades than newsprint were made in a number of weights, equipment capable of a wide range in machine speeds was necessary. Such a range was achieved by the use of special speed changing apparatus such as two cone pulleys or two expansible pulleys belted together. In other cases and more recently a variable speed engine or a direct current variable speed electric motor was used to drive the whole of the paper machine as a unit with a mechanical arrangement to secure the necessary adjustment in the speed of the sections.

The bleeder turbine, on account of its higher efficiency as a power producer, was the next step in advance for driving the paper machine. It was usually connected with the shafting by means of a rope drive and is still highly regarded by engineers although it is being displaced in most of the newer installations by the sectional electric motor drive. To a certain extent this is rather a displacement of the rope or belt drive and the individual section speed adjustment by individual motors for each section.

The turbine, with individual motors for driving the sections, is usually of the bleeder type operated as indicated, driving an electric generator which supplies current for the sectional motors and frequently for motors driving other machinery.

In the development of the machine drive, while it is true that without it a speed of 1,000 feet per minute was attained, the sectional motor drive represents the most advanced step in the application of power to the paper machine and all machines designed to operate at this or greater speeds are now so equipped. Prior to its use the usual system was the Marshall train consisting of a main shaft connected by cone pulleys through friction clutches, pinion and core gear, delivering the power to the individual sections of the paper machine. The adjustment in speed of the sections is obtained by shifting the belts on the cone pulleys.

While the machine is operating so that the speed of the paper is much above 750 feet per minute a slight variation in the speed either of the prime mover, main shaft or individual sections, militates against its satisfactory operation. In consequence it was soon found that for each section direct connected motors equipped with automatic speed control was the best known system. For variation in machine speed direct current motors are used equipped with one of three systems for automatically controlling the relative speeds of the sections or varying it at will.

Since steam enters so largely into the manufacturing costs of papermaking, requiring as it does under the best conditions about three pounds of steam to dry a pound of paper depending on the moisture it contains when it leaves the presses, some important developments have been made in the production of steam by electricity, its distribution and use, as well as the recovery of heat from the hot moist air emanating from the paper machine. It is considered that the building or machine room is part of the machine, its design, construction and system of ventilation having a definite bearing on the cost and quality of the paper made.

In the modern development of papermaking, especially newsprint, the importance and magnitude of the operation and the complex character of its closely related and dependent activities may be seen. A moderate sized plant will consist of a paper mill making 400 tons of paper per day, a mechanical pulp mill of perhaps 500 tons per day, a water power development of 75,000 horsepower and a sulphite mill of 100 tons per day — in all about 500 cords of wood will be used per day, necessitating several thousand workmen and several thousand square miles of timberland owned or under lease.

For the accommodation of the workmen and their families a large town is necessary, with sewage, lighting and water; also schools, hospitals, churches and all kinds of business houses. The management of the town is the direct or indirect responsibility of the papermaking concern since very frequently it is the only source of revenue.

For the perpetuation of its timber supply a forestry department is maintained to protect the forests and to reforest the cut over lands, as well as a railroad department by which the area may be properly harvested and brought to the mill.

While in former times the branch of science considered most necessary in papermaking was chemistry and in most recent years mechanical engineering, it is now realized that in pulp and paper manufacture, with its dependent and related responsibilities there is no science however apparently abstruse, nor few lines of experience however specialized, that will not find application in some of the activities connected with modern paper making.

Part of 90,000,000 feet of logs on Lake Kenogami and Rivière Au Sable.

Hydro-electric Possibilities of Quebec

The Potential and Actual Hydro-electric Development of the Province of Quebec and Its Probable Rate of Growth in the Future

Julian C. Smith, M.E.I.C.
General Manager and Chief Engineer, Shawinigan Water and Power Company.

Paper presented at the Spring Meeting of the American Society of Mechanical Engineers, held jointly with The Engineering Institute of Canada, Montreal, May 28th, to 31st, 1923

The object of this paper is to present briefly the potential and actual hydro-electric development of the province of Quebec, and so far as may be done from the progress in the past, to estimate the probable rate of development of the hydro-electric resources in the future.

The province of Quebec comprises that vast stretch of territory lying east of the Ottawa river and north of the United States boundary line, bounded on the north by Hudson strait, on the west by Hudson bay, and on the east by Labrador. It is 2,000 miles in width from north to south and 1,350 miles from east to west, having an area of 706,804 square miles, or almost 25 per cent of that of the United States. The northern section is for the most part uninhabited, but the southwestern portion lying along the lower part of the Ottawa and St. Lawrence rivers, and extending south to the American border and east to the Saguenay river, is an important and rapidly growing industrial section.

If we superimpose a map of the province of Quebec over a map of the eastern portion of the United States, Quebec will cover the states from the Atlantic ocean west to Chicago including the Great Lakes, and from North Carolina to Canada, leaving some 200,000 square miles of the northern part of the province overlapping Canada.

The climate of Quebec is quite similar to that of northern New England. The winters are severe, and snow covers the ground from the middle of November to the end of March. The summers are warm and pleasant, and the precipitation, which is fairly evenly distributed over all seasons, averages about forty inches per year.

The Watersheds of the Province

Topographically the country north of the St. Lawrence river is divided into three great watersheds. South of the river and west of the town of Levis, which is opposite the city of Quebec, the country is a low-lying fertile plain; east of the town of Levis the land rises gently to between 1,000 and 2,000 feet, with elevations of nearly 5,000 feet in the Gaspé Peninsula. On this south side of the river there are no large water powers as the watershed is comparatively narrow and, although well watered, is traversed by only a few rivers of any magnitude.

The three great watersheds lying to the north of the St. Lawrence river are the south watershed, draining into the St. Lawrence river; the north watershed, into the James and Hudson bays; and the east watershed, through Labrador into the Atlantic ocean. Of these the south watershed, through which flow the tributaries of the St. Lawrence from the Ottawa to the Notashkwan, is the most important. The height of land dividing the north and south watersheds lies some 200 miles north of the St. Lawrence and runs roughly parallel to it. On either side of this height of land there is a vast plateau having a mean elevation of from 1,200 to 2,000 feet which begins at the Ottawa with a width of some 150 miles and spreads out like a fan toward Labrador where it attains a width of 500 miles or more. The southern edges of this plateau are for the most part near the St. Lawrence so that the rivers which traverse it make their sharpest descent to sea level not far distant from the main river, and as a consequence much of the water power of this watershed is within easy reach of the industrial section of the province.

The north watershed is drained by many large streams flowing into James bay, and when the development of the country has progressed far enough to permit their water powers to be utilized, enormous amounts of power will become available on the Nottaway, Rupert, East Main, and Kaniapiskau rivers.

With regard to this northern watershed, although the area is large the precipitation is largely unknown, and the run-off also is largely a matter of speculation.

The east watershed is drained principally by the Hamilton river, on which is situated a water power estimated at 700,000 horse power at Great falls, some 350 miles from the mouth of the river and 200 miles north of the St. Lawrence river at the west end of Anticosti island.

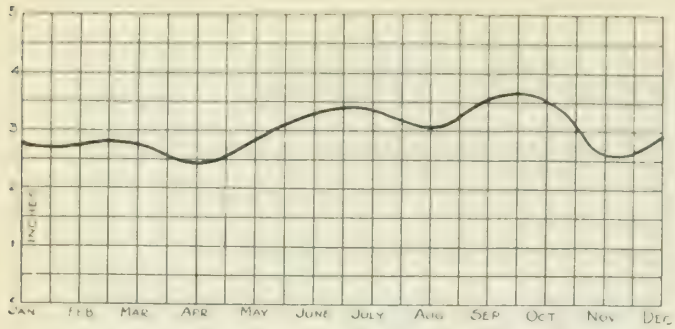
The ultimate source of the water power of any country is the precipitation, and the total potential water power produced thereby may be estimated by calculating the potential energy of this precipitation in its descent from the highlands to the sea.

Potential Water Power of the Province of Quebec

To calculate the total potential water power of the province of Quebec we may superimpose a map of the precipitation upon a topographical map of the province and then divide the province into areas having the same average elevation and approximately the same precipitation. An estimate of the potential energy due to precipitation can then easily be made. The precipitation in inches per year at different points of the province is as follows:

Montreal	40	Shawinigan	37.61
Quebec	40.5	Chicoutimi	30
Brome	34.3	Anticosti Island	36
Father Point	33.58		

The total area of the province is as stated above roughly 700,000 square miles, of which for the present purpose we may neglect the triangular area cut off by a line drawn from the northern tip of Labrador to the southern end of James bay containing some 200,000 square miles of snow-covered land, leaving a net area of 500,000 square miles. This area of 500,000 square miles may be divided into four plateaus of different elevations and slightly different rainfall, as follows:



Average Monthly Precipitation during the last Twenty Years in the Province of Quebec.

Average precipitation per year in inches	Average elevation in feet	Area in square miles	Equivalent continuous power in kw.
40	1,700	170,000	71,400,000
40	1,000	220,000	92,400,000
35	500	100,000	18,350,000
40	300	10,000	1,260,000
		500,000	183,410,000

C. P. Steinmetz, in a paper read before the American Institute of Electrical Engineers in 1918, made a similar computation showing the potential water power from the rainfall in the United States between the thirtieth and fiftieth parallels of latitude and found that over an area of 2,970,000 square miles the potential power was 1,000 million kilowatts of continuous power. Prorating the figures obtained above for the province of Quebec, the potential water power of the province due to the precipitation is about 10 per cent higher per square mile of area than the average potential water power of the United States.

It is of course obvious that this amount of power is not available because no water would be left for vegetation, and even were all hydro-electric developments carried out, no allowances have been made for losses due to seepage and evaporation.

If we average the figures for the various stations throughout the province, we arrive at an estimated run-off for the whole province of 18 inches per year. Substituting this figure for the total precipitation, we obtain a total of 88.7 million kilowatts of continuous power, and allowing an efficiency of conversion of 60 per cent from the stream to the distribution center, there remains 53 million kilowatts of continuous power as the maximum possible hydro-electric power which could be produced if during all seasons every drop of water which ran off the 500,000 square miles of territory considered were converted into hydro-electric power. This is of course an impossible condition, as there would be no flowing streams in the country but only lakes and canals connected together by penstocks discharging through turbines into those of lower levels.

In estimating the amount of power which is actually available we must obviously neglect the energy in the water falling on the upper plateau, which is lost in the first part of its descent from these highlands.

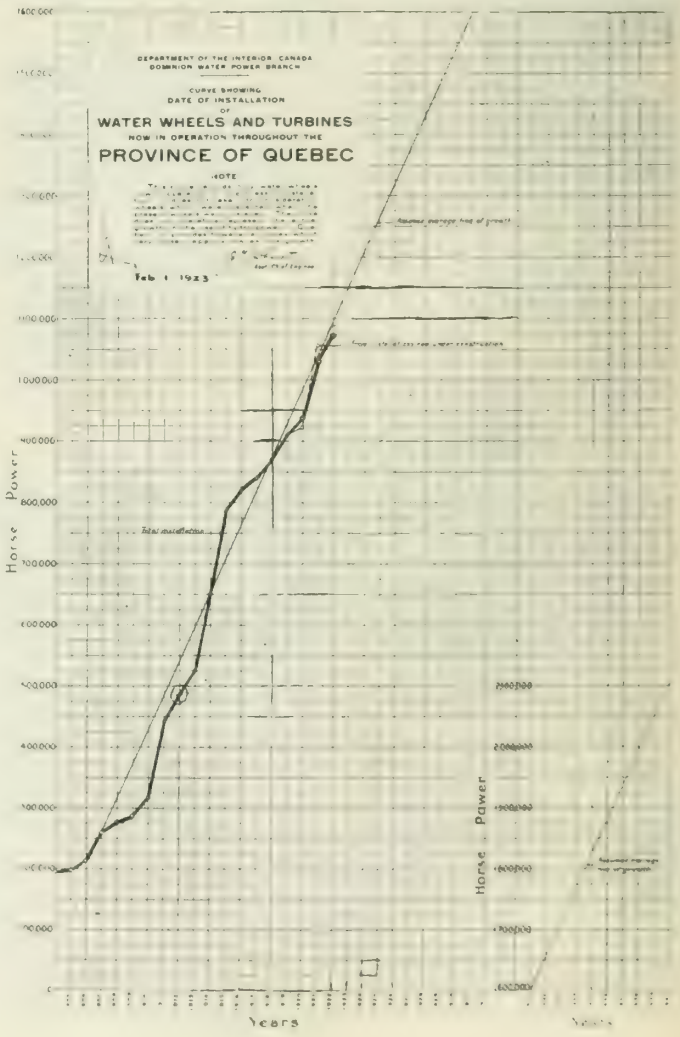
While it is impossible to state accurately the percentage of energy loss before the gathering together of water takes place, it may be conservatively estimated at 50 per cent on an average over the many steep and shallow valleys that go to make up the different drainage basins.

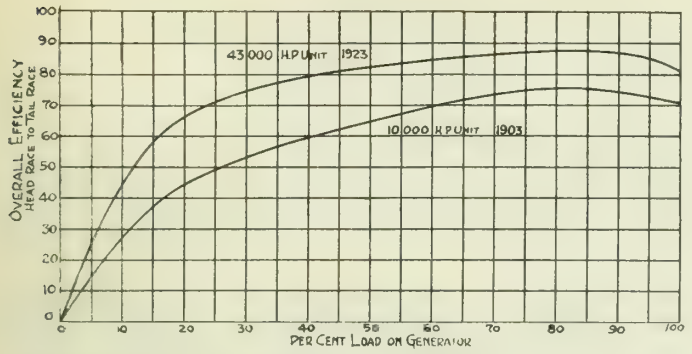
We must also substract from the total of available energy all the energy consumed by friction of the banks and beds of the rivers and streams, which is sufficient to use up about one-half foot of head per mile on the average; and in addition we must consider as non-available all the energy contained in those portions of the rivers and streams and brooks where the fall is hardly greater than that necessary to produce the required flow of water through the channel. In this class will be included practically all the lower reaches of the main rivers and those tributaries which unite with them below the points of greater descent.

As continuity of supply is an essential condition to all power service, due allowance must be made for the fact that while the precipitation is more or less equally distributed during the year, the run-off from the precipitation is most unequally divided among the different seasons. During the spring thaw the melting and running away of the accumulated winter snowfall produces flood conditions on all rivers and streams, raising the flow to as much as 20 to 100 times the minimum. The necessary waste of the greater part of the water reduces still further the quantity of energy which may be considered as available for industrial uses, even under ultimate conditions of development.

Combining the sources of lost energy enumerated we may assume that not more than 25 per cent of the 53 millions of kilowatts of energy contained in the total run-off could be converted into electric energy, and therefore that the actual potential energy of the province of Quebec is approximately thirteen to fifteen millions of continuous kilowatts.

In the present state of the art of the development and distribution by hydro-electric power, only those sites near industrial centers and at which water power exists in





Comparison of Overall Efficiences of Hydro-Electric Units installed in 1903 and 1923

considerable quantities are capable of being developed. The theoretical available quantity of fifteen to eighteen million kilowatts of continuous power must therefore be very considerably reduced in estimating the quantity of power that is actually adaptable to industrial purposes. From recent surveys of the water powers of the province, and considering only those rivers on which water power is available in such quantities and in such locations as could be economically developed either now or in the near future, the quantity of actually available water power in the province is estimated at approximately 5.25 million kilowatts of continuous power, of which some 800,000 kilowatts have now been developed and utilized. There remains, therefore, in the province of Quebec as available commercial water power about 4.5 million kilowatts of continuous power or about 12 million horse-power at 50 per cent load factor.

The Quebec Streams Commission of the province of Quebec, and the Dominion Water Power Branch of the Department of the Interior at Ottawa, have published during the past several years valuable articles giving detailed information regarding the available water powers, and particularly those which can be developed within the next few years from an economic standpoint.

The Load Factor

The various amounts of power mentioned in this paper thus far have been described as "continuous power", which means that the flow of water producing this power is sufficient to provide the full quantity twenty-four hours a day, three hundred and sixty-five days in the year, and here the author proposes to digress for a moment from the main subject of the paper to discuss briefly the subject of "load factor", or the proportionate duration of use of power.

It must be borne in mind that no industry is able to make continuous use of the power which it requires, and that therefore no power company supplying power for industrial purposes is called upon to supply the total amount of contracted power all day every day in the year. The term "load factor" is used as a measure of the duration of use of power and is defined as average power divided by peak power. The load factors of the various industrial loads in Quebec differ considerably. For instance, paper mills operate at a load factor of between 65 and 75 per cent, averaging more nearly 65 per cent; carbide and electro-chemical plants operate at 85 to 90 per cent; cement mills at 80 to 90 per cent; and asbestos and mining industries at 45 per cent load factor. The load factor of an hydro-electric station supplying various industrial establishments and providing power and lighting service to communities will obviously be the average of the combined load factors of the various loads. Such a plant will therefore not require to use continuously the flow of its water which will produce maximum output. Provided sufficient water-storage capacity exists, the surplus energy that the normal flow of the river could produce may be stored in the form of water, but otherwise a certain portion of the available energy — which might be very great at certain seasons in the year — must be allowed to run to waste. In estimating the amount of energy available for industrial uses from the flow of the river at a given head, due consideration must therefore always be given to the storage capacity of the watershed and to the amount of regulation of flow which is possible with full utilization of the storage capacity.

In plants where no storage capacity exists, the installation of sufficient generating capacity to consume the increased flow of water during the six high-water months becomes economically justifiable by the use of electric steam generators as an adjunct to the plant to make possible the utilization of the excess energy produced during these months by its conversion into stream. The ability to obtain a return from all the energy available at all times of the year will make possible the development of many power sites which, if dependent solely upon the sale of continuous electric power as such, might remain undeveloped.

Early Water Power Developments

The earliest water power developments in the province were the old seigniorial mills constructed by the French seigniors to grind the grain of their dependents. These little grist mills were in existence as early as 1650, and were almost always developed by the construction of a small canal which carried the water to an overshot or undershot wheel where the heads used varied from about five or six feet up to ten or fifteen feet.

The first hydro-electric development was the Montmorency plant near the mouth of the Montmorency river, seven miles below Quebec, built in 1895 and having an installed capacity of five 600-kw., generators.

This was followed in 1897 by the St. Narcisse plant on the Batiscan river, with an output of 750 kw., which was transmitted to Three Rivers over a two-phase 12,000-volt transmission line 18 miles long. This was the first high-tension line in the British Empire.

The Chambly plant on the Richelieu river, 17 miles from Montreal, was built in 1898 with four 2,000-kv.a., machines, the output of which was transmitted to Montreal at 25,000 volts, three-phase; and in the same year the Lachine Rapids plant was put into operation with a maximum output of 10,000 kw., at certain times of the year only.

Principal Water Powers Now in Operation

The principal water powers now in operation in the province of Quebec may be divided as follows: Powers on the Ottawa river; powers on the St. Lawrence river, province of Quebec; powers on the St. Maurice river; powers on the Saguenay river and its tributaries in the vicinity of Chicoutimi; and powers located on the south side of the St. Lawrence river, particularly on the St. Francis river and its tributaries.

The two great developments existing to-day in this province are located at Cedars rapids on the St. Lawrence river, thirty miles west of Montreal, and on the St. Maurice river at Shawinigan Falls and Grand Mere.

The third great power, which ultimately may eclipse these, is now being constructed on the Saguenay river just below the outlet of lake St. John.

In addition to the developments enumerated in table No. 1, which generate electricity for use in public utility service or for industrial service in the neighborhood of power developments, there are a large number supplying power for grinding wood. These latter are widely scattered throughout the province, most of them having been built prior to 1910. The total amount of hydraulic power used directly for this purpose in the province has been stated by the Dominion Water Power Branch to be 162,825 h.p. With the advent of the vertical turbine and the increase in the size of electrical generating units, it became in many cases more economical to develop the power in the form of electricity to be transmitted to pulp and paper mills built in favourable positions rather than to locate the mills at the site of the power development. The amount of hydro-electric power so used is stated to be 157,367 h.p., making a total of 320,192 h.p., of hydraulic turbines employed in the pulp and paper industry.

vanished. The other trouble is more difficult to remedy, and inasmuch as the change of levels may be due to blockades of considerable area, the remedy in most cases is peculiar to the power development.

Most plants on the St. Lawrence river experience variations in height of headwater or tailwater due to ice blockades at long distances from the power house. On smaller streams, and particularly on very small streams, these blockades may be extremely serious, as they may, and do, affect a large portion of the flow of the river.

In large power developments, ways and means have been developed which minimize to a considerable extent these difficulties, and the expense of carrying out such efforts is justified in case of large plants where it would not be in small ones. By keeping the channels open to permit the frazil ice to come up to the surface, and by the use of various skimming devices to remove this ice, a very considerable degree of success has been obtained at the Cedars Rapids plant on the St. Lawrence river. It may fairly be stated that while this ice difficulty was a serious menace some years ago, now such is not the case,

Table No. 1 Principal Water-Power Developments in the Province of Quebec

River	Location	Company	Available Head, ft.	Total Generating Capacity, h.p.
In Operation				
St. Maurice	Shawinigan Falls	Shawinigan Water & Power Co.	150	195,000
	Shawinigan Falls	Northern Aluminum Co.	145	40,000
	Grand Mere	Laurentide Power Co.	84	160,000
	St. Timothee	Quebec-New England Hydraulic Corpn.	50	21,000
St. Lawrence	Cedar rapids		32	229,200
	Soulanges	Montreal Light, Heat & Power Co.	50	15,000
	Lachine rapids		14	13,000
Richelieu	Chambly	Montreal Light, Heat & Power Co.		31,000
Ottawa	Hull	Ottawa and Hull Power & Mfg. Co.	40	20,000
		E. B. Eddy Co. (private)		10,000
St. Francis	Drummondville	Southern Canada Power Co.	32	6,700
Montmorency	Montmorency falls	Quebec Ry., Light, Heat & Power Co.	270	5,000
St. Anne	Seven falls	Laurentian Power Co.	410	20,000
Under Construction				
Saguenay	Lake St. John	Quebec Development Co.	300	400,000*
St. Maurice	Gres falls	Shawinigan Water & Power Co.	65	132,000
Ottawa	Calumet island	Ottawa and Hull Power & Mfg. Co.	60	60,000

* A further 800,000 hp. will be developed later near the mouth of the river.

Difficulties Encountered in Water-Power Engineering

There are certain difficulties occurring in water-power engineering in this province which meet engineers in every locality where the climatic conditions are similar to those which obtain in its latitude. Ice troubles in the past have caused serious interruptions of service and reductions in the available amount of power. These troubles may be divided into two broad divisions:

(*a*) Ice troubles occurring in the power house itself, due to the presence of ice on the racks or the waterwheels

(*b*) Troubles occurring in the water channels above or below the power house affecting the head acting on the turbine.

To a large extent the troubles in classification (*a*) have been overcome by better design of the power house and better knowledge of the cause of these troubles. By enclosing the rack structure and by getting the turbine chambers warm and in general by the use of larger units, much of the trouble which was experienced formerly has provided the plant is a large one and has been located and built with the knowledge acquired from the operation of existing installations.

The growth of hydraulic and hydro-electric development has been rapid and continuous over the past twenty years. The yearly rate of increase has been about seven per cent of the installed capacity per year over the last fifteen years, and the present total development is 1,070,000 h.p., of hydraulic and electrical capacity combined.

At the present rate of increase the total available amount of hydraulic power, which is estimated at 5.25 million kilowatts or about seven million horse power, will be developed and utilized in the next twenty-nine years. However, as the increase in development will in general follow the increase in population, it will take considerably less than twenty-nine years to develop all the power now in sight, and a careful study indicates that in twenty to twenty-five years the 7,000,000 h.p., will be utilized. Further, this time might be materially shortened if any large amount of power were exported from Canada.

Management Engineering in the Paper Industry

The Measurement of Performance a Factor in Good Management —Industry Should be Organized to Encourage Rather than Repress Individual Development

R. B. Wolf, Mem.A.S.M.E.

Paper presented at the Spring Meeting of the American Society of Mechanical Engineers held jointly with The Engineering Institute of Canada, Montreal, May 28th, to 31st, 1923.

The most difficult problem that the paper-mill manager has to solve is the problem of overcoming the resistance of the practical operators to the introduction of scientific manufacturing methods. He must depend upon his superintendents, department heads, and foremen for the carrying out of his ideas, and if he can produce in them a desire to improve existing conditions, rapid progress can be made.

The reason the so-called practical operator finds it difficult to follow the scientific or inductive method is that he has not been taught how. The things he knows about paper making he has learned by seeing the things happen. His knowledge, therefore, is made up of a great many more or less disconnected facts, which, due to a lack of scientific training, he has not learned to put together into principles or laws. This in no sense reflects discredit upon the practical man. He has simply lived his life in an environment where it has not been customary to use the scientific method of keeping accurate records of his past experiences. The lack of ability to develop general principles from particular instances can be overcome only if the management encourages the operators, particularly the department heads and foremen, to record the various happenings so that they can be studied in their relationship to one another.

In the past four or five years great progress has been made in measuring the quality elements in paper, and numerical values have been given to such elements as strength, weight, moisture, finish, formation, cleanliness, bulk, and color. In each case a numerical value indicates the nearness to an ideal 100 per cent standard.

One large company has for some time made it a practice to compare the output of each of its mills with the product of a number of outside mills, with whom samples are exchanged, recording in this way the individual performance of each producing unit. Of course such records stimulate interest in the factors which affect the various quality elements. For instance, both weight and moisture are affected by the amount of water in the stock flowing on to the wire of the paper machine, the slowness and freeness of the stock, the amount of agitation in the flow box of the paper machine, the stock proportions in the furnish, the pitch of wire, and many other factors of a similar nature. It is important to note that interest in recording these factors has been aroused by th discovery that the only way to control the quality elements is to control the factors which affect them. This control, however, is not possible, unless the management provides means for keeping individuals who are responsible for variations in quality constantly informed as to what is happening.

The science of paper making in the past has been too much like the old pseudo-sciences, where sense impressions governed. The immense waste attending the use of such methods makes it imperative for us to change them. There is plenty of evidence that the art of paper making is beginning to be based upon real scientific knowledge, and the publication of a complete set of textbooks by the Canadian and American technical associations is the best testimony that a genuine spirit of scientific inquiry is developing in the paper industry. As a result of this excellent piece of work it is now possible for the student of paper making to familiarize himself with the best paper-making practices of the past, and the manufacturer can avoid much costly duplication and experiment.

To insure continued progress, however, it is necessary that the group leaders become more skilful in recording and evaluating manufacturing processes. This evaluation of progress, however, is an individual thing and it is therefore necessary to understand the nature of the individual, particularly that very important individual, the superintendent or foreman, who will quite naturally block any effort to introduce methods which he does not himself understand. Any one who has ever tried it knows that scientific record keeping, by technically trained men, will bring to light many practices that should be changed, and this, of course, puts the head of the department on the defensive. He feels that he is *supposed* to know all about his job and in spite of assurances that he could not be expected to know what was not known before, he will, in the great majority of cases, remain on the defensive.

Departmental Cost Sheets Stimulate Economy

Our own experiences have taught us that the best way to produce an open-minded attitude is to introduce a system of departmental cost sheets, which will reflect the economy of operation in each department. No superintendent or department head will object to the introduction of such economy records, and the far-reaching effect of such a cost-keeping system will be seen by a few instances taken from actual experience.

In one plant the introduction of steam meters in order to charge the steam used to each operating department led to such an interest in steam usage that it was possible to avoid the installation of a new boiler, and finally to shut down the spare boiler which it had been previously necessary to keep in almost constant use. The department heads were no longer indifferent to leaky traps on the steam coils, poor insulation on steam pipes, the excessive use of steam in manufacturing processes, etc., for all of the steam used by the department had to be paid for and reflected itself in the cost sheet as uneconomical performance. Not only did the operating department head take an interest in the amount of steam used, but also in the cost of steam. So it followed that the head of the steam department soon found it necessary to know why the cost of making steam was high. Then came the installation of steam meters on each individual boiler unit, and the measurement of coal to each unit so that evaporating efficiency could be determined. Draft gages, CO_2 recorders, etc., of course, followed, for without them the reasons for low evaporation could not be known, but only guessed.

The important thing to remember is that intelligent cost keeping is sure to produce a demand from within the department for the introduction of scientific record keeping which will explain variations in cost, whereas the introduction of scientific methods without first stimulating an interest in economy of operation usually arouses suspicion.

Departmental cost sheets, which show the actual cost of stock in the paper, will soon bring about an inquiry as to the reasons for high shrinkage, and a demand for accurate records of the fiber losses invariably follows. One important development along this line has been the working out of a method for making continuous moisture determinations in the paper coming off the paper machines, making it possible for the machine operator to save stock by not overdrying the paper. The use of this method in the newsprint industry alone has saved literally hundreds of thousands of dollars, for, as shown by the figures of the News Print Service Bureau, an average of considerably over one per cent more paper is now obtained from the same raw materials.[1]

Maintenance of Individuality a Prime Necessity

In his paper on Non-Financial Incentives[2] the author showed the very great savings made in repair materials when cost records were furnished to responsible individuals in a large manufacturing organization, so further illustration is not needed. What it seems to him is needed, however, is a clear understanding of what constitutes individuality. If those entrusted with the direction of our industrial plants do not have a clear understanding of this principle, they cannot effectively instil the principles of sound economics into their organization.

John H. Williams pointed out before the Cost Accountants Association, at Cleveland, that the first thing to do before a cost system is set up is to determine managerial responsibility. Once this is done the group individuality becomes clearly defined and quality and quantity records are sure to follow. Science, in other words, will replace "rule of thumb".

There is, perhaps, no principle of life which is so difficult to understand as this principle of individuality. "Who can tell," says Bergson, "where individuality begins or ends; whether it is the cells which associate themselves into the organism, or the organism which dissociates itself into the cells?" The principle, however, must be understood, for otherwise mankind is doomed to eternal conflict with his fellow-men.

In no other period of the world's history has the group spirit found such material expression as in this twentieth-century development of corporate industry. In the past men have combined into groups for productive purposes, but never before have we seen such grouping of groups and these larger groups into still larger corporate units, and the startling fact is that most of this has taken place within the lifetime of the men who are still in active charge of industry. What is the meaning of it all, and what is to become of the individual men in the process? This, the author believes to be the most momentous problem confronting modern civilization, for if it is not solved, civilization as now constituted cannot last. To crush out the individuality of the workman is fatal to human progress and it is also fatal to destroy the individuality of our manufacturing or producing units.

Individuality Expressed in the Worker, the Group or Department, and the Plant as a Whole

One of the very first things to recognize about the principle of individuality as related to industry is that it has three modes of expression in any given plant:

First, it expresses itself through each individual worker

Second, it expresses itself through each individual group, or department, which has a specific function to perform

Third, it is expressed by the plant as a whole.

The next thing to recognize about individuality is that its purpose is to record a lapse of time. Progress must be made from one point in time to another point in time, and it is the very essence of individuality to preserve a record of the changes which have occurred between a sequence of time periods. To illustrate: the year is usually divided into twelve monthly periods and for each month we have records of quantity of paper produced, quality of paper produced, and cost of paper produced. It is only by studying these records of *past* performance of the plant as a whole that we can get a sense of what has been accomplished and, what is more important, a vision of what may be accomplished in the future.

The plant, however, is made up of departments, each of which contributes its individual share to the enterprise. Therefore, to get the most effective results, similar monthly records should be kept for each department, such as the quantity, quality, and cost of pulp produced; the quantity, quality, and cost of steam produced; or the quantity, quality, and cost of the output of each department of the plant.

Finally, all departments are composed of individual men and we have found it equally necessary to the cause of sane and rational progress to record for the workman's benefit the quantity, quality, and cost of performing his work. It is not always practical to record all of these factors, but always one can be recorded, sometimes two, and sometimes all three. It goes without saying that the workman who is conscious of all three will see how his own job is related to the process as a whole and can work with a much greater degree of intelligence.

The periods or points in time between which the records enable us to note changes, vary in both duration and frequency of occurrence. In processes where rapid changes occur, as in the weight of paper on paper machines, or temperatures in cooking digesters, the periods are short and are usually measured by minutes; in the case of average temperatures, paper-machine speeds, or evaporation records the periods are longer and are measured by hours; and in the case of many quantity, quality, and cost records the periods represent averages for days, weeks, or months.

In each case, however, it should be noted that we are measuring the progress of a producing unit and that these individual producing units are either men, groups (operating departments or divisions), or the plant as a whole.

It is not difficult to visualize the concrete reality of the first of these producing units, the man. It is difficult, however, to visualize the essential unity of the department or the unity of the plant itself, of which the department is an individual member.

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[1] Approximately 2,500,000 tons of news paper is made a year. Assuming an average price of $35 per ton for raw materials in this paper, a conservative estimate of 1¼ per cent increase in the moisture test shows a saving of over $1,000,000 a year.

[2] Trans. A.S.M.E., vol. 40 (1918), p. 925.

There is perhaps nothing more concrete and practical and at the same time more abstract and theoretical than this problem of developing these indivisible group individualities. The author feels sure that the way out is to come to a realization that the purpose of the individual is to create, whether the individual is a *man* creating (converting) pulp from wood on a grinder, a *department* creating chlorine liquor from salt and lime, or a *plant* creating paper from wood, clay, size, color, and all the various raw materials which furnish the energy or the substance used in the manufacturing process.

Interest Stimulated through Consciousness of Past Records

As indicated before, the answer seems to lie in increasing our skill in recording and evaluating the manufacturing process, so that consciousness of what has happened in "times" past may stimulate an interest in improvements to be made in "times" to come.

Just as the man's interest in the future economy of his own performance is aroused by making him conscious of the economy with which he has performed in the past, so must the group consciousness of economy be aroused by providing a record of past group performance. Unless group individuality (*esprit de corps*) is developed there can be no sense of responsibility and hence no progressive group accomplishment. It is obvious, therefore, that we must develop records for enabling the individuals who comprise the group to be conscious of what the group, *as a unit*, is accomplishing. Without this definite knowledge of progress made there can be no co-operative teamwork and the progress will be in the direction of quantity, with little thought of improvement in quality of performance or economy of operation.

What is true of the group or department is of course equally true of the plant as a whole, so each individual department must be conscious of the effect of its own activities upon the finished product. The point that must not be lost sight of is that this is not possible without a constant recording of the effect of variations in departmental products upon the finished product.

Quantity, quality, and cost should all be recorded, and if these records are kept *of* men, departments, and plant and made available *to* men, departments, and plant, there will be released very great creative power in the only way it can be released, namely, through the individual, whether that individual be a *man*, a *department*, or a *plant*.

"Our social economic system cannot march toward better days unless it is inspired by the things of the spirit. It is here that the higher purposes of individualism must find their sustenance." [1] Herbert Hoover, who says this, has a concrete record of accomplishment to his credit which makes these mystical words take on new meaning, especially when taken with his expressed conviction that "permanent spiritual progress lies with the individual".

Yes, the individual must be understood, and the whole problem of industry, it seems to the author, resolves itself into finding out how to enable the unit individual, the man, to become conscious of his relationship to the all-including group individual, the plant; and how to organize the plant so that it will be sufficiently sensitive to the welfare of the human units of which it is composed that it will not repress but encourage their individual development.

The secret seems to lie in stimulating group consciousness within the organic whole of the plant by continuously recording the group's relationship to the plant on the one hand, and the man on the other, and the immediate need seems to be for the education of foremen to intelligently direct the groups. This education, however, to be of use, must be largely obtained from a study of records of group experiences, for information obtained in this way constantly stimulates the individual to greater effort. The recorded results of this new effort will act again as a fresh stimulus, so that continuous progress in both knowledge of process and skill in the use of this knowledge is bound to follow.

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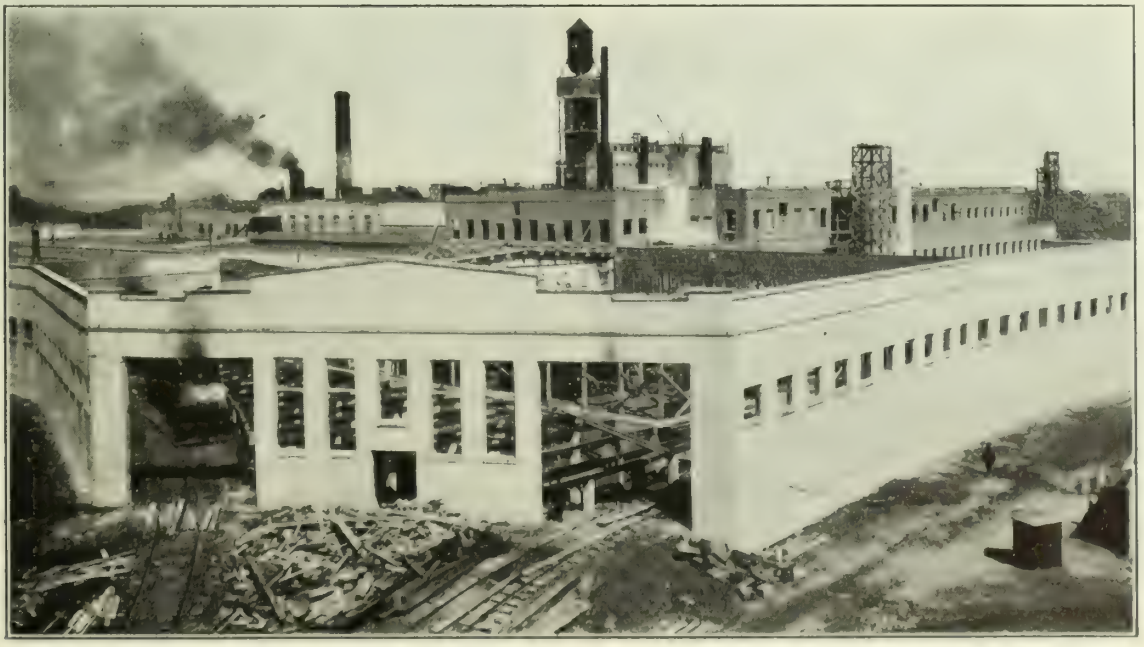
[1] American Individualism, by Herbert Hoover, published by Doubleday, Page & Co.



General View of New Extension Kenogami Paper Mills, looking north, Price Brothers & Co. Ltd.

Shop Problems in Paper Machine Manufacturing

E. T. Spidy, A.M.E.I.C.,

Assistant Superintendent, Dominion Engineering Works, Ltd

Paper presented at the Spring Meeting of the American Society of Mechanical Engineers held jointly with The Engineering Institute of Canada, Montreal, May 28th, to 31st, 1923.

The modern idea of paper making machines as reflected to the shop manufacturing the same, is to get larger and larger machines. The paper maker wants more paper produced per machine, per hour, and whether he gets it by running at higher speeds or by increasing the width of his sheet, he is making his machine larger.

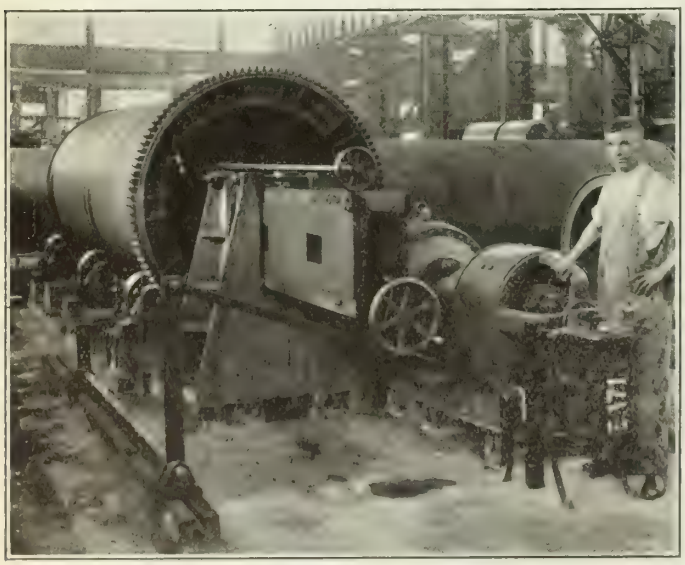
The manufacturer of paper machines of to-day, has to compete with the rest of the world. As a consequence of which it has been necessary to develop special machinery and special methods in order to maintain the standard of accuracy and at the same time to do the work profitably.

If we visualize a modern newsprint machine we see a continuous line of machinery approximately 300 feet long, and of a width from 14 to 20 feet. These machines are designed to make paper at a rate of 600 to 1,000 feet per minute depending on the particular machine. It contains up to 800 tons of metal.

The shop problem begins with the date that delivery is required. To-day six or seven months is the time usually allowed to complete a whole machine, and when a manufacturer has several machines to build, nothing but very careful planning gets the machine completed "on time", because it must be remembered that other work has usually to be handled during the same period.

It is not proposed to go into details of the shop organization or to deal with the many parts of a paper machine which represent ordinary work to any machine shop of modern capacity, but rather to give an outline of the way each item is planned in the shop in order that the whole machine is completed by a predetermined date.

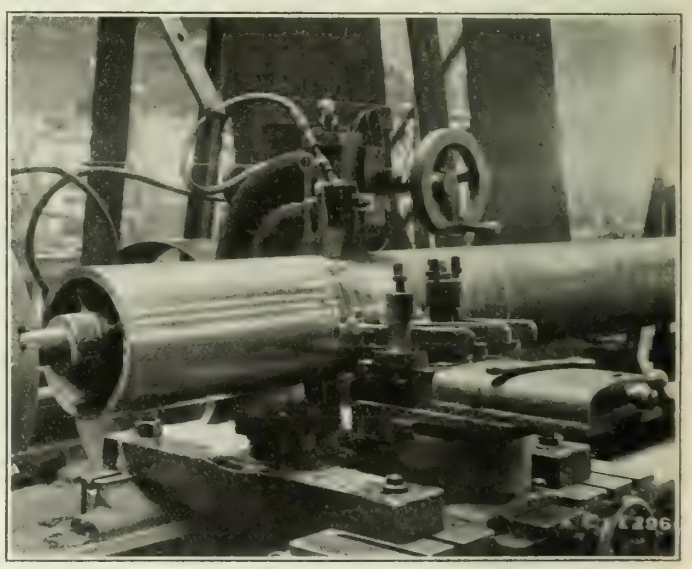
For every contract in the shop, paper machine or otherwise, the production department prepares a plan or schedule. On this plan is listed every item as issued by the engineering department. This schedule gives the complete information about each line, and in addition to the schedule provides a record of the exact standing of the item on each line. In making the plan the delivery date is first noted. By a process of counting backwards the number of days necessary to "test", "erect in shop", we arrive at the date when all machining should be finished. By repeating the process on each line, using actual or estimated machining times we arrive at the date "material must be in shop" which is transmitted to purchasing department. Likewise, "castings delivered", "patterns made", and finally, "drawings issued" dates are arrived at, so that the whole provides a means of looking after items that are late, while there is yet time. Graphic methods are used to record progress and this, aided by colours, quickly shows up items that need attention.



Shop view showing Dryer Boring Machine. Capacity 49 to 72 inches diameter and 24 feet long.

Operations on Paper Machine Dryers

Dryers present a problem to the shop because of their size, and on account of the accuracy and finish necessary. The rough casting for a 230-inch width dryer of 60 inches diameter, weighs approximately 15 tons. The entire equipment for molding in the foundry is special. "Sweeps", as the foundries call them, are used instead of regular patterns for molding, and special analysis of iron is put in to give toughness and the surface required on the finished dryer. This entire mold is bricked up, cores are swept up, then the whole is dryed in special ovens, and later set in the mold and poured. The casting and mold weigh approximately 40 tons, so that the making of one per day demands care and thought beyond the ordinary.



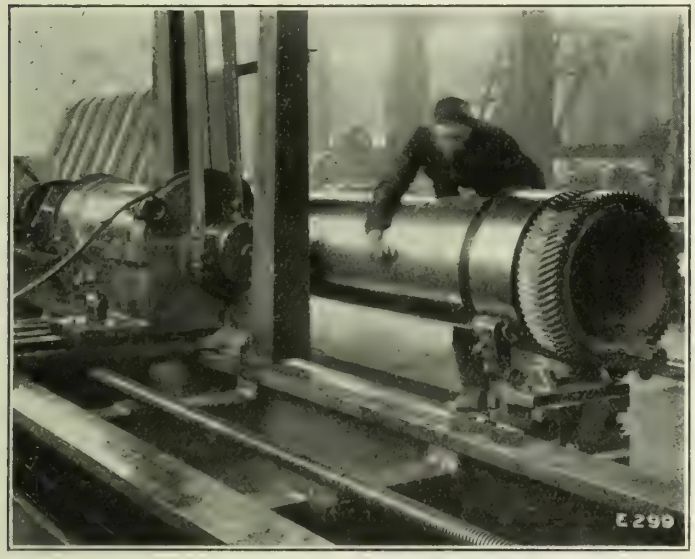
Shop view showing Set-Up for Turning Felt Rolls.

Rough turning dryer lathes are special machines. The dryer casting is mounted on a bar that runs in journals. Three carriages, operating three tools, take off the outside surface at the same time. A fourth tool operates from

the back and cuts off the riser left on by the foundry to ensure perfect metal right up to the end.

Boring dryers is also done on special machines although it may be done on regular horizontal boring machines if one large enough is available. In the special machine, the boring tools are still and the dryer revolves, while in the regular boring machine the job is still and the tools revolve and feed with the bar.

Finishing turning dryers after assembly may be done on a regular lathe of sufficient dimensions to accommodate the dryer. In this operation the diameter is reached within 10-thousands of an inch, which is left for the grinder This operation is done with the dryer rolling on its own journals.



Shop view showing Operation of Grinding Suction Roll, also Method Measuring.

Dryer grinding is also done on special machines. The dryer is rotated on its journals and the grinding head travels up and down the dryer. The adjustments of this machine are very accurate and the combinations of feed, speed, grits and grades are the results of much experimenting. It is to be mentioned that all measurements for diameters are made by means of steel tapes of circumferential length which are made in the tool room in a special department. The use of these special tapes prevents error on the part of workmen who do not have any calipers to set by this method and the accuracy factor is increased also by reason of using circumferential lengths instead of diameters.

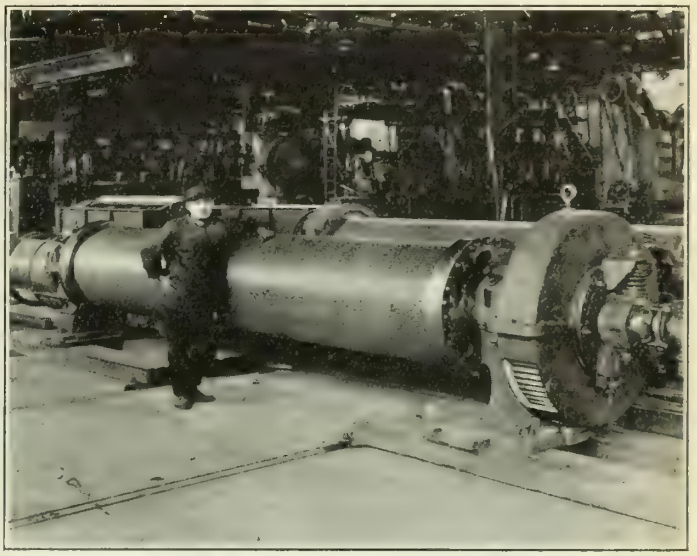
Drill, tap and stud operations on dryers is a one-man, one-machine job in a modern shop, entirely superseeding hand methods.

The balance of the operations on dryers, dryer heads, etc., include final assembly, balancing, hydrostatic test, steam test and so on, gives an idea of the shop problem as it refers to dryers alone.

Shop Work on the Rolls

Because of the number, variety and size of the various rolls included in a paper machine, the manufacturer has had to develop special methods and tools for this class of work also.

Turning steel rolls is a developed art. Lathes are equipped with special fixtures using combination steady rests and meltiple tools.



30-inch Millspaugh Suction Couch Roll for 166-inch Wire with Improved Design of Bearings.

Roll heads are bored in semi-automatic machines to standard reamer dimensions.

Press work journals are turned to fit heads and pressed in under supervision of inspectors. Roll heads, when pressed in are similiarly treaded. Pressure gauges indicate the pressure taken, and careful records are kept of every fit. In order to handle large press rolls, a 200-ton capacity horizontal press is used. For pres ing in small journals in heads, a 50-ton capacity vertical press is used.

Straightening pipe rolls is another expensive operation unless one is equipped with a special machine. Such a machine enables the operator to stand on a platform and control rotating and press motions. The whole machine is electrically driven having independent motors for rotating motion and hydraulic press. An expert can straighten pipes in one tenth of the time required by the old lathe method.

Straightening brass or copper tubes is done in a special power rotated machine, but not pressed hydraulically. The nature of the metal and the thinness of the tube makes this a peaning operation that requires expert handling.

Grinding rolls is done on a machine designed especially for the purpose, having facilities for crowning as desired. Large rolls are also ground on the grinders used for dryers grinding. The grinding wheels are changed to suit either the cast iron, steel, brass, granite, or rubber surface of the roll as the case may be.

Drilling suction and similar rolls is done in a special multispindle drill. Some of the rolls have hundreds of thousands of holes drilled in them, so that delivery becomes a problem even with a multispindle machine.

Bearings of many rolls are ground true in a lathe with a portable tool post grinder.

Balancing of felt rolls, table rools, etc., is done in two operations. First, statically on parallel ways, and second, dynamically by running the rolls at the operating speed and applying weights in each case at the necessary points. Special apparatus is used for this work.

Testing by running in the assembled machine is done wherever possible.

Special rolls for winders have zigzag grooves. These are cut by special fixtures on a planing machine and require indexing and gauging just like a gear. One single slip

on the part of an operator would render the whole job useless so that extraordinary precautions have to be taken.

Application of brass or copper tube coverings to iron bodies of rolls is also a very special operation.

Special papers require marking rolls which may be grooved variously. The cutting of grooves in rubber presents unusual features in tool shapes.

General Machine work and shop erection

Outside of the operations mentioned in detail we have bearings, frames, and multitudinous parts, some in quantities and some of which only a few are required. The shop endeavours to secure interchangeably, as far as consistent with necessity and cost by the use of jigs and fixtures. Each job is considered on its own merits. Some parts are drilled to jigs because that is the cheaper method, others are jigged because of the interchangeability required Special fixtures are also made for boring, planing or milling machining operations for the same reasons.

As far as possible gauges are made for all fits, Pin gauges are made from a special standard micrometer measuring machine. All gauges are checked in the tool room before being issued, they are also checked on their return to ensure that they have not become incorrect during usage.

Each of the separate sections of the paper machine is erected in the shop, as far as possible, on iron skids the same as in the mill, and all sub-assemblies are made complete.

In the foregoing the author has merely attempted to describe some of the interesting features in the process of manufacturing. The problems of this shop work never cease, and are always new, because while it might appear to be on the surface a nice straightforward job to build a machine it is in actual practice no such thing. "Nothing ever comes right" is a shop saying that tells you what the management job is. Material comes in hard, too soft, seamy, and so on, and consumes your time. Tools don't stand up to speed. Machines break down. Men make mistakes as they always did and always will. It is all however part of the problem that the manufacturing plants have to deal with, with an eternal eye on one thing, the delivery date.

Note:—This paper was illustrated by lantern slides showing all the operations and charts referred to, as well as many others.

Machine Tool Requirements of Pulp and Paper Mills

E. B. Wardle

Paper presented at the Spring Meeting of the American Society of Mechanical Engineers held jointly with The Engineering Institute of Canada, Montreal, May 28th, to 31st, 1923.

This paper is intended to present a very brief outline of the machine tool requirements of pulp and paper mills.

Very naturally as pulp and paper mills have to run continuously on a schedule of six days per week it is essential that loss of production be minimized by making repair parts in advance, where the need for them can be foreseen, and by installing necessary equipment to make quick repairs in emergencies. Mills making pulp and paper from wood are naturally located where the supply of wood and power is most plentiful and suitable. This generally means that the location is more or less remote from manufacturing centres where machine tool equipment is already established and available for doing various kinds of repair work.

In the manufacture of groundwood or mechanical pulp, the pulp grinders are usually driven either by water wheels or by motors. The need for machine tools to handle such pieces as water wheel shafts is perhaps passing with the advent of motor driven grinders, but in turn the tendency in large mechanical-pulp mills is toward grinder units of large capacity and therefore requiring heavier and larger tools for handling parts which need repair, than in the case of all mills built over ten years ago.

In chemical pulp mills using the soda and sulphate processes, and also the sulphite process, which is more common, the pieces to be handled are neither so large nor so heavy as in the case of the mechanical-pulp mill but on the other hand the sulphite process particularly requires a large amount of repair work especially on pipe fittings, valves, etc., which, due to corrosion, require frequent renewal even though they are made of acid resisting metal.

Machine tools for the pulp or paper mill repair shop should be selected mainly with a view toward ability to handle widely varied kinds of work rather than toward maximum economy of production, as the kind and amount of repair work required on paper machines varies considerably. It depends somewhat on width of the machine and speed, but also, and very largely, on the original design of the various parts, especially journals and bearings. Naturally also the care and judgment used in operation and maintenance play an important part in the amount of work that the repair department is called upon to handle.

Obviously a mill making 10 tons of writing paper per day, and buying all of the raw materials required, and located near a city, can easily get along with a few small tools and have any extraordinary work done outside, while a mill producing say 300 tons of newspaper per day, and located several hundred miles from a well equipped shop, and having in connection with it a mechanical-pulp mill of a capacity of at least 250 tons per day, and a sulphite pulp mill of 75 tons per day, must be equipped to handle anything up to rolls weighing 25 tons and 25 feet in length.

As the equipment for the large mill will naturally include that for the small one, perhaps it will be more interesting to outline only the requirements of the former.

The first point about the large mill to consider is that it must be equipped, generally speaking, to repair any piece of machinery that is installed, and granting this, it is equipped to reproduce it, provided the rough casting or forging is supplied. As the overhead expense for tools has to be met anyway, the tendency is toward making the repair parts instead of buying them outside.

This is especially true of Canadian mills using machinery that has been imported. Several of the large mills have even felt warranted in installing foundries for cast iron and brass for making castings for centrifugal pumps, gears, conveyor sprockets, pipe fittings, bearings, bushings, etc.

In addition to the more or less routine work of repairs, the machine shop work required by the various changes and improvements in manufacturing processes and extensions to plant is a very important matter in a mill that is progressive enough even to try to keep up with the times.

So much for the general conditions that influence the selection of equipment.

A vertical boring mill is a necessity for handling such things as large gears, chipper discs, conveyor sprockets, centrifugal screen runners and large pulleys. This tool should be capable of boring or turning up to 96-inch diameter. A smaller vertical boring mill, say 42-inch, is very handy for handling smaller work, such as facing flanged pipe fittings, boring bearings and bushings.

For handling rolls of various kinds, a heavy lathe is an essential. Press rolls of granite, wood, and rubber covered cast iron very often require to be turned or be fitted with new journals or to have worn journals trued up. Felt rolls of wood, iron pipe, or brass tubes frequently require straightening. Grinder shafts occasionally need to have the threads recut or journals repaired. For this sort of work a lathe of at least 24-inch swing and 30 feet or more between centres is needed. A double-spindle lathe is often purchased for this work, and is very convenient, as such parts as cylinder molds, 48-inch diameter by 120-inch face or more, can be handled on the upper spindle. Otherwise an additional long lathe is usually required.

An open side planer say 48 inches by 48 inches by 16 feet will be found very useful in making repairs to such heavy machinery as magazine grinders, and chipper discs, which are too large to be handled in the ordinary planer. Some sort of a planer of about the size given is, of course, a necessity. A few mills find it wise to also have a smaller planer for light work.

A back-geared crank shaper of say 24-inch stroke is practically indispensable and a smaller shaper is sometimes added for small parts.

Next in importance should be placed a 5-foot (or preferably 6-foot) universal radial drill, a 30-inch upright drill press and a small sensitive drill.

Three pipe-threading machines are needed to take pipe sizes ¼ inch to 2 inches, 1½ inches to 4 inches and 4 inches to 12 inches. Some mills get along by cutting threads on pipe larger than 6 inches in a lathe.

A bolt machine to take up to 2 inches is a paying investment in mills where changes and extensions are frequent.

A universal milling machine is one of the most valuable tools in the shop. This tool should be of fairly large capacity so that it can be used for such work as cutting gears up to 24-inch diameter and 1-inch circumferential pitch.

At least four small lathes are required for miscellaneous work in a large mill. These tools should be especially selected so as to cover as wide a variatino as practicable.

In addition to these a specially equipped precision lathe of say 14-inch swing is needed for the tool room.

In a fully equipped shop a vertical key-slotter of about 26-inch stroke should be installed for keyseating large pulleys, conveyor sprockets, gears and shaft couplings.

A 250-ton crank pin press is another necessity. This machine is especially useful for motor and pump couplings and on gears and pulleys for paper machine drives where good fits must be made.

Such small tools as a shaft centering machine, emery grinder, grindstone, twist drill grinder, power hack saw, and pneumatic hammers and drills and portable electric grinder and buffer should of course be included in even a small shop.

Special tools necessary for the paper mill include a suitable size roll grinder for grinding calender rolls and press rolls, slitter grinder, knife grinder, plug lathe, core machine and a gear cutter for bevel mortise gears.

The pulp mill requires equipment for sharpening circular saws up to at least 66-inch diameter, and a grinder for chipper and barker knives. A hobber for cutting grinder burrs is also advisable. Most mills have a special lathe (usually home made) for hanging and truing grinder stones.

The blacksmithshop equipment should include forges, and preferably a power hammer, power punch and shears, cold saw and apparatus for heat treatment and tempering steel.

An oxy-acetylene welding outfit is nowadays considered a prime requisite in the pulp and paper mill repair department and a small portable electric welding outfit will soon pay for itself.

Most mills make a large proportion of the patterns for castings that are required. A rip saw, cutting off saw, buzz planer and wood turning lathe are the minimum requirements. Several of the large mills that have been built have practically been forced into building houses for their employees and in such cases regular planing mill equipment is needed for making complete house trim. This equipment is very useful also for doing such work as tanks and chests for the mills.

Built-in motor drives are greatly to be preferred on all tools in which heavy parts have to be handled in order that the tools may be conveniently located and so that they can be served by an overhead travelling crane or trolley. Many of the smaller tools can also, with manifest advantages, be equipped with separate motors.

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VOL. VI September 1923 No. 9

Saguenay Branch Established

With the inauguration on August tenth, at Kenogami, of the Saguenay Branch of *The Institute*, another member was added to the ever increasingly important group of engineering societies known as the branches of *The Institute*, and another area of influence, activity and consequent responsibility added to the engineering profession.

While it is already well established that in power plant development the engineer is supreme, whether it means reporting on the feasibility of the project, designing the works to be built, and later supervising their construction, and deciding on the installation and equipment, the engineer has not been given credit for the part he has played and is playing in the large industrial enterprises of the Dominion. The establishment of the new branch in the Saguenay reveals the fact that in the pulp and paper industry, and this applies not only to that district but to the whole of Canada, members of the engineering profession are occupying positions of greatest importance, and more and more are the financial men recognizing the value of the engineer, not alone in designing, erecting and installing and equipping their plants, but also in the maintenance, production and actual management. Gradually it is becoming recognized that such industries are absolutely dependent upon men with engineering knowledge and experience, and the more fully this fact is appreciated the greater will be the benefit to the industry.

Programme Maritime General Professional Meeting

(Subject to revision)

St. John, N.B. September 26th, 27th and 28th, 1923.

First Session

Wednesday, September 26th.

10.00 a.m. Registration.

10.30 a.m. Addresses of Welcome by Lieutenant-Governor of New Brunswick and Mayor of St. John.
Business.
Papers.
"Locomotive Tonnage Rating," by W. U. Appleton, Moncton, N.B., General Superintendent, Atlantic Region, Canadian National Railways.
Discussion.
"Metallurgical Reheating Furnaces for Blooms, Billets and Slabs," by A. P. Theuerkauf, M.E.I.C., Sydney, N.S., Assistant Chief Engineer, Dominion Iron and Steel Company.
Discussion.

1.00 p.m. Luncheon. Paradise Grill, 87 Charlotte St. Guests of the St. John Branch.

2.30 p.m. Paper.
"Hydro-Electric Development," by F. T. Kaelin, M.E.I.C., Montreal, Que., Chief Engineer, Shawinigan Water and Power Company.

4.00 p.m. Auto Drive or Golf.

7.00 p.m. Dinner. Riverside Golf and Country Club.

Second Session

Thursday, September 27th.

10.00 a.m. Paper.
"St. John Dry Dock," by E. G. Cameron, A.M.E.I.C., Chief Engineer, St. John Dry Dock and Shipbuilding Company.
Discussion.

11.15 a.m. Adjourn to Courtenay Bay for Inspection of Dry Dock.

1.30 p.m. Luncheon at Courtenay Bay. Guests of St. John Dry Dock and Shipbuilding Company.

3.00 p.m. Boat trip on St. John Harbour.

8.00 p.m. Paper.
"The Fuel Problem of Canada," by F. A. Combe, M.E.I.C., Montreal, Consulting Combustion and Steam Engineer.
Discussion.

Third Session

Friday, September 28th.

10.00 a.m. Papers.

"A Lump of Coal," by K. L. Dawson, A.M.E.I.C., Halifax, N.S., Assistant Engineer, Gas Department, Nova Scotia Tramways and Power Company.

Discussion.

"Baltimore Harbour Improvement," by Bancroft Hill, Harbour Engineer, Baltimore.

Discussion.

The Engineer in the Pulp and Paper Industry

The manufacture of pulp and paper is essentially the domain of the engineer and in Canada it is only natural that this most important industry is in the main directed by men of technical engineering training. This industry might rightly be termed a "pioneer industry". It must ever move to the outshirts of developed territory which by virtue of its primative state provides the most desirable source of supply of the fundamental raw material, pulpwood, and what body of men have borne the burden of development in this country as the engineer.

From the initial stages of promotion it falls to the engineer to carry on investigations and reconnaissance work of the forest resources, the means of transporting the pulp logs, the mill site with the many important details of water supply, power supply, transportation facilities for raw materials and finished product, labour conditions both for construction and operation, housing facilities — these all devolve on the engineer.

With the decision to develop comes the more detailed investigations, the design of structures, the layout of the plant, the determination of property requirement, the proper provision for a supply of power whether it is to be developed by the company or purchased from some distributing power company, the construction of all necessary works, the installation of railway facilities, the choice and installation of the most suitable machinery and equipment and a thousand other details — all these — all rest with the man of engineering training. When it is considered that every branch of engineering, — civil (in all its sub-branches, such as construction, surveying, town planning, hydraulic, railroad, etc.), mechanical, electrical, forestry, chemical, and management engineering — enters into the development of a pulp and paper mill, is it any wonder that, when the mill is completed and operation commences, there are to be found engineers at the head of all departments, as active operating manager, and even on the board of directors. Such is the case to-day, — engineers are taking a greater and greater part in the control and management of our industries and in their hands lies to a very large extent the direction of the pulp and paper industry.

Recent Visitors to Headquarters

J. W. Haywood, A.M.E.I.C., New York, N.Y., C. R. Young, M.E.I.C., Toronto, Ont., D. O. Wing, A.M.E.I.C., Iberville, Que., N. M. Hall, M.E.I.C., Winnipeg, Man., J. N. Finlayson, M.E.I.C., Winnipeg, Man., J. J. Trail, A.M.E.I.C., Toronto, Ont., C. M. Barg, A.M.E.I.C., Three Rivers, Que., P. Manning, A.M.E.I.C., Peterborough, Ont.

OBITUARIES

W. A. Hendry, A.M.E.I.C.

William A. Hendry, A.M.E.I.C., chief engineer of the Nova Scotia Highways, and one of the best known engineers in the Maritime provinces, died at his home at Bedford, a suburb of Halifax, on June 29th, 1923. He had been in poor health and was confined to his residence for six weeks.

The late Mr. Hendry, was born at Halifax, on October 12th, 1859, and in his early twenties was assistant engineer on the construction of the Cape Breton railway from Port Hawkesbury to Sydney and later in the building of the bridge across Grand Narrows, Bras D'Or Lakes and the construction of Sydney and Louisburg railway for the Dominion Coal Company. He was later engaged in the electrification of Halifax Street Railway; building of Halifax and Southwestern railway; and surveys for Halifax and Eastern railway, now the Musquodobolt branch of the Canadian National Railways. After completion of the latter railway he was made its chief resident engineer. Two years ago he was appointed chief engineer of the provincial highways. Mr. Hendry was admitted as an Associate Member of *The Engineering Institute of Canada* on May 20th, 1892. Mr. Hendry is survived by two sons and four sisters. His wife predeceased him three years ago.

Lieut. Dennis Baker, B.Sc., A.M.E.I.C.

After being in ill health for some time, Lieut. Dennis Baker, B. Sc., McGill University '15, A.M.E.I.C., died at Ste. Agathe des Monts on July 12th, 1923, from pneumonia. The late Mr. Baker was born at Ockley, Surrey, England, on October 15th, 1893.

During his college term he spent one summer as rodman on construction with a survey party for the Canadian Pacific Railway, and another summer as draughtsman in the office of the Canadian Signal Company, Lachine. Immediately after graduation he enlisted receiving a commission as lieutenant in the Royal Engineers, being a section commander. He was wounded in October of that year, and in August 1917 became personal assistant to the assistant director of railways on the left bank of the Mesopotamia. A year later he was assistant engineer under the engineer in charge of Diala Bridge construction. On this bridge he was in charge of labour including five supervisors and eight hundred natives — concrete work and erection of girders. He also had charge of alignment and minor bridges for three mile railway diversion. Since returning to Canada in 1919, he had been in poor health.

Mr. Baker was elected to Associate Membership in *The Institute* on December 21st. 1920.

Robert Woolston Hunt, M.E.I.C.

It is with regret that word has been received of the death of Robert Woolston Hunt, M.E.I.C., at his home in Chicago, on July 11th, 1923, at the age of eighty-four.

The late Mr. Hunt was born in Fallsington, Bucks Co., Pa., on December 9th, 1838. He spent several years learning the practical side of iron making in the rolling mills of John Burnish and Company, Pottsville, Pa., and later took a course in analytical chemistry in the laboratory of Booth, Garrett and Blair. Upon the completion of this he entered the employ of the Cambria Iron

Company, of Johnstown, Pa., and for them on August first, 1860, he established the first laboratory in America as a direct part of an iron and steel organization. In the fall of 1861, he entered the United States military service and was in command of Camp Curtain at Harrisburg, Pa., with the rank of captain. Upon being mustered out of service, he returned to the employ of the Cambria Iron Company and was sent to the works at Wyandotte, Mich., where experiments with the new bessemer process of making steel were being conducted. He was placed in charge of the experimental works in July, 1865, and so continued until May, 1866, when the Cambria Iron Company called him back to Johnstown to take charge of its steel business. It was at the mill later, and largely under Mr. Hunt's direction, that the first commercial order for steel rails ever made in America was rolled.

Later, he assisted in designing and building the Bessemer works of the Cambria plant, in 1873 he moved to Troy, N.Y., to become superintendent of the Alband and Rensselaer Iron and Steel Company. During his years of active connection with steel-rail manufacture he almost completely rebuilt the various works of this company and he also patented many details of iron and steel metallurgical processes and machinery, including, in conjunction with others, the first automatic rail mill tables.

Upon leaving Troy in 1888, he removed to Chicago, and established the bureau of inspection, tests and consultation now known as the Robert W. Hunt Company.

Mr. Hunt was elected Member of *The Engineering Institute of Canada* on April 8th, 1911. He was a member of numerous other technical societies among which may be mentioned the American Institute of Mining and Metallurgical Engineers, (honorary member and twice president); American Society of Mechanical Engineers; (honorary member and past president); American Society of Civil Engineers; Western Society of Engineers, (honorary member and past president); the Institution of Mechanical Engineers; the Iron and Steel Institute of England; American Iron and Steel Institute; and the American Society of Testing Materials, (honorary member and past president).

In 1912 Mr. Hunt was awarded the John Fritz medal, (for his contribution to the early development of the bessemer process) and in June of this year he was given the Washington award of the Western Society of Engineers in recognition of his achievements. He was for many years a trustee fo the Rensselaer Polytechnic Institute and in 1916 received from it the honorary degree of Doctor of Engineering. He was married in 1866 to Miss Eleanor Clark, of Ecorse, Mich., who survives him.

Heroic Death of Engineer

E. H. Pacy, A.M.E.I.C., advises of the death of John Marven Fouse, his partner in the Pittsburgh Welding Corporation, while engaged in an unusual act of heroism. Mr. Fouse was drowned on July twentieth, off the Delaware coast, in an effort to save his brother who was in distress and called for help. The condition of the sea was such that boatmen declined to go to the assistance of the brother, and Mr. Fouse, who was on the beach, swam out and becoming exhausted, went down. At the time of his death he was vice-president and treasurer of the Pittsburgh Welding Corporation of Pittsburgh.

Mr. Fouse graduated from Lehigh University with the class of 1905, and at the time of his death, as well as holding the position mentioned, he was the American representative of the Dominion Bridge Company Limited.

PERSONALS

R. R. Bostwick, Jr.E.I.C., has been transferred by the Canadian National Railways from Toronto to Montreal.

C. O. Foss, A.M.E.I.C., of St. John, N.B., has resigned from the position of chief engineer, of the New Brunswick Electric Power Commission.

Hugh M. Black, S.E.I.C., of Montreal, has accepted a position with the Allis-Chalmers Manufacturing Company, Milwaukee, in their steam turbine department.

J. Hardy Devey, A.M.E.I.C., is with Charles H. Ellacott, M.E.I.C., on railway construction work at Doughton, N.C.

W. E. Bennett, S.E.I.C., is resident engineer on the Larder Lake extension of the Temiskaming and Northern Ontario Railway, at Dane, Ont.

H. D. Fyfe, A.M.E.I.C., of Vancouver, B.C., is engineer for the Iroquois Gas Corporation, Buffalo, N.Y. Mr. Fyfe, was of the class of 1911, School of Practical Science, University of Toronto.

L. J. Scott, S.E.I.C., is on the engineering staff of the Anglo-Newfoundland Development Company, Ltd., at Grand Falls, Newfoundland. Mr Scott graduated in applied science from McGill University, this year.

Stuart M. Connelly, S.E.I.C., until recently on the staff of the Welland Ship Canal, at Thorold,, Ont., has located in Vancouver, B.C., and is at present timber cruising for a firm of forestry engineers.

J. A. M. Penrose, Jr.E.I.C., of Winnipeg, Man., is engineer in charge of construction for the Wind River Lumber Company of Portland, Oregon, and is at present at Camp 8, Carson, Oregon.

Simcoe C. Scadding, S.E.I.C., is with the Bell Telephone Company of Canada, Limited, at Montreal, in the chief accountants office. Mr. Scadding, graduated in electrical engineering in 1922 from the University of Toronto.

R. I. Wynne-Roberts, S.E.I.C., has joined the sales staff of Bristol Company, New York. Mr Wynne-Roberts received his B.A.Sc. degree from the University of Toronto in 1922 and his M.A.Sc. in chemical engineering this spring.

P. E. McIlhargey, Jr.E.I.C., is assistant electrical engineer with the Canadian National Railways, central region, with headquarters at Toronto. Mr. McIlhargey received the degree of B.A.Sc. in mechanical engineering from the University of Toronto in 1917.

R. C. McLachlan, A.M.E.I.C., is engineer for Messrs. J. P. Porter, Standifer and Porter Brothers, of St. Catharines, Ont., contractors on the Welland Ship Canal, sections 1 and 2. Mr. McLachlan is a graduate of McGill University of the class of 1916.

J. B. Hayes, B.Sc., A.M.E.I.C., who has been for some time on the engineering staff of Stone and Webster, Boston, Mass., is now assistant manager of the Jamaica Public Service Company, Limited, with headquarters at Kingston, Jamaica, B.W.I.

Carlo Carniel, A.M.E.I.C., is now located in Frankneld, Jamaica, B.W.I., on railway work. While in Canada Mr. Carniel was connected with the Bedford Construction Company of St. John, as superintendent and later as manager.

Charles Leaver, A.M.E.I.C., has been transferred by the Imperial Oil Refineries, Limited, from Montreal, to superintendent at their Sarnia refinery. Mr. Leaver received the degree of B.A.Sc. in 1910 from the University of Toronto, and has been connected with the above company for the past eleven years in various capacities.

K. R. MacKinnon, A.M.E.I.C., was appointed in May of this year to the position of general superintendent of the Nebraska Power Company, Omaha, Neb. On returning from overseas in 1919 Mr. MacKinnon accepted a position in the efficiency department of the company and two years later was appointed chief operating engineer.

L. L. Jacobs, A.M.E.I.C., of Montreal, has deen transferred to Toronto by the Fess Oil Burners of Canada, Limited. Mr. Jacobs was formerly located at the Montreal office of this company and is now at the head office in Toronto, in charge of the entire operations of the company.

William S. Wilson, A.M.E.I.C., is manager of the Lands Department of the Lake Superior Corporation at Sault Ste. Marie. Mr. Wilson was located at the Soo with the Algoma Steel Corporation for some seven or eight years until the end of 1922, when he moved to Toronto in connection with some investigation work with Walter J. Francis & Co. Ltd.

A. E. Patterson, A.M.E.I.C., of Longueuil, Quebec, has been appointed town engineer of Greenfield Park, Quebec. Mr. Patterson, who is a graduate of McGill University of the class of 1915, has for the past four years been in charge of maintenance of way, structures and buildings, for the Montreal and Southern Counties Railway.

E. V. Deverall, A.M.E.I.C., is with the Canadian and General Finance Company, Limited, Toronto, on their engineering staff, on the design of power houses for Latin America and Spanish power companies. Mr. Deverall graduated from the University of Toronto with the class of '15 and has since been engaged in structural engineering with the Dominion Bridge Company, Limited, and Frank Barber and Associates, Limited.

D. E. McPherson, A.M.E.I.C., has accepted a position with Messrs. Blank and Veatch, consulting engineers of Kansas City, Mo. After graduating from the University of Manitoba in 1916, Mr. McPherson was appointed assistant engineer with the Winnipeg Aqueduct Construction Company and later spent several years with the Canadian National Railways, on maintenance work, etc., in the West.

P. C. Kirkpatrick, A.M.E.I.C., who has been located at Great Falls, on the Winnipeg river, on the construction of the new power development for the Manitoba Power Company, has been transferred to the Humber River project in Newfoundland, where he is engineer for Fraser, Brace and Company, Limited. Mr. Kirkpatrick, is a graduate of McGill University, in civil engineering, and has been connected with the above firm for some time on various works.

S. R. Turner, A.M.E.I.C., has accepted a position with Charles Walmsley and Company (Canada) Limited, Longueuil, Que. Mr. Turner has had considerable experience in structural steel work, both draughting and superintending, and was for a time mill engineer with the Riordon Company, Limited, at Hawkesbury, Ont., and later engineer with the Spanish River Pulp and Paper Company at Espanola, Ont. Subsequently he was engineer for the Wm. Hamilton Company of Peterborough, Ont.

Harry L. Dowling, A.M.E.I.C., has joined the engineering staff of the Canadian and General Finance Company, Limited, Toronto. Mr. Dowling is a graduate of the University of Toronto, receiving his B.A.Sc. degree in 1919 and was for a time connected with the Dominion Bridge Company, Limited, at their Toronto office as structural draughtsman and later accepted a position as structural engineer for Albert Kahn, architect, Detroit. He was for a time structural engineer with Frank Barber and Associates, Limited.

Charles Warnock, A.M.E.I.C., vice-president and general manager of the Robert W. Hunt and Company, Limited, has been elected president of the company, to succeed the late president, Robert W. Hunt, M.E.I.C., who died at his home in Chicago, on July 11th, 1923. Mr. Warnock received his engineering training and education in the United States, and first joined the Robert W. Hunt and Company, Limited, in 1903 as general inspector on steel buildings, bridges, etc., and in 1904 was appointed their Canadian manager.

A. C. Brown, M.E.I.C., has resigned as chief engineer for J. P. Porter, Standifer and Porter Brothers, St. Catharines, to accept the position of engineeer and manager for Sir William Arrol and Company, Limited, on their contract for the Hollinger Power Development, on the Abitibi river, in connection with which the preliminary work of erecting camps, railway sidings, etc., it is understood, has already commenced. Mr. Brown received his earlier training and education in England and after six years of experience in the design and construction of docks he came to Canada and was chief assistant engineer for the Halifax Ocean Terminals and was later appointed resident engineer in charge of dock construction. In 1919 he was appointed chief engineer for J. P. Porter and Company, contractors of Halifax, N.S. and in 1921 was appointed to the position from which he has just resigned.

B. Stuart McKenzie, M.E.I.C. moves to Montreal

B. Stuart McKenzie, M.E.I.C., has associated himself with the Dominion Engineering and Inspection Company, with headquarters at 320 Lagauchetiere Street West, Montreal. Mr. McKenzie has recently come from Winnipeg in which city he practised as consulting engineer for about eight years. Latterly he was field engineer for the Manitoba Power Company on their 168,000-h.p., hydro electric development at Great Falls on the Winnipeg river. Mr. McKenzie has had extensive experience in foundations and underpinning of buildings, hydro-electric work, structural steel work, inspection and testing of construction materials, etc. He was a member of the Council of *The Engineering Institute of Canada* in 1920 and was first chairman of the *Institute* committee investigating concrete deterioration in Alkali soils.

Becomes General Manager

George L. Guy, M.E.I.C., who has for years [illegible] secretary-treasurer of the Winnipeg Branch of *The Institute*, been one of the most energetic members in the west, has given up his private practice as consulting electrical engineer in Winnipeg, to assume the general managership of the Tudhope-Anderson Company, Limited, Orillia, Ontario, following a report made by Mr. Guy on a reorganization of this company.

Besides carrying on a successful private practice, Mr. Guy was for a number of years chief engineer of the Manitoba Utilities Commission, holding office until the commission was dissolved. He was responsible for the entire valuation work on the Winnipeg Electrical Company, and among other important assignments he was consulting engineer to a number of milling and elevator companies.

Mr. Guy is one of the most popular members of the profession, of well known ability, and judged by the splendid record he has made in the past, his success in his new position of responsibility seems amply assured.

W. Gordon Mitchell, M.Sc., M.E.I.C., Chairman Saguenay Branch

At the initial meeting of the Saguenay Branch, W. Gordon Mitchell, M.E.I.C., was elected chairman. Mr. Mitchell was born in Port Hope, Ontario, in 1888, and is a graduate of McGill University, having received his degrees of B.Sc., in 1913, and M.Sc., the following year. During the summers of his university course he was on railway and highway construction work and following his graduation in 1913 he was on technical investigations for the Mount Royal Tunnel and Terminal Company. From 1914 to 1916 he was in charge of the division of wood preservation for the Forest Products Laboratories, Montreal. For the next three years he was mining engineer with R. Martens and Company, Ltd., of London, England, engaged in the investigation of timber and mining industries in Scandinavia, Finland, European Russia, Serbia and Manchuria. For six months in the latter part of 1919 he was on independent engineering work in Canada and the United States, following which he was appointed by the Canadian Export Paper Company, Montreal, to investigate technical and economic conditions of the pulp and paper industry in Norway, Sweden, Finland, Russia, Poland and Germany. In March 1921, he became associated with Price Brothers and Company, Limited, and in January 1922, took charge of the operation of the company's pulp and paper mills as assistant to the president.

Hemming Falls Contract Let

J. B. Woodyatt, A.M.E.I.C., general manager of the Southern Canada Power Company, Limited, has had his engineering staff for some months working on plans for the development of one of the company's power sites located at Hemmings Falls, near Drummondville, on the St. Francis river, Quebec. The design and construction of this development has been in charge of J. S. H. Wurtele, M.E.I.C., plant manager of the Southern Canada Power Company. The purchase of machinery and equipment will be made through the purchasing department of the Southern Canada Power Company, Limited.

It is proposed to develop 30,000 h.p., which will be second of a chain of six power developments under this company on the St. Francis river. With the increasing demand for electric energy it is anticipated that the total capacity of the plant will be disposed of by the time the plant is in operation, following which an additional power site will be put to use.

The contract was awarded to the Foundation Company of Canada, of which R. E. Chadwick, M.E.I.C., is general manager, L. C. Jacobs, M.E.I.C., general superintendent in charge of engineering work, W. H. Hunter, A.M.E.I.C., resident engineer, W. Griesbach, A.M.E.I.C., office engineer, and F. G. Rutley, A.M.E.I.C., engineer.

Institute Members form Partnership

Norman D. Wilson, C.E. (Tor.), A.M.E.I.C., and Arthur E. K. Bunnell, A.M.E.I.C., have entered partnership under the name of Wilson and Bunnell, for the practice of surveying, city planning and allied subjects, with offices at 57 Queen Street, West, Toronto.

In 1903 Mr. Wilson received his diploma (with honours) in civil engineering from the School of Practical Science, Toronto, and the following year obtained his degree of B.A.Sc., again with honours. His experience in railway and municipal engineering, surveying and land development work covers a period of nineteen years, while for the past eleven years he has been engineer of surveys and lands for the Toronto Harbour Commissioners. In addition to this Mr. Wilson was in private land surveying practice in Toronto and Niagara Falls, Ont., for three years prior to 1912. He is a Dominion and Ontario Land Surveyor, and a member of the Town Planning Institute of Canada.

Mr. Bunnell is also a graduate of the School of Practical Science, Toronto, receiving his diploma with honours in 1906, and the following year his B.A.Sc. degree. His experience in the sixteen years since graduating has been in general municipal, transportation, and city planning engineering, including work as assistant engineer in charge of sewer and sidewalk construction, at Brantford, Ont.; resident engineer on sewage and waterworks plant at Weyburn, Sask.; assistant on railway and bridge work in Toronto, and assistant engineer with the Grand Trunk Railway. He is at present town planning consultant to the city of Brantford and managing engineer for the Toronto Civic Guild. He is also a member of the Town Planning Institute of Canada.

C. N. Shanly, A.M.E.I.C., Vice-Chairman Saguenay Branch

C. N. Shanly, A.M.E.I.C., who was elected vice-chairman of the newly established Saguenay Branch, has been a member of *The Institute* since 1909, when he was admitted as a Student while attending McGill University. Mr. Shanly was born in Montreal in 1889 and has been engaged in engineering work continuously since 1904, at which date he commenced as chainman on a railway survey. During the next four years he was engaged in survey work and draughting with the Dominion Bridge Company, St. Lawrence and Lake Champlain Canal Survey, and the Prince Edward Island Railway. In 1909 he was in charge of a plane-table party for the Canadian Pacific Railway Company, irrigation department, and the following year was given charge of a party on railway location for the Kananaski Coal Company. For the next two years he was located in the city engineer's office at Vancouver, B.C., and from 1913 until he enlisted for overseas, the following year, he was with the Canadian Northern Railway on concrete design. While overseas he was commissioned with the Royal Engineers and in 1918 was commanding a railway survey and reconnaissance section of the Royal Engineers in Salonika. On returning to Canada he was appointed, in 1919, principal of the vocational classes, Montreal Retraining Centre, Department of Soldiers' Civil Re-establishment. Mr. Shanly joined the staff of Price Brothers and Company, Limited, first as assistant resident engineer at Kenogami paper mills; next, as resident engineer on the construction of their 16,000-h.p. hydro-electric development at Chute aux Galets on the Shipshaw river, then in charge of the surveys and investigations for their proposed new townsite at Saguenay, P.Q., and finally in charge of the construction of the Chicoutimi hydro-electric power development, which is described in another part of this issue.

Henri Burroughs Pelletier, B.Sc., S.E.I.C., Secretary-Treasurer Saguenay Branch

Henri Burroughs Pelletier, B.Sc., S.E.I.C., was born at Montreal on February 15th, 1894, and graduated from McGill University with the degree of B.Sc., in 1918. Immediately after graduation he was commissioned a Lieutenant in the Canadian Engineers. In 1919 he was with the Dominion Bridge Company at Lachine in the draughting department, and in 1920 was employed as assistant on work connected with proposed hydraulic development of the Peribouca river. Since that time Mr. Pelletier's work has been centered about the pulp and paper and power development of the Lake St. John district, being confined to field work in the summer and office work in the winter time. This includes charge of work on proposed hydraulic development of Peribonka river, May 1920 to June 1921, entailing about one half time in office work at Chicoutimi and other half with party on sites and surroundings of the proposed dams

(Chute de la Savanne and Chute du Diable). June to September 1921: field and office work in connection with various subjects pertaining to power houses Nos. 1 and 2 on Ha! Ha! river, above Grande Baie. September 1921 to June 1922: delimitation of timber limits on lower part of Rivière à Mars in the fall; and upper sources of the same river in winter. Office work in connection with same, done in spring. June to August 1922: working in conjunction with J. E. A. McConville, A.M.E.I.C., on classification of lands in connection with lake Kenogami reservoir project. August 1922 to date: permanently attached to staff of Chicoutimi mills; and winter occupied at mills on maintenance, improvements, etc. Since June provisionally relieved from mill duties and given charge of keeping posted on the progress of the Kenogami dams construction in the interests of the company. Also to take responsible charge of various small constructions (not in connection with lake Kenogami reservoir) at Pont Arnaud and Port Alfred.

Hon. J. L. Coté, A.M.E.I.C., appointed Senator.

Hon. J. L. COTÉ, A.M.E.I.C.

The Hon. J. L. Côté, A.M.E.I.C., has been appointed to the vacancy in the Senate created by the death of Senator Amédée Emmanuel Forget. The Honorable Mr. Côté was born at Les Eboulements, on the north shore of the St. Lawrence river some sixty-one miles below the city of Quebec. He was fifty-six years of age on May twenty-sixth last. Following his early education, he attended the Commercial Academy at Montmagny and later graduated from Ottawa University in 1890. He choose land surveying, civil and mining engineering as his profession. The years 1893 to 1895, Mr. Côté spent in Alaska on photo-topographical survey of the eastern part of the International boundary. After a short time spent in the east, he returned to Manitoba and subsequently to the Yukon where he spent a year on survey work. In 1903 he opened an office as land surveyor and engineer in Edmonton being connected with the Jasper Park Collieries. In 1909 Mr. Côté was elected member of parliament for the district of Athabasca and in 1913, 1917, and 1921 was elected for Grouard after the district had been subdivided. On September 25th, 1918, he was appointed provincial secretary of Alberta.

ELECTIONS AND TRANSFERS

At the meeting of Council held on August 27th, 1923, the following elections and transfers were effected:—

Members

CLARKE, Wilfred Ernest, vice-president and general manager, Sydney Foundry and Machine Works, Limited, Sydney, N.S.

DOWNING-COOK, Walter Scott, chief engineer, Downing-Cook and Company, Montreal, Que.

PAWSON, Herbert Edwin, manager, gas and electricity dept., City of Sherbrooke, Que.

Associate Members

BOWMAN, Charles Arthur, editor, *The Citizen*, Ottawa, Ont.

CAMPBELL, Robert Anderson, E.E. (Univ. of Tor.), supt. of the hydro-electric power station, Great Lakes Power Company, Sault Ste. Marie, Ont.

DINGWALL, Robert Macfarlane, (Assoc. Royal Tech. Coll., Scotland), supervisor of industrial mech. engrg. and correspondence dept. in power plant engrg., Provincial Institute of Technology and Art, Calgary, Alta.

HUSSEY, Erwin Howard, C.E., (Univ. of Maine), chief engineer of the Minnesota and Ontario Paper Company and all allied interests at International Falls, Minn.

MILLS, Geoffrey Gordon, B.A.Sc. (Univ. of Tor.), manager, The Under Feed Stoker Co. of Canada, Limited, and general manager, A. W. Cash Co. of Canada, Limited, Toronto, Ont.

ROBINSON, Christopher M., in charge constrn. Port Hope — Peterborough Provincial Highway, Provincial Highways Dept., Peterborough, Ont.

SMITH, Walter A., drawing office, Dominion Coal Company, Limited, Glace Bay, N.S.

Junior

WRIGHT, Weir Stanley, B.Sc., (McGill Univ.), in charge water filtration plant for town of Iroquois Falls, operated by Abitibi Power and Paper Company.

Transferred from the class of Associate Member to that of Member

DOANE, Harvey William Lawrence, B.Sc. (C.E.), (N.S. Tech. Coll.), city engineer's dept., Halifax, N.S.

Transferred from the class of Junior to that of Associate Member

COKE, Reginald Norman, B.Sc., (McGill Univ.), asst. elec. engr., Winnipeg Electric Railway, Winnipeg, Man.

HUGLI, Edwin Ezra Herman, B.A.Sc., (Univ. of Tor.), structural engr., H.E.P.C. of Ontario, Toronto, Ont.

McDONALD, William Sutherland, B.Sc., (Univ. of Alta.), junior hydrometric engr., Dept. of the Interior, Calgary, Alta.

O'CONNOR, Garrett Daunt, B.Sc., (Queen's Univ.), asst. to city manager and engineer, Niagara Falls, Ont.

TITUS, Olcott W., B.A.Sc., (Univ. of Tor.), elec. cable sales engr., Standard Underground Cable Company of Canada, Limited, Hamilton, Ont.

WILSON, John S., B.A.Sc., (Univ. of Tor.), engineer in charge of design and constrn. of boiler plant and new main pumping station, also in operating charge of boiler plant, Dryden Paper Co., Dryden, Ont.

Transferred from the class of Student to that of Junior

DEPOCAS, Jean Charles, B.A.Sc., (Ecole Polytech.), Quebec Development Company, St. Joseph d'Alma, Que.

The following students were admitted:—

MIDDLETON, William Edgar Knowles, asst. bookkeeper, highway engineer's office, Department of Highways, Regina, Sask.

MUNROE, Kenneth A., Provincial Highways Board, Heatherton, N. S.

EMPLOYMENT BUREAU

Situations Wanted

Civil Engineer

Civil engineer, A.M.E.I.C., desires new connection with an industrial corporation, engineering firm, or on staff of a city engineer. Seven years experience railway, highway and pavement construction, office practice, and surveying. Apply Box No. 113-W.

Civil Engineer

Wanted by civil engineer of eighteen years general railway experience, partnership in well established active engineering firm in British Columbia. Would consider taking an interest in an engineering agency or manufacturing business with good prospects for expansion. Apply Box No. 115-W.

Chemical Engineer

Chemical engineer, M.A.Sc. Age 25. Well grounded in all branches of chemistry; experienced in research, metallurgy, pulp and paper; has special knowledge of alkali deposits of Western Canada and their utilization; desires position with a future. Location immaterial. Apply Box No. 114-W.

Steel Rolling Mill Manager

Steel rolling mill manager, disengaged, seeks appointment. Thoroughly experienced in all sizes and types of mills with practical working knowledge of gas producers. Soaking pits and gas continuous furnace methods of heating. Costs, waste and economy a speciality. Highest references. Write box 249, Sells Advertising Offices, Fleet Street, London, England.

Civil Engineer

Civil engineer, A.M.E.I.C., 29 years of age, graduate, registered, desires position with firm of contractors or engineers. Location immaterial. Three years railroad construction, six years highway and municipal engineering and paving, and three years as engineer officer overseas. Prefer heavy construction. Employed. Good references. Apply Box 116-W.

Civil Engineer

Civil Engineer, married, graduate of a recognized school, desires a responsible position. Fifteen years experience on construction work in both field and office work. Would like to engage with contractor or consulting engineer. Apply Box 68-W.

Civil Engineer

Civil engineer, 1923 graduate, two seasons experience in surveying desires position preferably structural work. Strong constitution and in first class physical condition. Salary not a governing feature provided there is an opportunity for advancement. Available after October first. Apply Box No. 117-W.

Mechanical Draughtsman

Mechanical draughtsman, S.E.I.C., seven years experience desires position in any locality where there is promise of advancement. Apply Box No. 119-W.

Pulp and Paper Mill Engineer

Engineer desires change. Experienced on the design, layout and construction of pulp and paper mills. At present employed in charge of maintenance and power in paper mill. Apply Box No. 118-W.

Situations Vacant

Transitmen

Two (2) transitmen wanted for stadia work and topography. Apply to Singer Manufacturing Company, Duhamel, P.O. Quebec.

Electrical Engineer

Electrical engineer, recent graduate required by a large electrical manufacturing concern for work on factory methods and manufacturing problems. Please state in first instance, education, full qualifications, references, salary required, age, and when available. Apply Box No. 50-V.

Woods Dept. Assistant

A large pulp and paper company in Quebec, wishes to secure an assistant on forestry work. Must be English speaking of good training and capable of going into the bush to take charge if necessary of the work, including logging, dams, etc. Salary $150. and expenses outside of Montreal. Apply Box No. 50-V.

Rodman on Railway Construction

A rodman on railway construction on or about September fifth. Should have a little experience on railway work. Preferably a man able to run a level. Apply Box No. 51-V.

Concrete Inspectors

One or two concrete inspectors required for highway construction work. Apply Box No. 52-V.

BRANCH NEWS

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

The annual picnic was held at Queen Victoria Park, Niagara Falls, Ont., on July 18th. The members and their guests to the number of seventy-five gathered at the Refectory. A keenly contested tennis tournament was run off. The winner of the singles was Forbes Brown, the runner up, F. W. Clark, A.M.E.I.C. The finals of the doubles are still to be played. During the afternoon a large party took advantage of the bathing at Dufferin Island and at Chippewa. Dinner was held at the Refectory and was followed by a very successful sing song.

The event of the day was the soft ball game between Niagara Falls and St. Catharines. The teams were evenly matched. It is strongly rumored that both were guilty of introducing professionals, and threats and counter threats of protests have been made. Among those suspected are "Sandy" Grant, center field for St. Kits, who starred with three catches and a home run. Acres and Lazier made the initial sack the awkward corner. Wagner was the slab artist for the Falls and McCullough for St. Kits. Frost as umpire required all the majesty that goes with the office of chairman but escaped without bodily injury. The game was called at the end of the fifth innings on account of darkness. The score of 9 to 9 reflects credit on the skill of the umpire.

The evening wound up with dancing in the Refectory. The thanks of the branch are due Messrs. Bond and Clark for their able efforts in making all arrangements, to Messrs. Blanchard and Grant for donations and to the park staff for their co-operation.

The fall outing will be a trip to Port Colborne to visit the local industries. It is hoped to arrange for a trip through the plants of the International Nickle Company, the Canadian Furnace Company, the Maple Leaf Milling Company, and the Dominion Government elevator.

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

The new executive of the Hamilton Branch of *The Engineering Institute of Canada* held its first meeting in the office of the chairman, J. W. Tyrrell, M.E.I.C., on July 17th, 1923.

At this meeting the following committees were chosen:—

Fuel: E. R. Gray, A.M.E.I.C., Chairman, F. W. Paulin, M.E.I.C., F. P. Adams, A.M.E.I.C., (Brantford), C. J. Nicholson, A.M.E.I.C., W. L. McFaul, A.M.E.I.C., and W. G. Milne, A.M.E.I.C.

Membership: W. G. Milne, A.M.E.I.C., Chairman, H. B. Stuart, A.M.E.I.C., H. G. Bertram, M.E.I.C., (Dundas), A. M. Jackson, A.M.E.I.C., (Brantford), G. M. Bayne, A.M.E.I.C., F. H. Midgeley, A.M.E.I.C., (Galt), Guy R. Marston, A.M.E.I.C., (Simcoe), F. P. Adams, A.M.E.I.C., (Brantford), D. T. Black, A.M.E.I.C., (Galt).

Credentials: E. H. Darling, M.E.I.C., Chairman, H. B. Dwight, A.M.E.I.C., W. B. Ford, A.M.E.I.C., J. J. Mackay, M.E.I.C., and J. A. McFarlane. M.E.I.C.

Papers: E. H. Darling, M.E.I.C., Chairman, E. R. Gray, A.M.E.I.C., L. W. Gill, M.E.I.C., J. G. Campbell, A.M.E.I.C., J. R. Dunbar, Jr.E.I.C., and Hugh Lumsden, M.E.I.C.

Entertainment: C. H. Marrs, M.E.I.C., Chairman, J. J. Mackay, M.E.I.C., P. M. Smith, M.E.I.C., F. I. Ker, A.M.E.I.C., O. W. Titus, r.E.I.C., and A. H. Munson, A.M.E.I.C.

Hardwood Distillation in Canada

"Hardwood distillation may be looked upon as a minor key industry, because a number of the products cannot be produced by other means and are of an essential nature." Of this number, methyl hydrate (wood alcohol) is the most important, being obtainable only through distillation of wood. Acetic acid and acetone, also, are largely produced through this means. The importance of the industry has led the Forestry Branch of the Department of the Interior to issue an illustrated pamphlet treating of this subject. The pamphlet was written by Dr. John S. Bates, formerly superintendent of the Forest Products Laboratories of Canada, who has made extensive studies in this subject. It is known as Forestry Branch Bulletin No. 74, "Hardwood Distillation in Canada". A bibliography of the subject is also included in the bulletin.

Second Power Exposition

Announcement has been made that the second national exposition of power and mechanical engineering will take place during the week of December third, 1923, at the Grand Central Palace, New York City.

Accident Prevention in the Pulp and Paper Industry of Ontario

A. P. Costigane, Secretary, Ontario Pulp and Paper Makers' Safety Association, Toronto

Organized accident prevention came into operation some six years ago simultaneously with the passing by the Provincial House, of the Ontario Workmen's Compensation Act. This act might justly be referred to as one of the most progressive pieces of legislation ever enacted by a Canadian parliament, it represented the first real step taken to clear up at least some of the misunderstandings between employer and employees and marked the dawn of a better day in industry. The act may not be perfect as it stands to-day, but it is at least an honest effort to deal justly with both employer and employee in respect to accidents and the compensation thereof.

Previous to the passing of this act all claims for compensation for accident were made under common law and in serious cases the claims were usually opposed by insurance companies who had insured employers' risk. In the event of the insurance company being able to prove contributary negligence, little or no compensation was awarded the injured party. Besides being an expensive and uncertain method of procedure the ability to appeal on the part of the insurance companies who had funds at their disposal against the inability of the injured or his dependents to procure funds to cover legal expenses, resulted in many cases of injustice. Many just claims for compensation for accident, sometimes caused by unprotected machinery never received compensation of any kind on the ground that such hazards were accepted by the employee on entering the service of the company. On the other hand many cases of malingering received compensation through the agency of shyster lawyers whose importunities often forced a payment from employers who would rather pay a species of blackmail than go to court. The Ontario Workmen's Compensation Act has done away with all injustices of this nature, and as the government handles the business itself, insurance companies are eliminated. This article does not purport to deal with the Workmen's Compensation Act as a whole, but only with the clauses relative to accident prevention, suffice it to say, however, that under the provisions of this act no matter how, when, or where, an employee is injured while executing the duties of his employment, he is entitled to compensation

The Formation of the Association

The provision in the act whereby employers in any industry have the right to form themselves into an association, and appoint an expert to carry on an active accident prevention campaign, appealed strongly to, and was early taken advantage of, by the pulp and paper industry. Hence the incorporation under the act of the Ontario Pulp and Paper Makers' Safety Association, Toronto. This association is governed by a board of seven directors, all of whom are prominent in the industry. They hold office for one year and are eligible for re-election. The original board of director took a broad view of the situation and after exhaustive study of the experience of other countries, decided that something more than the guarding of machinery was required if the best results were to be obtained. A study of accident statistics showed that not more than 20 to 25 per cent of accidents were due to unguarded machinery, and the question arose as to how to deal with the other 75 or 80 per cent.

It was realized that while the employer could take care of accidents due to exposed gears, etc., little, or no progress could be made along other lines, without the whole-hearted co-operation of the men in the mill. An organization has now been in operation for about six years working educationally and has secured the co-operation of a large percentage of employees. The progress has justified the early conception of the directors and proves that the efforts of the association are along the right lines.

The Aim of an Educational Campaign

The question naturally presents itself, what is to be gained by an educational campaign in any industry? That query can be answered as follows:

(1) Reduction in the number of accidents.
(2) Reduction in lost time due to accident disability.
(3) Reduction in compensation costs.
(4) Reduction in labour turnover.
(5) Establishment of a mutual respect between employer and employee.

Statistics covering a period of years compiled in the United States, proves conclusively that accidents can be reduced by organized effort. The experience in the pulp and paper industry of Ontario bears this out. A chart classifying all accidents that have taken place in the pulp and paper mills in Ontario during the years 1920 to 1922 inclusive, shows a reduction of time lost per employee of 18.3 per cent, and that in spite of the abnormal expansion of the industry during the same period, entailing the employment and training of a large percentage of men unskilled in the industry.

Safety Methods employed by the Association

The methods adopted by the association must of necessity vary, as the men employed are not all of the same class. The grades run from technically trained men, to day labourers, and sometimes the latter are not even familiar with the English language.

Some of the principle methods used, are as follows:

(1) Securing executive co-operation.
(2) Formation of safety committees.
(3) Safeguarding physical hazards.
(4) Improving sanitary conditions.
(5) Issuing books containing safety instructions.
(6) Placing bulletin boards in each department, on which are posted regularly bulletins depicting the causes and results of accidents.
(7) Exhibiting at meetings of employees specially prepared safety films and giving short lectures on safety topics.
(8) Arranging matinees for school children to see safety films, and encouraging essay competitions for prizes among the children on what the pictures taught them.
(9) Designing and distributing safety calendars.
(10) Encouraging attendance at night schools.
(11) Visiting all mills and by personal contact arousing interest of the management and employees.
(12) Issuing monthly statistics showing the position of each mill in respect to accidents in comparison with other similar mills.
(13) Issuing letters commenting on accidents which might have been avoided.

Safeguarding Physical Hazards

To describe in detail all the methods enumerated above would detail too much space, so will mention briefly only the principal ones.

Safeguarding physical hazards, for instance, is important and this must be the first step taken after securing the co-operation of the management. There would be no use asking men to be careful if glaring cases of unguarded belts or gears were left to trap the unwary. Safeguarding of hazards must be done if for no other reason than to show sincerity on the part of the employer.

Safety Films

What has brought the best results so far has been the exhibiting of safety films to the employees. The usual procedure is to secure the use of a picture theatre in a mill town, issue tickets to employees a week in advance for the evening show, and inviting the school children to a matinee. Men on the night shift often attend the matinee with the children. Meetings such as these are always well attended and safety films such as "The House that Jack Built", "The Man he Might Have Been," "The Crime of Carelessness," etc., are followed intently. An interval is arranged for, during which a short talk on how to prevent accidents is given. After viewing pictures such as referred to, the audience is usually in a receptive frame of mind during the interval and listen carefully to anything said from the platform. These intervals are great opportunities for a speaker to push home the lessons depicted on the screen.

Safety Committees

The formation of safety committees has been largely responsible for the spread of the safety idea among the rank and file, and also for bringing the employees and employer together on a common platform. When representatives of the employees sit in committee with representatives of the management and discuss questions affecting the welfare of the employees, each learns the viewpoint of the other. The feeling of restraint passes away and questions are discussed freely and openly. Meetings such as these quickly bring each side to realize that the other fellow is not such a bad soul after all

Safety Calendars

The distribution of safety calendars at New Year's time, has been found to appeal strongly to both the men and the families, especially if the illustrations are of a practical nature and treated humourously. Calendars such as described are taken home and studied and create an interest in safety among the whole family. At the end of each month when a page is turned over, a new lesson in safety is exposed to the gaze of members of the family and so on from month to month.

Competitions

Two years ago an interesting competition was started among all the pulp and paper mills in Ontario, for the lowest accident record in any one year. For the purposes of the competition, the mills were divided into two classes. Class *A* including all mills employing 200 people and up, class *B* all mills employing under 200 people. A silver mounted shield and a silk Canadian flag were the trophies in each class. The competition is now in the third year and each year shows a keener interest on the part of the employees and a great desire in each of the mills to secure the shield. The presentation of the shield and flag to the winners, is made a great occasion in which the management take an active part. As a rule the shield is presented to a popularly elected representative of the men who receives it on their behalf. Winners of the trophies are unanimous in declaring that the competition has had a wonderful influence in the mills in fostering the sporting instincts whereby the individual is submerged and team-work predominates. The wonderful success of accident prevention in the pulp and paper industry in Ontario is due largely to the whole-hearted backing the movement has secured from the companies. There is not now a mill in operation in which accident prevention does not receive the consideration it so richly deserves.

OTHER SOCIETIES NEWS

The Association of Professional Engineers of Ontario

At the quarterly meeting of the Council of the Association of Professional Engineers of Ontario held on July 28th, it was decided to publish a year book or register, which is now in course of preparation. It is not probable that it will be ready for distribution until after the next meeting of Council, which will be held on October 13th.

At the July meeting two hundred and twenty-five additional registrations for membership were approved. The total registration to date is as follows:

	Registrations Approved at July Meeting	*Total Registrations to date*
Civil Branch	160	604
Mechanical Branch	27	89
Chemical Branch	1	20
Electrical Branch	26	145
Mining Branch	11	98
Total	225	956

There are about 148 applications in the hand of the secretary which have not as yet been dealt with.

There can now be no doubt that the total registrations will exceed one thousand before the end of the year 1923.

A Board of Examiners was appointed at the meeting of Council held on February 27th, and at the last quarterly meeting, the executive was authorized to confer with the Board of Examiners and to draft the necessary rules and regulations to comply with the act. So far, no candidates have been requested to submit to an examination.

At the October meeting of Council a nominating committee of ten members is to be appointed to make nominations for president, vice-president and ten councillors, also to appoint auditors to prepare financial statement for the year ending October 31st, which is to be returned to the secretary-treasurer on or before November 15th. The report of auditors, balance sheet and ballot for officers are to be mailed to members on or before Dec. 1st, and we expect to be in a position to mail the year book or register on or before the above date.

Certificates of membership have been sent to the majority of those registered and individual seals are being sent out as requested.

Trade Publication

C. A. Dunham Company, Limited, Toronto, Ont., have issued bulletin number 113, describing Type No. 80 Bucket Trap for high pressure service, which embodies a new and distinctive feature in quick closing action. The bulletin describes this bucket trap which operates on the same principle as other bucket traps but the destructive effect of steam wire-drawing the seat is reduced to a minimum by the quick closing accomplished through the shape of the bucket.

A copy of this bulletin will be sent to any reader of *The Journal* on request.

The Second British Empire Forestry Conference

Canada is honoured by being selected as the meeting place of the second Empire Forestry Conference. No effort is being spared to justify this selection, and it may be anticipated that the numerous delegates will return to their respective countries with a clearer conception than they have previously had of Canadian conditions, the advantages of Canada as a source of raw forest products, and of the state of her development in the manufacture of wood material into many different forms.

It is the aim of the conference to find the ways and means of making the Empire self-sustaining in its timber supply. This involves careful stock-taking of forest resources, the pooling of information in regard thereto, and the establishment of facilities for increasing Empire trade generally in forest products. In many cases possibilities have been neglected purely through the lack of information that has prevailed regarding supplies and facilities.

The official meetings of the conference took place in Ottawa, on July 25th, 1923, and was attended by delegates from all parts of the British Empire. The various provinces of Canada, were represented by the following delegates: — Dominion: E. H. Finlayson, A.M.E.I.C., B.Sc.F., Acting Director of Forestry and D. Roy Cameron, A.M.E.I.C., B.Sc.F., Dominion Forest Service; British Columbia: P. Z. Caverhill, B.S.F., Chief Forester, Provincial Forest Service; New Brunswick: G. H. Prince, B.S.F., Chief Forester, Provincial Forest Service; Nova Scotia: J. A. Knight, Commissioner of Forests and Game; Ontario: E. J. Zavitz, M.S.F., Provincial Forester; Quebec: G. C. Piché, A.M.E.I.C., Chief of Forest Service.

In his address as chairman of the conference, Major-General Lord Lovat, K.T., K.C.M.G., D.S.O., dealt with certain general principles as well as certain regulations which might govern the conduct of the conferences. These were referred to under six headings: — (1) Notice of conference, under which it was suggested that one year's notice should be given of the calling of a conference; (2) Colonial Office representation; (3) Interval between conferences; (4) Organization for the preservation of continuity; (5) Composition of future conferences; and (6) Survey of timber resources. In the course of his remarks Lord Lovat, spoke of the work that was being done in other countries, and in this connection gave the following examples at random:—

"While the state forests of Europe naturally have exact information not only of the capital value but also of the annual growth in their woods, even some of the new and debt-burdened countries of the Baltic provinces have already achieved a very creditable survey of their forest resources, rightly believing them to be the main wealth-producing factor of their country and that the more they know of them the more likely they are to be preserved.

"In Great Britain until three years ago the only information on the subject of our forests was given on the ordnance sheet. By 1925, when our forest policy will be revised in preparation for the second decennial period, a complete survey not only of the capital value but also of the annual increment and the annual loss will be forthcoming. In New Brunswick a survey has been undertaken of the forest resources of some sixty per cent of the state-owned area of that province. By means of sample plots selected under varying forest conditions it should be possible in the future to determine the average annual increment of typical forest land. India, which has had a forest service for over eighty years, is continually adding to the area which she puts under complete forest survey in her working plans. In the United States of America a bill has been presented for the expenditure of $3,000,000 of a complete survey of the forest resources of that great country.

"These examples go to show that surveys are being undertaken. That they are costly is undoubted, but that they must be faced if a forest policy is to be broad, based on the knowledge and will of the people, is equally certain.

"One word in conclusion on this subject. While a permanent forest policy cannot be laid down with certainty until the resources of the forest area are calculated, the absence of such a forest survey does not necessarily mean the abstention from silvicultural activities or the creation of an ad interim forest policy."

The programme of the conference provided for a tour from coast to coast during which the delegates had an opportunity to observe forest conditions and inspect forest industries in all parts of the Dominion.

The general itinerary of the conference was as follows:—

July 25th — Official opening, Ottawa, Ont.
July 26th — August 4th. Tour Quebec and New Brunswick.
August 8th — Visit to Petawawa Forest Experiment Station.
August 9th-11th — Business meetings, Ottawa, Ont.
August 12th-14th — Tour, Southern Ontario.
August 15th-30th — Tour in Northern Ontario, Manitoba, Saskatchewan, Alberta, and the interior of British Columbia.
August 31st-Sept. 6th — Tour to British Columbia Coast and island points.
September 7th — Conclusion of the conference at Victoria, B.C

CORRESPONDENCE

Editor, *Journal*, Toronto, July 24th, 1923.
Dear Sir:—

Recently I came across the following few lines of appreciation of the devotion of the engineering profession, and as I have never seen them in print it has occurred to me that they may never have come before your attention, so am sending them on.

The Engineer

When there's a thankless task to do
Just get an engineer.
Of small details a multitude
Just hire an engineer.
Twice in each minute passing by
As traffic's rush we take on high
A task to make an image cry
Go get an engineer.
When things get mussed or go astry
Bring in that engineer.
When magnates fuss at some delay
Go call that engineer.
From early morn till late at night
When works go wrong and won't come right
There's nought to do but just sit tight
And get an engineer.

It is not often that I have the time to pay attention to such mush but it seems to just about fit present day practice.

Yours very truly,
GEO. H. FERGUSON, M.E.I.C.

Publications

A Treatise on "Principles and Practice of Dock Engineering" (Third Edition)

By Brysson Cunningham D.Sc., B.E., M.E.I., F.R.S.E.

Reviewed by T. W. Harvie, M.E.I.C., Chief Engineer, Harbour Commissioners of Montreal.

Dr. Cunningham's books have long be regarded as standards by dock and harbour engineers, and the latest edition (the third) of Dock Engineering has been so revised and enlarged as to make it perhaps the most complete and reliable work on the subject.

Nothing seems to have been forgotten. The text expands from the definition of a dock to the design, construction and equipment of the most elaborate developments of dock engineering.

The illustrations, 600 in number, are excellent and there are no less than 49 folding plates, while the work abounds in tables of statistics of all the world ports, dimensions of vessels and kindred matters, while the usual technical reference tables are both very complete and reliable.

The work involved in preparing such a comprehensive treatise must have been enormous. Information has been collected from every corner of the earth, compiled and tabulated, arranged and indexed in such a manner that information on any specific subject can be directly turned to.

It is really impossible in a short review to give an adequate idea of the quantity and excellence of the information it contains, but it may safely be said that there is no harbour or dock engineer who will not find it a most valuable, if not necessary, volume for his reference library, and at the same time the treatise has been so carefully written and is so readable as to make it almost ideal as a university text book for the prospective harbour engineer during his curriculum.

Modern Pulp and Paper Making

By G. S. Witham, Sr.

Modern Pulp and Paper Making by G. S. Witham, Sr., Manager of Mills, Union Bag and Paper Corporation, Hudson Falls, New York, published by the Chemical Catalogue Company, Incorporated, New York. While this volume has been published for some little time its value as a practical treatise on pulp and paper mill practice warrants its being again brought to the attention of engineers and others interested in the industry. The author has given to the profession a thoroughly practical work embodying the results of his thirty-seven years of experience in the pulp and paper industry. The comprehensive manner in which the author has covered the subject may be readily seen from the following principal subjects treated: — Processes by which pulp is produced; Materials from which pulp is produced; Varieties of paper; The saw mill; The wood room; The sulphite mill; The acid plant; The soda process; The sulphate process; The ground wood mill; Bleaching; The beater room; The machine room; The finishing room; General design of pulp and paper plants; The power plant; Testing of paper and paper materials; Paper defects, their cause and cure; Personnel; Useful data and tables.

Forest Resources of Canada

Hitherto a good deal of inference, or even guess-work has been evident in the discussion of the subject, and even yet reliable information on the subject is not too plentiful. Considerable work has been done on the problem however. Reports based on comprehensive surveys have been published in regard to the forests of Nova Scotia and British Columbia, and an inventory of the Ontario forests is being completed by the Forestry Branch of the Department of the Interior. The Forestry Branch has also examined a very considerable area of the forest land in the Prairie Provinces and the forest service of Quebec and New Brunswick are collecting data as to the forest resources in their respective provinces, but the information available is still far from complete.

Based largely on these surveys, a tentative estimate of the remaining timber supplies of the Dominion has been given by the Department of the Interior, Ottawa, as follows:—

Region	Softwood	Hardwood	Total
	(Millions of feet board measure)		
Eastern provinces	310,000	90,000	400,000
Prairie provinces	140,000	85,000	225,000
British Columbia	360,000	1,800	361,800
	810,000	176,800	986,800

This estimate includes all classes of timber — saw-material, pulpwood, ties, poles, fuel, etc., whether accessible or inaccessible.

It is estimated that of this about 560,000,000,000 board feet is of saw-timber size.

Of the species which are used for the manufacture of pulp, there are estimated to be 800,000,000 cords of spruce, balsam, fir ,and western hemlock, and 490,000,000 cords of jack pine, lodge-pole pine, eastern hemlock, poplar, and cottonwood, a total of 1,300,000,000 cords. About 600,000,000 cords of this is in Eastern Canada. Included in the pulpwood estimate is 500,000,000 cords which is also saw-material and will doubtless be used to a very considerable extent as lumber.

Accessibility is a most important factor in considering forest resources. It is difficult however to estimate the extent to which these resources may become commercially valuable, since accessibility depends on changing conditions, such as transportation facilities, methods of exploitation, market standards, price of products, and cutting regulations. Under present conditions it is doubtful whether more than one-half of the saw-material and one-third of the pulpwood, exclusive of the Prairie Provinces, can be considered commercially accessible.

The average annual cut is now approximately as follows:—

	Million ft. B.M.
Lumber	4,000
Pulpwood (4,000,000 cords)	2,000
Fuel (8,000,000 cords)	4,000
Shingles, ties, poles, etc. (estimated)	1,000
Total	11,000

A superficial comparison of the above figures might lead to the conclusion that Canada still has sufficient timber to supply her requirements for an indefinite period, but such a conclusion is entirely unwarranted when all the facts are considered. It must be remembered that the estimates will doubtless be considerably reduced when more authentic information is secured, that a large proportion of the timber can probably never be operated at a profit, that under the present systems of exploitation a great deal of the timber is wasted, and that fire, insects, and fungi are destroying many times the amount of timber used.

Publication

New Building Estimators, Handbook; by William Arthur; published by the U.P.C. Book Company, Inc. The first edition of this handbook published in 1904 and containing one hundred and fifty pages, has been entirely revised, reset and enlarged in the 1922 edition. This is a hand-book of ready reference for architects, builders, appraisers, engineers, superintendents and draughtsmen, and in this present edition contains, approximately, one thousand pages. Much information of value will be found under the following principal headings: — Measurements of building work; the quantity system of measuring; speed and how affected by climate, hand versus machine labour; excavation and filling; piling and underpinning; concrete work; reinforced concrete; stone, gravel marble and terra cotta; brickwork; cement stone; structural iron and steel; tile and gypsum fireproofing; steel sash and steel buildings; plaster; carpenter and joiner work; millwork; glass; roofing; sheet metal work; hardware; painting; plumbing and gas fitting; heating; electric and conduit work; tiling; asbestos materials; dairy barns; silos and tanks; municipal work.

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J. A. Shaw

Preliminary Notice

of Applications for Admission and for Transfer

August 20th, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in September, 1923.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BEVAN—ALEXANDER BRAITHWAITE BEVAN, of Outremont, Que. Born at Philippopolis, South Bulgaria, May 12th, 1887; Educ., Ass. City & Guilds of London Institute, 1909; Assoc. Mem. Inst. C.E. of London, 1909-10, asst. engr., bridge inspn., city of Winnipeg, and railroad constrn., N.T.C.Rly.; 1911, asst. engr., trestle bridging, C.Nor.Rly.; 1912-13, asst. engr., grading, N.T.C.Rly.; 1913-14, engr. & asst. supt., reinforced concrete bldg. constrn., 1915-19, overseas Royal Engrs., Capt., M.C.; 1919-21, supt. on bldg. constrn.; 1921-23, engr. in charge of engr'g. office, Montreal Tramways Co., Montreal. At present dis-engaged.

References: P. A. N. Seurot, W. F. Graves, C. M. Morssen, J. B. Bladon, J. L. Busfield.

BRICKENDEN—WILLIAM THOMAS, of 191 Logan Avenue, Toronto, Ont. Born at Toronto, July 15th, 1897, Educ., B.A.Sc. Univ. of Toronto, 1922, 1916-19, war service. From Sept. 1917 to Jan. 1919, asst. engr. in charge of power plant and equipment, Barrington Passage, N.S., wireless station (naval station), R.N.C.V.R.; 1919 (July-Sept.), inspr., Frank Barber & Associates, 1920 (Apr.-Aug.), dftsman, Under Feed Stoker Co. of America, 1920-21, chief dftsman and asst. engr., Under Feed Stoker Co. of Canada, Ltd.; and from July to Dec. 1922, asst. engr. with same company, Jan. 1923 to date, sales engr. and asst. manager, A. W. Cash Co. of Canada Ltd., Toronto.

References: C. R. Young, R. W. Angus, C. H. Mitchell, J. R. Cockburn, T. R. London.

COPLEY—JOHN EDWARD, of 2217 Robinson Street, Regina, Sask. Born at Athy, Co. Kildare, Ireland, June 28th, 1896; Educ., practical telephony, I.C.S. constrn. and mtce. of automatic telephone equipment, toll boards, storage batteries and power equipment; At present automatic telephone switchman.

References: W. R. Warren, H. B. Sherman, S. R. Parker, D. A. R. McCannel, A. C. Garner.

CORCORAN—JOHN C., of Montreal, Que. Born at San Antonio, Texas, March 8th, 1873; Educ., diplomas from University of New York State; 1894-97, paper machine tender and charge of manufacturing high grade paper in different mills; 1897, sales engr., Adirondack Machine Company, Carthage, N.Y.; 1898, organized Carthage Machine Co., treasurer and chief engr., from 1898 to 1900; 1900-01, constrn. engr. and charge of chemical and mechanical equipment for Henry Paper Co.; 1901-07, chief engr., paper machinery dept., Thompson Mfg. Co.; 1907-18, sales engr. and road engr., Rice, Barton & Fales Co.; 1918-20, with Dominion Bridge Co. Ltd.; At present, president and manager, John C. Corcoran Machinery Company, Limited, Montreal, Que.

References: H. H. Vaughan, C. N. Monsarrat, P. L. Pratley, G. H. Duggan, R. Collins, R. W. Robb, F. Newell, G. F. Hardy.

CUNNINGHAM—LEONARD, of Westmount, Cape Breton, N.S. Born at Antigonish, N.S., March 24th, 1881; Educ., St. Francis Xavier, 1900. I.C.S.; 1902-06, mech. dfting. office, Dominion Iron & Steel Co., Sydney, N.S.; 1906 (6 mos.), location dftsman., Transcontinental Rly.; 1907-08, location dftsman., So. Pacific Rly.; 1909-10, location dftsman. and instr'man., So. Pacific of Mexico; 1911-18, asst. res. engr., dept. of public works, Cape Breton Island District; 1918-19, dftsman., Dominion Iron & Steel Co., Sydney; 1920 (6 mos.), engr'g. inspr., plate mill and brick plant constrn., with above company; 1921 to date, managing director, Scotia Double Wall Co. Ltd., engrs. and contractors, Sydney, N.S.

References: K. H. Marsh, G. A. Bernasconi, W. P. Morrison, J. L. Allan, T. J. Brown, H. Longley, J. Stephenson, K. G. Cameron.

FREEMAN—JOHN PELHAM, of Glace Bay, N.S. Born at Liverpool, N.S., March 10th, 1890; Educ., 1908-10, Mt. Allison Univ., 1910-12, N.S. Tech. Coll.; N.S.L.S.; railroad work during vacations; 1912-15, with Highway Board of Nova Scotia, in charge of road survey, location of culverts, small bridges, etc.; 1915-16 in charge of painting and packing shells for N.S. Steel & Coal Co., New Glasgow, N.S.; 1916-20, drawing office, N.S. Steel & Coal Co.; 1920 (June-Oct.), with Thompson Bros., installing hoisting outfits on ships, also machinery in their new foundry; Nov. 1920, field and office work on irrigation (pipe lines only), with Union Sugar Company, Betteravia, Calif.; ran transit for six weeks in Calif.; worked with A. A. Patterson, general contractor, for a year, laying out his work, etc.; July 1922, town of Liverpool, street surveys, sewerage and drainage proposals; Nov. 1922-Feb. 1923, engrg. work, also installing machinery in new shops, Thompson Bros., Liverpool, N.S.; At present, drawing office, Dominion Coal Company, Glace Bay, N.S.

References: K. H. Marsh, H. C. Chipman, W. M. Sutherland, W. G. Matheson, W. Rodger, J. S. Whyte.

HUME—DUNCAN CLIVE MACKENZIE, of Camp Borden, Ont. Born at Bournemouth, Hampshire, England, April 5th, 1884; Educ., electrical certificate, City and Guilds of London Institute; 1904-06, consulting elec. work; 1906-08, journalistic work; 1908-09, sales, and aircraft design; 1910-11, consltg. engr. to London and General Electric Theatres; England; 1911-13, erecting engr., Kinemacolor, England, Greece, Turkey, Roumania, and Italy; 1913-14, supervising engr., "Life Targets" England and Wales; 1915-1922, with British Admiralty — Air Board, Ministry of Munitions, Air Ministry in turn, as evolved from one another, as technical officer. Ranks held — Lieut. R.N.V.R., Lieut. Commdr., R.N.V.R. Major, R.A.F.; 1922-23, designer of aircraft to the Laurentide Air Service, Montreal; At present squadron leader in charge of technical services, Camp Borden, Ont.

References: E W. Stedman, E. Wilson, H. E. Bates, J. D. Peart, A. M. Mackenzie.

JOYAL—JULES, of Chicoutimi, Que. Born at St. François du Lac, Que., Oct. 6th, 1896; Educ., B.A., B.S.A., Civil Engineer, University of Montreal, 1920; 1916-19 (summers), with Quebec Streams Commission; 1920-21, in charge of survey party for Price Bros.; 1921-22, in charge of small party survey for the following. Lake Megantic Pulp Co., Montmorency Lumber Co., and Henry Atkinson, Reg'd.; 1922 (June-Dec.), divn. engr. in Lotbiniere for roads dept., Quebec; Dec. 1922 to date, with Price Bros. & Company, Chicoutimi, in charge of constrn. of river improvements, driving dams, flumes, booms, etc.

References: O. O. Lefebvre, J. A. Lefebvre, A. B. Normandin, H. Cimon, G. E. LaMothe, H. Massue, E. A. Evans.

KAY—HARRY, of 27 Lorne Avenue, Longueuil, Que. Born at Bury, Lancashire, England, May 12th, 1882; Educ., 1898-1906, engr'g. and industrial courses, Manchester School of Technology, and Technical Institute, Bury, England; 1898-1902, ap'ticeship, Bentley and Jackson Limited, Engineers, Bury, England; 1902-04, mech. engrg. dept., London Paper Mills Co. Ltd., Dartford, England; 1904-06, dftsman., Bentley and Jackson, Ltd., Bury; 1907-10, mech. engrg., dept., Bagley & Sewall Co., Watertown, N.Y.; 1910-15, chief mech. engr., Charles Walmsley & Co. Ltd., Bury, England; 1920-23, gen. tech. engr., Price Bros. & Co., Quebec; At present, vice-president and general manager, Charles Walmsley & Co. (Canada) Limited, Longueuil, Que.

References: W. G. Mitchell, G. E. Bell, J. Stadler, H. O. Keay, G. F. Hardy.

LAVOIE—EDOUARD, of Chicoutimi, Que. Born at Baie St. Paul, Oct. 4th, 1883, Educ., B.A. Laval Univ. B.Sc. Queen's Univ. 1907, 1907-08, transitman, Nat. Trans. Rly. in charge of location Ha Ha Bay Rly. and 1909-10, res. engr. on constrn. of same rly.; 1911-12, in charge of constrn. mill no. 3, Chicoutimi Pulp Co.; 1913-14, municipal work under the firm of Grenon & Lavoie, 1915-17, in charge of the constrn. of the Jalbert mill of the Chicoutimi Pulp Co., and from 1918 to date, supt. of mills for the Chicoutimi Pulp Co.

References: R. O. Sweezey, J. E. A. McConville, A. Duperron, A. B. Normandin, J. F. Grenon, G. E. LaMothe.

MICHAUD—JOSEPH ARTHUR, of Toronto, Ont. Born at Rimouski, Que. July 30th, 1886, Educ., Matric. Univ. of Tor. 1904, 1st and 2nd year [illegible] civil engrg. 1905-06, 1903-04, rodman, Toronto & Niagara Power Co., 1905 [illegible], rodman, leveller, topog'r. and 1906 (summer), asst. to res. engr. on constrn. of Thorold-Welland line, Niagara St. Catharine & Toronto Rly., 1907-09, with the following firms: Miller & Cummings, engrg. contractors, Buffalo Lockport & Rochester Rly., John Anglin Co., Engrs. and Boiler Makers, Toronto, 1909 to date, on engrg. staff, Department of Public Works, Ontario, 1910, res. engr. highway [illegible], at Islington, 1912, in charge of survey party making topog'l. survey for Whitby Asylum, and at the present time, assistant engineer, Toronto.

References: A. J. Halford, J. W. Hackner, G. Hogarth, J. F. Willso, A. Sedgwick.

MOULTON—ARTHUR GARLAND, of Westmount, Que. Born at Chicago, Ill., Feb. 13th, 1876; Educ., Chicago Manual Training School (now affiliated with Chicago University, 1891-1895, 1901 supt. for Moulton Starrett Co., Builders, 1901-06, supt. and foreign representative in Argentina for Witherspoon Engineering Company, grain elevator erection, 1906-21, supt. and later vice-president Thompson-Starrett Company, Chicago and New York, 1921 to date, vice-president and gen. mgr., Thompson Starrett Company, Limited, Montreal.

References: C. H. Keefer, W. J. Armstrong, S. J. Fortin, W. F. Gronau, A. Potter, J. T. O'Rourke, I. O. White.

RIPLEY—WILFRED JAMIESON, of 46 St. Peters Road, Sydney, N.S. Born at Nappan Station, N.S., March 22nd, 1891; Educ., B.Sc., McGill Univ., 1914; 1913 (summer), draftsman, C.N.R., and rodman, G.T.R., 1914-18, transitman in charge of party, Can. Govt. Rlys., 1918 (May-Sept.), asst. field engr., on coke oven and by-product plant constrn., 1918-19, field engr. in charge of construction on above job with Koppers Co., Pittsburg (Sydney); 1919-20, designer and squad foreman on coke oven and by-product work, also gen. steel plant work, Dominion Iron & Steel Co., Sydney, N.S.; 1920-21, field engr. coke oven constrn., in charge of constrn. in field and progress and cost reports in office; At present, squad foreman, drafting office, Dominion Coal Company, Glace Bay, N.S.

References: K. H. Marsh, K. G. Cameron, S. C. Mifflen, J. R. Morrison, W. M. Sutherland, E. Brown, H. M. MacKay.

WALSH—STEVEN NICHOLAS, of Montreal, Que. Born at St. John's, Nfld., Jan. 7th, 1886; Educ., I.C.S. diploma, elec. engrg.; 1905-11, elect'n., C.P.R., Lake Superior Divn.; 1911-14, operator to chief operator, constrn. and erection on power station; 1914-17, elect'l. supt. and chief engr. of steam and power station; 1918-19, elect'l. engr. for the Air Nitrates Corpn. of New York at Muscle Shoals, Alabama, U.S.A. steam station, 1919-22, shop elec. engr., A. A. Giddings & Co. Ltd., handling windings, repairs, and design of elect. apparatus; At present, prov. examiner of electricians of Quebec.

References: F. P. Gutelius, F. Thomson, J. A. Shaw, H. G. Hunter, T. W. Lesage, H. H. Vaughan.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

GREENE—LESLIE KIRK, of London, England. Born at Montreal, Dec. 31st, 1892; Educ., B.Sc. (C.E.), McGill Univ. 1920. Diploma with honours, R.M.C., Kingston, 1911-14; Four years active service. Selected for British Mission in U.S.A. Final rank Captain; 1920-22, with Vickers Ltd., England — Birmingham branch, as asst. to one of the departmental supts.; 1922-23, asst. to Messrs. MacDonald & MacCorquodale, consltg. engrs., London, England, design, drawings, and estimates for two large irrigation schemes; May 1923, loaned by above firm to The Northern & Western Motorway Co., on constrn. of a trunk highway from London to Manchester, for high speed motor traffic. First assisted chief engr. on prelim. location, and now in charge of a 35 mile section.

References: G. H. Duggan, F. P. Shearwood, F. B. Brown, C. M. McKergow, E. Brown, H. M. MacKay.

McCAGHEY—NORMAN FRASER, of Kenogami, Que. Born at Quebec, Que. May 30th, 1890; Educ. 3 years applied science, McGill Univ., 1909-1910, 1910-11, and 1914-15; 1908 (summer), rodman, C.N.R. survey; one summer timekeeper, M.P. & J. T. Davis, contractors; one summer, asst. engr. on substructure Quebec bridge; 2 years instr'man and res. eng. Commnr. Transcontinental Ry.; 1915-19, overseas. Major, D.S.O., M.C. Twice wounded; Four years to date, asst. engr., Price Bros. & Co. Ltd., Kenogami, Que.

References: J. M. McCarthy, F. B. Brown, W. G. Mitchell, F. L. Darrell, C. N. Shanly, J. T. Farmer, A. Ferguson, S. E. Oliver.

McRAE—JOSEPH PERCY, of Toronto, Ont. Born at Ottawa, Ont., Feb. 7th, 1889; Educ., B.Sc. (Mech.), McGill Univ. 1912; 1912-13, office of J. B. McRae, Ottawa; 1913, erection and operation of 500 h.p. diesel unit, Moose Jaw Street Railway; 1914-15, design and constrn. High Falls dam — Line River, and worked on several other developments; 1915-19, overseas, O.C. 3rd Divn. Ambulance Workshop. Later with R.F.C. 1917-18, prisoner of war; 1919, with hydro-elec. on inspection Chippawa units in Cleveland; 1920, asst. service mgr. and shop super. of the Cole 8 — Olds 8 Agency. Designed and supervised constrn. of new reinforced concrete and brick service; with Moore & Hughes, Dodge Bros. distributors, as shop super. of their service. Down to Ottawa for Purchasing Commission of Canada, advisor on purchase of motor equipment for P.O. dept.; July 1923, mgr. of engrg. and water works dept., General Supply Co. of Canada, Ottawa, Ont.

References: J. B. McRae, M. V. Sauer, H. G. Acres, J. Murphy, R. J. Durley, J. H. McLaren, D. L. McLean, A. H. Munro.

STEPHENSON—GEORGE ELGIN, of Walkerton, Ont. Born at Varna, Ont., June 3rd, 1894; Educ., B.A.Sc. Univ. of Tor. 1920; 1914 (summer), rodman, highways dept., 1916-19, overseas, Lieut. Can. Engrs.; 1920-21, foreman and acting supt., Warren Paving Co.; 1921 (Jan.-May), asst. engr., T. D. Mylrea with Norman McLeod, Ltd.; 1921 (May-Aug.), res. engr., Chipman & Power; 1921-22, asst. engr., Ontario highways dept.; April 1922 to date, county engr., and road supt. of Bruce County, Ontario.

References: P. Gillespie, C. R. Young, W. Chipman, R. C. Muir, T. D. Mylrea, L. M. Jones.

YOUNG—FRANK BENNET, of Strathmore, Alta. Born at Lethbridge, Alta., August 27th, 1892; Educ., 2nd year, Prince of Wales Univ., Charlottetown, P.E.I.; Deputy Land Surveyor, Prov. of N.B.; field officer's cert., R.S.I., Halifax; Crown Land Surveyor for N.B., 1913, three years (1910-13) transitman on C.P.R. irrigation canal, location and constrn. at Brooks and vicinity, Alta., two years (1912-14), private practice as prov. land surveyor, St. John, N.B., three and a half years overseas, 26th Batt., Major; At present, asst. canal supt., C.P.R., D.N.R., Strathmore, Alta.

References: R. S. Stockton, G. G. Murdoch, A. S. Dawson, L. N. Ridley, G. W. H. Perley, G. H. Patrick.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

DAVIS—SYDNEY HERBERT, of 157 Pretoria Avenue, Ottawa, Ont. Born at Ottawa, April 13th, 1893; Educ., B.Sc. McGill Univ. 1923; two seasons — asst. on Can. geol. surveys; three years overseas service. At present engaged in mining prospect work.

References: C. M. McKergow, B. C. Root, J. B. Porter, W. G. Mitchell, A. U. Merkle.

MEADD—HOWARD ELLIOTT, of Fort Frances, Ont. Born at Township of McGillivray, Ont., May 11th, 1892; Educ., B.Sc., Queen's Univ. 1921; 1914 (summer), Mond Nickel Co., Mond, Ont.; 1917 (May-Oct.), rly. location and prelim. hydro-elec. surveys; 1919 (summer), instr'man., Nipigon power development, 1920 (summer), instr'man on power house constrn., Nipigon power development; 1921-22, in charge engrg. field office, Nipigon power development; July 1922, highway inspr., Dept. Public Highways, Ontario; Aug. 1922 to date, designing engr., Backus, Brooks & Co. and allied interests, Fort Frances, Ont. (Overseas with Can. Rly. Troops).

References: J. N. Stanley, R. C. McCully, O. Holden, W. P. Wilgar, T. V. McCarthy, G. F. Hanning, A. Macphail, A. Drowley.

PELLETIER—HENRI BURROUGHS, of Chicoutimi, Que. Born at Montreal, Feb. 15th, 1894; Educ., B.Sc., McGill Univ. 1918; 1918-19, Lieut. Can. Engrs., service in Canada and England; 1919, drfting dept., Dominion Bridge Co., Lachine; 1919 to date with Chicoutimi Pulp Co., field and office work in connection with various projects in the Lake St. John district.

References: J. E. A. McConville, T. J. Lafreniere, C. N. Shanly, L. T. G. Boisseau, F. S. Keith.

ROBINSON—DENIS OWEN, of St. Thomas, Ont. Born at Stapleford, Notts., England, July 6th, 1901; Educ., B.Sc., Queen's Univ. 1923; 1920 (summer), concrete inspr., 1921 (summer), instr'man., 1922 (summer), asst. engr., City of St. Thomas; May 1923 to date, with Dominion Constrn. Co., as foreman on Michigan Central R.R. yard extension in St. Thomas.

References: W. C. Miller, W. P. Wilgar, A. Macphail, L. T. Rutledge, L. M. Arkley.

SMITH—CAMPBELL TAYLOR, of St. Catharines, Ont. Born at Sarnia, Ont., July 13th, 1890; Educ., B.A.Sc. Univ. of Toronto, 1921; O.L.S. 1922; Two and a half years overseas; 1920 (6 mos.), instr'man., Dept. Public Highways, Ont.; 1921-22, in charge of municipal works, etc., with F. N. Rutherford; May 1922 to date, partner in firm Rutherford and Smith, St. Catharines, Ont.

References: F. N. Rutherford, R. W. Downie, P. Gillespie, C. R. Young, T. R. Loudon.

Books Recently Added to the Library

"Railway Electric Traction", by F. W. Carter.
"Power House Design", by Sir John F. C. Snell. Second edition.
"A Text-Book of Paper-Making", by C. F. Cross and E. J. Bevan. Fifth edition.
"Guide to Sulphite Pulp Manufacture", by R. E. Cooper. Chemistry of the process and details of the various operations. Reprinted from "Paper" the official Journal of the Technical Association of the Pulp & Paper Industry. No. 2.
"Electrical Engineering Testing", by G. D. Aspinall Parr. 4th edition.
"The Paper Mill Chemist", by Henry P. Stevens, M.A., F.I.C., 2nd. revised edition.
"Electrical Rates", by G. P. Watkins.
"Paper-Making and Its Machinery", by T. W. Chalmers, B.Sc., A.M.I. Mech. E.
"Wood Pulp and Its Uses", by C. F. Cross, E. J. Bevan and R. W. Sindall, with the collaboration of W. N. Bacon. 2nd. edition.
"Tests on Railway Bridges in respect of Impact Effect."
"The Manufacture of Pulp and Paper," by J. J. Clark, M.E. Volume 1. Mathematics, Reading Drawings and Physics. Volume 2. Mechanics, Hydraulics, Electricity and Chemistry. Volume 3, "The Manufacture of Pulp and Paper." Preparation and treatment of wood pulp, by H. N. Lee, A.M., J. Newell Stephenson, M.S., R. W. Hovey, B.Sc., S. Roy Turner, B.Sc., Bjarne Johnsen, Dr. Ing, Arthur Burgess Larchar, Karl M. Thorsen, Chem. Engr., J. O. Mason, T. E. Kloss, B.S., H. H. Hanson, S.B., Max Cline, and H. J. Buncke, C.E.
"Principles of Radio Communication," by J. H. Morecroft, assisted by A. Pinto and W. A. Curry.
"Steam Power Plant Engineering," by Geo. F. Gebhardt, M.E.A.M. 5th. edition.
"A practical treatise on Suspension Bridges," their design, construction and erection, by D. B. Steinman.
"American Highway Engineers' Handbook," by Arthur H. Blanchard, editor-in-chief. First edition.
"Architects' and Builders' Handbook," by the late Frank E. Kidder, C.E., Ph.D. and Thomas Nolan, M.S., A.M., editor-in-chief. 17th edition.
"Bridge Engineering," by J. A. L. Waddell. Volume 1. First edit.
"Bridge Engineering," by J. A. L. Waddell. Volume 2. First edit.
"Economics of Bridgework," — a Sequel to Bridge Engineering, by J. A. L. Waddell.
"Modern Tunneling," by David W. Brunton and John A. Davis. 1st. edition.
"Structural Draughting and the Design of Details," by Carlton Thomas Bishop. 2nd. edition.
"Masonry Structures," by F. P. Spalding.
"Graphical and Mechanical Computation," by Joseph Lipka, Ph.D.
"Materials of Construction," by the late Adelbert P. Mills. 2nd. edition. Edited by Harrison W. Hayward.
"Water Proofing Engineering," by Joseph Ross, B.S., C.E., first edition.
"Chemistry of Pulp and Paper Making," by Edwin Sutermeister, S.B.
"Modern Framed Structures." Part 3 — Design, by the late J. B. Johnson, C.E., C. W. Bryan, C.E. and F. E. Turneaure, C.E. 9th edition, in three parts.
"Cements, Limes and Plasters," by Edwin C. Eckel, C.E. 2nd. edition.
"Hydraulic Motors," by Irving P. Church. 1st. edition.
"Engineering for Masonry Dams," by William Pitcher Creager, C.E.
"Modern Underpinning," by Lazarus White, C.E. and Edmund Astley Prentis, Jr. E.M., First edition.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

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A

ABRASIVE WHEELS

BREAKAGES. Grinding Wheel Breakages—Cause and Prevention. H. W. Wagner. Can. Machy., vol. 29, no. 26, June 28, 1923, pp. 19-20. Theory of cooling strains; calculation of centrifugal forces; uniformity of bearing surfaces; cross bending stress, etc.

BUFFING WHEELS. The Manufacture of Buffing Wheels, Bradford H. Divine. Machy. (N.Y.), vol. 29, no. 11, July 1923, pp. 881-885, 4 figs. Materials used for buffing wheels; need for standardization of wheels; importance of aging buff; converting cloth into buffs; design of buffs; special forms of buffing wheels.

ABUTMENTS

DESIGN. Economic Development of Abutments (Wirtschaftliche Ausbildung von Widerlagern), Hulsenkamp. Beton u. Eisen, vol. 22, no. 10, Mar. 20, 1923, pp. 131-133, 6 figs. Connections with floor and with wings; details of design.

ACCIDENT PREVENTION

LEGISLATION. Proceedings of the Ninth Annual Meeting of the International Association of Industrial Accident Boards and Commissions. U. S. Dept. Labor, Bur. Labor Statistics no. 333, May 1923, 336 pp. Papers and discussions on forms and procedure for workmen's compensation, standard permanent disability schedules, medical problems, accident prevention, legislation and administration.

AERONAUTICAL INSTRUMENTS

STEERING, EQUIPMENT FOR. Aeronautical Instruments, Kurt Bennewitz. Nat. Advisory Committee for Aeronautics. Tech. Notes, no. 145, June 1923, 13 pp., 7 figs. on supp. plates. Points out that suitable outfit for steering consists of (1) transverse inclinometer (pendulum or level); (2) longitudinal inclinometer (pressure speed meter); (3) turn meter for large airplanes (Drexler steering indicator, for small airplanes, probably an improved pressure turn meter). Translated from Technische Berichte, vol. 3, no. 5.

AERONAUTICS

SOUTH AMERICA. An Aeronautical Survey of South America. Aviation, vol. 15, no. 1, July 2, 1923, pp. 14-16. Opportunities for constructors, pilots, etc. Abstract of lecture by G. F. Luke before Scottish Branch of Roy. Aero. Soc.

AIR COMPRESSORS

ROTARY. The Planche System Rotary Compressor (Le compresseur rotatif, système Planche), R. Chenal. Génie Civil, vol. 82, no. 24, June 16, 1923, pp. 569-574, 15 figs. Details of design and construction; comparison with various compressor systems, particularly that of rotary vanes.

TYPES. Air Compressor and Cargo Oil Pump. Engineering, vol. 115, no. 2999, June 22, 1923, pp. 772-773, 3 figs. Details of air compressor, cargo oil pump, and turbine-driven circulating pump constructed by G. and J. Weir, Glasgow.

AIR CONDITIONING

INDUSTRIAL STENCHES, ABATEMENT OF. Abatement of Industrial Stenches by Means of Activated Carbon. Arthur B. Ray and N. K. Chaney. Chem. & Met. Eng., vol. 28, no. 25, June 25, 1923, pp. 1114-1116, 2 figs. Review of previous efforts at eliminating industrial stenches and description of installation using activated carbon that successfully cured stench nuisance in rendering plant. Paper read before Am. Inst. Chem. Engrs.

AIR FURNACES

OIL-BURNING. Fuel Oil for Air-Furnace Melting, D. L. Dobson. Iron Age, vol. 112, no. 1, July 5, 1922, pp. 5-6, 1 fig. Equipment at Samson Tractor Co. Plant at Waukesha, Wis.; costs of oil and coal operation compared.

Melts with Oil in Air Furnace, D. L. Dobson. Trade Rev., vol. 73, no. 1, July 5, 1923, pp. 33-34 and 41, 1 fig. Coal burning furnaces used to melt malleable with slight changes in combustion chamber, figures given showing relative cost of coal and oil firing, oil consumption.

AIRCRAFT

DEVELOPMENT. Aircraft Development since the Armistice. Aviation, vol. 15, no. 1, July 2, 1923, pp. 6-9. Development of pursuit, attack, observation, bombardment, training, and special types. Prepared by Engineering Division, U. S. Army Air Service, McCook Field, Dayton, Ohio.

AIRPLANE ENGINES

ACCESSORIES. Accessories in the Propulsion Group (Les accessoires du groupe motopropulseur), Martinot-Lagarde. Aéronautique, vol. 5, no. 48, May 1923, pp. 185-193, 15 figs. Apparatus at recent aeronautical exposition. Starting and starting devices; supply of gasoline to engine; engine cooling.

SUPERCHARGING. Machinery Equipment for Flight at High Altitudes (Machine installatie van het verkeers-hoogtevliegtuig), B. L. Voskuil. Ingenieur, vol. 38, no. 20, May 19, 1923, pp. 390-393, 7 figs. Discusses as example machine flying at 13,000 m. altitude with 400-hp. Liberty engine, oxygen supply, overdimensioning, supercharging and supercompressing of various types.

AIRPLANES

COMMERCIAL, EFFECTIVE LOAD. Effect of Minimum Security on Effective Load of Commercial Airplanes (Influencê des conditions minima de sécurité sur la charge utile des avions de transport), J. Sabatier. Aéronautique, vol. 5, no. 48, May 1923, pp. 210-215. General reduction of effective load with application of safety devices; analysis of conditions of security; fatigue of materials; calculation of effective load for given airplanes.

CONTROL DEVICES. The Constantin Vane (La gironette Constantin), J. Felix. Nature (Paris), no. 2567, June 16, 1923, pp. 379-384, 9 figs. Describes new type having two curved surfaces, and its successful applications in aerial navigation, such as indicating angle of attack, lateral sliding, veering of plane, etc.

EXPRESS FREIGHT, DESIGN OF. Aerial Express Service Will Demand Special Plane Designs, Archibald Black. Automotive Industries, vol. 49, no. 2, July 12, 1923, pp. 68-70, 3 figs. Convertible passenger machines do not meet all requirements; maximum carrying space must be provided; location of pilot is important, but place in rear seems to have most advantages; plywood best material for body construction; table giving weights per cu. ft. for a list of packages selected at random as typical of variations to be expected in shipments.

STABILITY. A Study of Longitudinal Dynamic Stability in Flight, F. H. Norton. Nat. Advisory Committee for Aeronautics—Report, no. 170, 1923, 7 pp., 14 figs. Results of investigation show that engine speed has as much effect on period and damping as air speed, and that, contrary to theory as developed for small oscillations, damping decreased at higher air speeds with closed throttle.

Longitudinal Stability of Airplanes (Zur Längsstabilität der Flugzeuge), Georg König. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 14, nos. 7-8, Apr. 26, 1923, pp. 61-64, 8 figs. Characteristics of steering apparatus; thrust of propellers and its equalization; stability of sustaining surfaces; stability diagram.

STRUCTURAL STRENGTH. An Investigation of the Structural Strength of the T-2 Transport. A. S. No. 64233, R. A. Miller and D. B. Weaver. Air Service Information Circular, vol. 5, no. 420, Apr. 1, 1923, 8 pp., 9 figs. Report of static test of wing; stress analysis of wing; and stress analysis of landing chassis.

TAIL-SKID IMPACT TEST. Impact Test of a JN-4 Tail Skid and Landing Chassis, D. B. Weaver. Air Service Information Circular, vol. 5, no. 409, Apr. 1, 1923, 3 pp., 3 figs. Conducted for purpose of determining height from which both tail skid and landing chassis could be dropped before failure.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

BEARING-METAL. *See Bearing Metals.*

BRASS. *See Brass.*

PERMALLOY. Permalloy, H. D. Arnold and G. W. Elmen. Electrician, vol. 90, no. 2353, June 22, 1923, pp. 672-674, 7 figs. Nickel-iron alloys, which when properly heat-treated, possess remarkable magnetic properties.

SEGREGATION. Some Cases of the Segregation in Alloys [Einige Fälle von Entmischung (Saigerung) bei Legierungen], W. J. Van Heteren and J. W. A. Haagen Smit. Metall u. Erz, vol. 20, no. 10, May 22, 1923, pp. 183-187, 4 figs. Segregation in binary alloys, gold-silver, gold-copper, silver-copper; solidification curves and tables of data.

SOLID SOLUTIONS. Solid Solutions, Walter Rosenhain. Am. Inst. Min. & Met. Engrs.—Trans., no. 1250-N, June 1923, 32 pp., 8 figs.; also (abstract) in Min. & Metallurgy, vol. 4, no. 198, June 1923, pp. 306-307. Relates to internal structure and constitution of solid solutions, describes various ways in which alloys solidify and manner in which solid solutions are formed, pointing out that essentially all constituents of alloys are solid solutions.

ALUMINUM ALLOYS

DURALUMIN. *See Duralumin.*

FOUNDING. The Founding of Aluminum Alloys. Metal Ind. (Lond.), vol. 22, no. 24, June 15, 1923, pp. 611-613, and 622. Lightness of aluminum, dry and green sand cores, melting and pouring, temperature control, checking and drawing, hard spots, iron content, and machining aluminum alloys.

AMMONIA COMPRESSORS

MOTIVE POWER FOR. Refrigerating Machinery, William Sinclair and Alfred Snashall. Indus. Australian and Min. Standard, vol. 69, nos. 1794, 1795 and 1796, Apr. 19, 26 and May 3, 1923, pp. 630, 671, and 615-616. Motive power for ammonia compressors. Refrigeration and power calculations, gas and oil engines, electric driving. Abstract of paper read before Inst. Engrs.

APPRENTICES, TRAINING OF

FOUNDRY. Technical School and Aid to Foundry Apprentice. F. H. Bell. Can. Foundryman, vol. 15, no. 6, June 1923, pp. 13-15 and 19, 5 figs. Need and advantages of a technical school education to foundry apprentice, described as an example of layout, equipment, and management. Montreal Technical School, Montreal, Canada.

RAILWAY. The Modern Plan for Training Apprentices, John Purcell. Ry. Rev., vol. 72, no. 25, June 23, 1923, pp. 1071-1073. Scarcity of skilled mechanics has led railways to progressive plan for educating and training apprentices in shops.

ARCHES

STATICALLY INDETERMINATE. Most Favorable Form of Statically Indeterminate Arches (Den gunstigste buctorm for statisk ubestemte Hvaelvinger), A. Ostenfeld. Ingeniøren, vol. 32, no. 18, May 5, 1923, pp. 210-213, 1 fig. Formulas and calculations.

ATOMS

ALPHA PARTICLES. The Life History of an Alpha Particle, Ernest Rutherford. Engineering, vol. 115, no. 2999, June 22, 1923, pp. 769-770, 6 figs. Account of latest researches. (Abstract.) Address before Roy. Instn.

AUTOGENOUS WELDING

ALUMINUM CASTINGS. The Autogenous Welding of Broken Aluminum Castings. Mech. World, vol. 73, no. 1902, June 15, 1923, pp. 375-376. Possibilities of autogenous welding for aluminum castings, points to be observed.

AUTOMOBILE ENGINES

MIXTURE REQUIREMENTS, EFFECT OF SPEED ON. The Effect of Speed on Mixture Requirements, Claude S. Kegerreis and Gilbert A. Young. Purdue Univ., Eng. Experiment Station, Bul. no. 11, vol. 7, no. 3, Feb. 1923, 29 pp., 16 figs. Results of investigation to establish mixture ratios required by an automobile engine, as effected more especially by speed and fuel-air ratios required by an internal-combustion engine of throttling type at any speed and load condition; description of apparatus.

PISTONS. *See Pistons.*

AUTOMOBILE FUELS

DISTILLATION CURVES. Distillation Curve Becoming Generally Used As Motor Fuel Index, J. C. Chatfield. Nat. Petroleum News, vol. 15, no. 23, June 6, 1923, pp. 34-36, 12 figs. Presents curves of 11 different grades of motor fuel.

GASOLINE. *See Gasoline.*

MIXED, USE OF ACETONE IN. The Use of Acetone in Composite Engine-Fuels, R. F. Remler. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 23-24. Chemical structure of acetone; comparative heating values of acetone and ethyl alcohol; properties of acetone; its advantages as a fuel.

VOLATILITY. Economic Motor-Fuel Volatility, Stephen M. Lee. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 3-15, 28 figs. Progress report of fuel investigation being conducted by Bur. of Standards, in co-operation with Am. Petroleum Inst., Nat. Automobile Chamber of Commerce and Soc. Automotive Engrs., to secure data to be used in estimating effect of changes in gasoline volatility on fuel consumption of cars; description of fuels used, test cars, apparatus, tests and test methods.

AUTOMOBILE MANUFACTURING PLANTS

ENGINEERS' SERVICE. The Factory Engineering-Staff and Its Relation to Service, J. W. Lord. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 93-95 and (discussion) 95-100. Considers service problems, fundamental in character, that must be solved at point where vehicle is designed and produced; problems due to inaccessibility of parts, repairs and repair parts; influence that factory engineers has and can have on service; makes recommendation that engineers be given opportunity to see product in field.

AUTOMOBILES

BRAKES, FRONT-WHEEL. American Front Wheel Brake Design Making Rapid Strides, Herbert Chase. Automotive Industries, vol. 48, no. 26, June 28, 1923, pp. 1364-1374, 17 figs. Several are said to have commendable features not found in European products; some are operated by hydraulic pressure, but majority use mechanical actuation; "servo" mechanisms are conspicuously absent.

BRAKING, FOUR-WHEEL. Four-Wheel Braking Systems. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 55-59, 7 figs. Two articles: Mechanical Braking on Four Wheels as a Present Automotive Necessity, by Alvin M. Yocom; and Renault Mechanical Four-Wheel Braking-System, by Marcel Guillelmon.

FUEL-CONSUMPTION METERS. Measuring Petrol-Consumption. Autocar, vol. 50, no. 1442, June 8, 1923, pp. 989-990, 3 figs. Describes Aga gasoline consumption meter, manufactured by Gas Accumulator Co., Eng., an instrument which conveys fuel from tank to carburetor, registers every tenth of a gallon consumed by engine, indicates quantity of fuel remaining in tank, and filters fuel before it enters carburetor.

HEADLIGHTS. Bureau of Standards Tests Reveal Many Defective Headlamps, T. S. Sligh, Jr. Automotive Industries, vol. 49, no. 2, July 12, 1923, pp. 71-73, 1 fig. Examination of equipment on 400 cars selected at random shows 54 per cent of glaring lights; bulbs on 73 per cent are found out of focus; reduction of glare results in better illumination; great need for education in care and adjustment of headlamps.

RACING, INFLUENCE ON TOURING MODELS. How Racing Influences Touring Cars, Louis Coatalen. Autocar, vol. 50, no. 1441, June 1, 1923, pp. 939-941, 4 figs. Lessons learned and data obtained from speed cars are having a marked effect on design of touring models and their cost of operation.

REAR-AXLE WORM SHAFTS. Rear Axle Worm-Shafts, D. Cecil M'Intosh. Automobile Engr., vol. 13, no. 177, June 1923, pp. 172-173, 8 figs. Investigation of their deflection under load.

STEERING GEARS. Recent Steering Gear Designs. Automotive Industries, vol. 48, no. 26, June 28, 1923, pp. 1404-1405, 6 figs. Mechanical drawings showing recent development in steering wheels.

AVIATION

AIRWAYS AND LANDING FACILITIES. Airways and Landing Facilities. Air Service Information Circular, vol. 5, no. 404, Mar. 1, 1923, 112 pp., 13 figs. Published for use of pilots of aircraft.

MEDICAL SERVICE. Air Medical Service. Air Service Information Circular, vol. 5, no. 414, Apr. 1, 1923, 80 pp., 29 figs. Contains following articles: New Type of Rebreather and other Respiratory Apparatus; Cardio-Vascular Rating as Measure of Physical Fatigue and Efficiency; Dark Adaptation, with Special Reference to Problems of Night Flying; Maddox Rod and Screen Test Combined; Respiratory Volumes of Men During Short Exposures to Constant Low Oxygen Tensions Attained by Rebreathing; Alveolar Air, Respiratory Volume at Low Oxygen Tension, Compensatory Reactions to Low Oxygen; Tests for Determining Sighting Eye; New Apparatus for Testing Accommodation; etc.

B

BALANCING

ROTATING DISKS. Balancing of Rotating Disk (Unbalancering af roterende Skiver), Th. E. Thomsen. Ingeniøren, vol. 32, no. 11, Mar. 17, 1923, pp. 126-127, 4 figs. Describes method and apparatus, application to steam turbines, centrifugal pumps, compressor wheels, etc.

BALLISTICS

INTERIOR. Principles of Interior Ballistics (Sur les principes de la Balistique intérieure), F. Gossot and R. Liouville. Académie des Sciences—Comptes Rendus des Séances, vol. 176, no. 22, May 28, 1923, pp. 1530-1534. Equations of interior ballistics, calculations based on velocity of combustion of powder being proportional to pressure or below it.

BEAMS

BREAKING STRENGTH. Breaking Strength (Knickfestigkeit), R. Krell. Bautechnik, vol. 1, no. 25, June 12, 1923, pp. 230-250, 10 figs. Shows that by loading to breaking point original plane cross sections of bar remain approximately same on deformation and exactly same on bending; derivation of formulas valid for loads up to fracture of bar; articulated compression bars, method for approximate calculation of breaking strength.

ECCENTRICALLY-LOADED. Calculation of Eccentrically-Loaded Bars With Uniform Cross Section Load (Berechnung exzentrisch gedruckter stabe mit gleichformiger querbelastung), Franz Fabous. Zeit. des Oester. Ingenieur- u. Architekten-Vereines, vol. 75, nos. 21-22, June 1, 1923, pp. 132-133, 2 figs. Develops formulas from laws of elasticity and tensile strength and makes calculations.

CONTINUOUS. Graphical Analysis of Beams with Unusual Load Conditions. Assn. Chinese & Am. Engrs., Jl., vol. 4, no. 2, Feb. 1923, pp. 1-16. Analysis of restrained or continuous beams with distributed loads, whether uniform or varying; use of proportional dividers.

REINFORCED-CONCRETE. Determination of Stresses in Reinforced-Concrete Cross-Sections Eccentrically Loaded (Spaendingsbestemmelse i jaernbetontvaersnit paavirket af en ekscentrisk normalkraft), Finn Wedell-Wedelsborg. Ingeniören, vol. 32, no. 18, May 5, 1923, pp. 215-217, 1 fig. Examples and calculations for rectangular and other cross-sections.

The Moment Determination of Continuous Reinforced-Concrete Beams (Zur Momentenbestimmung durchlaufender Eisenbetontragwerke), B. Loser. Bauingenieur, vol. 4, no. 7, Apr. 15, 1923, pp. 204-208, 3 figs. Author attempts to develop shorter calculating methods for obtaining quicker moments of approximately same size; it is claimed that negative field moments have heretofore been overrated.

RIVETED. Minimum Weight and Rational Height of Riveted Beams (El peso mínimo y la altura racional de las vigas remachadas con alma llena), Sergio Bobrovsky. Ingeniería, vol. 27, no. 5, May 1923, pp. 199-205. Formulas, tables of coefficients, and examples of calculations.

BEARING METALS

THERMIT. A New Bearing Metal (Ein neues Lagermetall). Wirtschaftsmotor, no. 10, Oct. 1922, p. 6, 1 fig. Discusses thermit, a nickel-hardened white metal of high lead content giving less friction than white metals of high tin content, placed on market by Goldschmidt A. G.; Brinell hardness, 33 per cent; strength of compression, 1600 kg. per sq. cm.

BEARINGS

LUBRICATION. Lubricating Bearings (Lejesmoring med saerlig omtale af ...), T. C. Thomsen. Ingeniören, vol. 32, no. 16, Apr. 21, 1923, pp. 181-186, 5 figs. Friction and coefficient of friction; lubricating methods; mechanical and force feed; description of Michell bearings.

BEARINGS, ROLLER

CONNECTING RODS. Kinematics and Dynamics of Roller Bearings in the heads of Connecting Rods (Kinematik und Dynamik der in Pleuelkopfe eingebauten Wälzlager), J. Kirner. Motorwagen, vol. 26, no. 14, May 20, 1923, pp. 213-220, 24 figs. Formulas and calculations; effect of length of connecting rod; velocity of rotation; centrifugal force of pins; etc.

BELT DRIVE

ELECTRIC MACHINERY. Behavior of Belt Drive for Electric Machinery (Remdriftforhold ved elektriske maskiner), Fr. Lund. Elektroteknisk Tidsskrift, vol. 36, no. 9, Mar. 26, 1923, pp. 67-69, 3 figs. Diameter and width of belt pulleys for given speeds; calculations.

STEEL BELTING. British Practice in Steel Belt Power Transmission, Richard Norris. Indian Industries & Power, vol. 20, no. 7, Mar. 1923, pp. 250-253. Results of tests and experience, and advantages.

BELTING

DYE AND CHEMICAL INDUSTRY. Transmission Belt Problems in Dye and Chemical Industry, William Staniar. Belting, Transmission, Tools & Supplies, vol. 22, no. 6, June 1923, pp. 26-28, 6 figs. Tests have shown that no type is actually acidproof; factors to be considered in selection of belting.

BLAST FURNACES

LABOR-SAVING EQUIPMENT. Labor-Saving Blast Furnace Equipment. Iron Age, vol. 111, no. 26, June 28, 1923, pp. 1846-1848, 3 figs. Reduction from 19 to 3 men per shift in stock house of furnace plant; special transfer car required by clearance limitations.

BLASTING

QUARRY. Scientific Quarry Blasting, J. Barab. Explosives Engr., vol. 1, nos. 1, 2, and 3, Mar., Apr. and May 1923, pp. 18-21, 46-47 and 81-83, 14 figs. Special blasting methods; measurements, calculations and records; good proportions for medium and hard rock for pocket loading; depth of well-drill holes with column loading for various heights of bank, where natural parting planes are not present at floor.

BOILER FEEDWATER

HEATING. Effect of Feedwater Heating on Plant Economy, G. G. Bell. Mech. Eng., vol. 45, no. 7, July 1923, pp. 417-420 and 429, 9 figs. Studies of plant equipped with 30,000-kw. units which clearly indicate advantage of bleeding main turbine both in plants with and without economizers.

SOFTENING. Softening Boiler Feed Water by Zeolite System, H. M. Marsh. Can. Mfr., vol. 43, no. 6, June 1923, pp. 21-22, 1 fig. Notes on zeolite system of water softening which will positively prevent formation of scale, sludge and mud in boilers.

BOILER FIRING

LIGNITE. Lignite for Cement Plants (Rohbraunkohle fur Zementfabriken), Berner. Braunkohle, vol. 22, no. 10, June 9, 1923, pp. 145-153, 6 figs. Rearrangement for lignite firing; failure of gas firing in rotary furnaces, especially with lignite dust; effect of lignite ash on cement, latest processes for dust production; lignite pulverizing and drying costs.

See also Pulverized Coal, Boiler Firing With.

BOILER FURNACES

DRAFT. Draft (Le tirage), P. Regnault. Outillage, vol. 7, no. 22, June 2, 1923, pp. 630-633, 8 figs. Combustion, natural and forced draft, distribution of air over grate; annual cost data for natural- and mechanical-draft plants.

FUELS, LIQUID AND GASEOUS. Burning of Liquid and Gaseous Fuel, R. C. Powell. Combustion, vol. 9, no. 1, July 1923, pp. 73-80, 5 figs. Report from Nat. Elec. Light Assn. Prime Movers Committee report. Discusses fuel oil situation in 1922, fuel oil delivery, furnace and burner design for fuel oil, accessories for mechanical burners for fuel-oil use, measurement of gas supplied in large quantities for boiler firing, combination gas and oil furnaces, emergency use of fuel oil, and methods of increasing efficiency of oil burning-stations, giving statements, from various companies.

RADIATION TYPE. Radiant Heat from New Type of Furnace. Power, vol. 58, no. 3, July 17, 1923, pp. 99-100, 1 fig. Description of new type of furnace known as Cannon Radiating Furnace, manufactured by Carborundum Co., Perth Amboy, N.J., in which by far largest part of total heat transfer (depending on particular design of boiler and furnace) is accomplished by pure radiation from outside of combustion chamber; is made in various forms, and for burning gaseous, liquid or powdered fuel; description of experimental oil-burning furnace of this type at Mass. Inst. Technology.

STOKER EQUIPMENT. Stoker Equipment and Furnaces, E. B. Ricketts. Combustion, vol. 9, no. 1, July 1923, pp. 31-54, 18 figs. Report relative to combustion from 1923 Nat. Elec. Light Assn. Prime Movers Committee report. Details regarding air heaters, arches, automatic stoker control, high-temperature cements, inclined baffles, lining boiler furnaces with cement gun, stokers, etc., giving statements by different companies.

BOILER OPERATION

EFFICIENCY. Determining Boiler Operating Factors, D. C. Hess. Southern Engr., vol. 39, no. 3, May 1923, pp. 52-55, 8 figs. Discussion of methods used to determine essential factors for economical operation of boiler rooms; results of tests; explains method of calculating combined efficiencies of boiler furnaces and grate.

The Determination of Boiler Efficiency, Henry B. Jones. Power, vol. 58, no. 3, July 17, 1923, pp. 88-91, 1 fig. Scientific analysis of errors that arise in determining boiler efficiency; determining heat in steam; measuring refuse fuels; how to measure pulverized coal; factors determining minimum length of test; computation for length of test; fuel sampling; etc.

BOILER PLATE

PROPERTIES. Properties of Boiler Plates at the Higher Temperatures (Eingenschaften von Kesselblechen bei höheren Temperaturen), K. Daeves. Zeit. des Bayerischen Revisions-Vereins, vol. 27, no. 9, May 15, 1923, pp. 65-68, 8 figs. Concludes that plates not cold-worked or hot-rolled or annealed may be used at temperatures of about 300 deg.; material which has been deformed at room temperature or up to 500 deg. should not be used for boiler construction.

BOILERS

EVOLUTION. The Steam Boiler in Evolution, David Brownlie. Elec. Times, vol. 63, no. 1653, June 21, 1923, pp. 644-647. Concise review of steam-generation developments.

GAS PASSAGES, DETERMINATION OF. Graphic Determination of Gas Passages, M. E. Yeager. Coal Industry, vol. 6, no. 6, June 1923, pp. 297-299, 2 figs. Explanation of chart for reading areas of gas passages in boilers and furnaces; how chart is derived; formulas for circulating areas.

BOILERS, WATER TUBE

WATER CIRCULATION. Water Circulation in Vertical Water-Tube Boilers (Der Wasserumlauf in Steilrohrkesseln), W. Otte. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 22, June 2, 1923, pp. 544-547, 13 figs. Points out that design of such boilers, with regard to improvement of water circulation has shown no fundamental progress during past few years; investigation of phenomena in formation of steam bubbles and their movement in boiler feed-water; aspects in design of boiler for obtaining water circulation as nearly perfect as possible.

BREATHING APPARATUS

CLOSED SYSTEM. Closed System Breathing Apparatus, I. C. Mackie. Can. Inst. Min. & Met.—Bul. no. 135, July 1923, pp. 475-482 and (discussion), 482-483. Study of apparatus from point of view of oxygen required under different circumstances.

SELF-RESCUER. The Self-Rescuer, George C. Nelms. Explosives Engr., vol. 1, no. 3, May 1923, p. 77, 2 figs. New, small, simple and serviceable device provides emergency protection against carbon monoxide and other gases encountered in mines.

BRICKWORK

STRENGTH OF. The Strength of Ordinary Brickwork, Rudolph P. Miller. Eng. & Contracting (Buildings), vol. 59, no. 6, June 27, 1923, pp. 1416-1417, 3 figs. Tests of old brick press from a building. Ordinary brickwork laid in ordinary way by an ordinary bricklayer is said to have just as great strength as brickwork laid specially for testing in a laboratory.

BRIDGE CONSTRUCTION

NICKEL STEEL FOR. The Use of Nickel in Bridges, Paul D. Merica. Iron & Steel of Canada, vol. 6, no. 6, June 1923, pp. 120-122. High tensile strength and elastic limit of nickel steel makes it valuable for bridge construction.

BRIDGES, CONCRETE

ARCH. Reinforced Concrete Schemes in the International Competition for the Limfjord Bridge in Denmark. Concrete & Constructional Engr., vol. 18, no. 6, June 1923, pp. 383-385, 7 figs. Reinforced concrete designs submitted employed cast-iron reinforcement, possibilities in centering and strutting.

Wilmington's (Del.) Memorial Bridge, Frank W. Skinner. Pub. Works, vol. 54, no. 6, June 1923, pp. 185-189, 6 figs. Reinforced-concrete structure, notable for rational design, exceptional arch proportions, strength, capacity and harmonious decorative features.

BRIDGE DESIGN

CIRCULAR. The Design of Circular Bridges, Bertrand de Fontviolant. Ferro-Concrete, vol. 14, nos. 7, 8, 9, 10 and 11, Jan., Feb., Mar., Apr. and May, 1923, pp. 177-178, 201-202, 223-225, 239-243 and 265-267. Calculations in connection with bridges and continuous spans. (For first part of paper see references in Eng. Index 1922, p. 90.)

BRIDGES, HIGHWAY

CREOSOTED, SPECIFICATION FOR. Standard Specification for Creosoted Highway Bridges Adopted by U. S. Bureau of Public Roads. Wood Preserving News, vol. 1, no. 4, pp. 68-72, 1 fig. Standard for all classes of highway work under Federal supervision, and also particularly suitable for state and county work.

RELATION TO NATIONAL TRANSPORTATION. The Importance of Highway Bridges to National Transportation, Don Holbrook. Good Roads, vol. 64, no. 23, June 6, 1923, pp. 207-213 and 219, 7 figs. Discusses what New York state is doing to solve the problem.

BRIDGES, RAILWAY

IMPACT TESTING. Effect of Impact on Metal Railway Bridges (El efecto de "impacto" en los puentes metalicos para ferrocarriles), Domingo Mendizabal y Alberto Laffon. Revista de Obras Publicas, vol. 71, no. 2382, June 1, 1923, pp. 33-38, 5 figs. Static and dynamic forces, forces of impact, determination of load; describes Federay-Palmer apparatus for photographing registration of stresses; impact formula.

LOAD DISTRIBUTIONS. Load Distributions For Calculation of Railway Bridges and Preserved Axle Pressure for Track Structure (Die Lastenzüge zur Berechnung der Eisenbahnbrücken und der für den Oberbau massgebende Achsdruck), H. Kommerell. Bauingenieur, vol. 4, no. 10, May 31, 1923, pp. 294-298, 7 figs. Discusses preliminary regulations for design and calculation of steel railway bridges.

MAINTENANCE. Maintenance of Bridges and Trestles, G. W. Rear. Pacific Ry. Club—Proc., vol. 7, no. 1, Apr. 1923, pp. 13, 15, 17, and 19-20. Discussion of problems faced by bridge department of a railroad, and how they are to be met.

BRIDGES, SUSPENSION

DELAWARE RIVER. The Delaware River Bridge between Philadelphia and Camden, Ralph Modjeski. West. Soc. Engrs.—Jl., vol. 28, no. 6, June 1923, pp. 229-248, 13 figs. Detailed description of bridge which will have main span of 1,750 ft. between centers of piers, and side spans of 716 ft. 8 in.; to be of suspension type.

MODERATE SPAN. Possibilities of the Modern Suspension Bridge for Moderate Spans, O. H. Ammann. Eng. News-Rec., vol. 90, no. 25, June 21, 1923, pp. 1072-1078, 10 figs. Reconsideration of current views of suspension-bridge limitations, with special references to development of type and influence of recent changes.

BRIDGES, WOODEN

DESIGN. National Types of Hardwood Bridges (Tipo nacional de puente de madera dura), Carlos M. Palacio. Ingeniera, vol. 27, no. 5, May 1923, pp. 195-198, 2 figs. Argentine hardwood resources; details of design of wood bridges; comparison of cost with iron bridges.

BRASS

LEAD IN. The Function of Lead in Brass and Bronze, H. Hyman. Metal Industry (Lond.), vol. 22, no. 23, June 8, 1923, pp. 581-582, 1 fig. Reasons for introducing lead into brass; advantages and disadvantages; lead added to bronze to improve its machining properties, and also when it is intended to be used as bearing metal.

BUILDING MATERIALS

PROTECTION OF. The Protection of Concrete and Other Building Materials against Water and Noxious Fumes, Maximilian Toch. Indus. & Eng. Chem., vol. 15, no. 7, July 1923, pp. 665-666. Notes on protection of concrete, steel, wood, brick and hollow tile.

BUILDINGS

FIRE PROTECTION AND SANITATION. Buildings from the Manager's Viewpoint, G. L. H. Arnold. Management and Administration (Management Eng. & Administration), vol. 6, no. 1, July 1923, pp. 43-47, 9 figs. Practical suggestions on fire protection, sanitation, and service equipment.

MECHANICAL PLANT. Mechanical Plant of John Hancock Building, Charles L. Hubbard, Power Plant Eng., vol. 27, no. 13, July 1, 1923, pp. 659-664, 9 figs. Plant of new Boston office building to meet diversified service requirements, including special systems of heating, ventilating and air-conditioning apparatus, elevators, refrigerating machinery, domestic-hot-water and drinking-water service, sanitary equipment and special automatic drainage systems extending below system, electrical equipment, pneumatic conveyor, etc.

MOVING. Simple Methods of Trussing and Bracing Extra Wide Buildings for Moving, E. W. LaPlant. Bldg. Age, vol. 45, no. 6, June 1923, pp. 70-72, 4 figs. Practical details to be employed in connection with three-point method of loading.

SKY-SCRAPERS. Construction of New York Sky-Scrapers (La construction des "gratte-ciel" de New-York), Henri Pantz. Arts & Métiers, vol. 76, no. 31, Apr. 1923, pp. 525-533, 18 figs. Details of design and construction of Woolworth, Singer, Equitable, and other buildings, also Wilmington (Del.) sugar factory.

BUSES

STREET SPACE OCCUPIED BY. Street Space Occupied by Cars and Buses, Daniel L. Turner. Elec. Ry. Jl., vol. 61, no. 22, June 2, 1923, pp. 957-958. Comparison of various types of single-deck and double-deck street cars and buses in New York and Great Britain; on a seat basis double deck designs show up well, but for American conditions cars do not compare unfavourably.

TROLLEY. Trackless Trolley on the Increase. Elec. Traction, vol. 19, no. 6, June 1923, pp. 288-289, 2 figs. Successful operation in several cities proves that the trackless trolley has a real place in modern transportation.

Trolley Buses (Les Omnibus à Trolley), Jean Boes. Industrie des Tramways, Chemins de Fer et Transports Publics Automobiles, vol. 17, no. 197, May 1923, pp. 172-180, 22 figs. Compares economics of street railways, trolley buses and motor buses; details of design and construction, including chassis, electric motors, current feeds, overhead lines, etc.; their development in various countries.

C

CABLES, ELECTRIC

ALUMINUM. Steel-Cored Aluminum Cables for Overhead Lines, H. Krautt. Electrician, vol. 90, no. 2353, June 32, 1923, p. 677. Objections to steel core, a table for manufacturers. Abstracted from Elecktrotechnik und Maschinenbau, vol. 41, p. 113.

UNDERGROUND SYSTEMS. Underground Transmission at 44 Kv., R. E. Dennis and H. R. Searing. Elec. World, vol. 82, no. 2, July 14, 1923, pp. 64-69, 9 figs. Increased demands on Westchester Lighting Co. for energy has necessitated raising existing voltage of 13,200 to 44,000 volts, single-conductor cables used, 18,000-kva. self-cooled transformers.

CABLES, HOISTING

CONSTRUCTION. Hoisting Apparatus (Les Appareils de Levage et de Manutention à bras), Marcel Demoux. Métallurgie, vol. 55, no. 22, May 31, 1923, pp. 785-789, 13 figs. Construction and manufacture of metal cables; nature of metals; etc.

ELEVATOR. Hoisting-Rope Compensation on Elevators, A. A. Gazda. Power, vol. 52, no. 2, July 10, 1923, pp. 58-60, 8 figs. Compares the various arrangements of compensating cables and shows their relative advantages.

CALORIMETERS

JUNKERS. The Junkers Calorimeter. Gas Jl., vol. 162, no. 3136, June 20, 1923, p. 726, 1 fig. Flow calorimeter designed for testing gases and liquids.

CAR LIGHTING

ELECTRIC. Car Lighting on the Canadian National Railways, A. H. Mattlaw. Ry. Elec. Engr., vol. 14, no. 6, June 1923, pp. 171-173, 9 figs. Difficulties encountered in winter-time maintenance of electrically lighted cars in Quebec.

CARBURETORS

Test Chamber for Aircraft. Description of Carburetor Test Chamber and Method of Making Computations, J. M. Miller. Air Service Information Circular, vol. 5, no. 405, Apr. 1, 1923, 16 pp., 11 figs. Designed and built by Engineering Division of Air Service to determine metering characteristics—mixture ratio and fuel flow—of aviation-engine carburetors under various conditions of temperature, air flow, throttle opening, and altitude, description of apparatus and computation of test results.

CARS

Painting. Time of Painting a Car Cut in Half, J. A. Lucas. Elec. Ry. Jl., vol. 62, no. 1, July 7, 1923, pp. 3-6, 7 figs. Pneumatic spray painting system, introduced at Cold Springs Shops, Milwaukee, proves effective and economical.

Street-Railway, Storage of. Inclosed Storage Favored from Standpoint of Service Reliability. Elec. Ry. Jl., vol. 61, no. 24, June 16, 1923, pp. 993-996, 1 fig. Survey of experience and opinion, comparing open and closed street-railway car storage.

CARS, REFRIGERATOR

Design. A Notable Development in Refrigerator Car Design. Ry. Rev., vol. 72, no. 24, June 16, 1923, pp. 1015-1032, 30 figs. New C. M. & St. P. Ry. experimental refrigerator car represents original analysis of refrigeration and structural problems; refrigeration problems involved in design; structural features.

CENTRAL STATIONS

Auxiliary Drives. Electric Drive for Station Auxiliaries, M. D. Engle. Elec. Light & Power, vol. 1, no. 6, June 1923, pp. 92-95 and 107, 3 figs. Combinations of steam-driven and motor-driven auxiliaries best suited to plants under 1000 kw., from 1000 to 5000 kw., and larger than 5000 kw.

Electrical Equipment. Desirable Duplication and Safeguarding in the Electrical Equipment of a Generating Station, William F. Sims. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923, pp. 704-705. Discusses more important considerations to be taken into account and points out that local conditions will have determine influence on decision made.

Short Circuits in. Short Circuits in Central Stations and How to Remedy Them (Phénomènes de court-circuit dans les stations centrales et moyens d'y remédier), A. R. Garnier. Industrie Electrique, vol. 32, no. 742, May 25, 1923, pp. 186-189, 3 figs. Discusses effect of short circuits on generators and proposes checking coils as most simple and effective remedy.

CEMENT

Alumina. Rapid-Hardening or Fused Cements [Les ciments à durcissement rapide (ciments fondus)], F. Anstett. Revue des Matériaux de Construction et de Travaux Publics, no. 162, Mar. 1923, pp. 49-52, 8 figs. Compares characteristics of alumina or fused cement with those of Portland cement; its applications.

Chemical Action of Liquids. Chemical Action of Various Liquids on Cement (Chemische Einwirkung verschiedener Flüssigkeiten auf Beton), Th. Gesteschi. Bautechnik, vol. 1, no. 24, June 8, 1923, pp. 222-223. Use of cement for containers, pipe lines, etc.; for aqueous solutions, oils and fats; deleterious action of H_2SO_4, salts, acids, fatty acids, salty water, etc.

CEMENT, PORTLAND

Manufacture. Various Processes for Portland Cement Manufacture (A propos des divers procédés de fabrication du ciment Portland), Jules Dautrebandf. Revue des Matériaux de Construction et de Travaux Publics, no. 160, Jan. 1923, pp. 6-7. Grinding and preparation of mixture from prime materials, heating, grinding of clinker resulting; wet and dry processes; vertical and rotary furnaces used.

CHROMIUM

Occurrences and Uses. Chromium, Henry Bailey. Can. Min. Jl., vol. 45, no. 24, June 15, 1923, pp. 459-460. Occurrences and uses. From Raw Materials Rev.

CIRCUIT BREAKERS

Oil Type. Oil Circuit Breaker Development, H. Michener. Jl. Electricity & West. Ind., vol. 50, no. 11, June 1, 1923, pp. 427-428, 1 fig. Increasing capacities and rearranging the system; carrying capacity of circuit breakers, etc. Report Oil Circuit Sub-Committee of Apparatus Committee before Pacific Coast Elec. Assn.

Selection and Design of Oil Circuit Breakers, W. A. Coates. Denki Gakkwai Zasshi (Jl. Inst. Elec. Engrs. of Japan), no. 418, May 1923, pp. 417-428, 10 figs. Apparatus for proper rating and selection of oil circuit breakers; calculation of short circuit breakers; design.

COAL

Anthracite. Report of U. S. Coal Commission on Anthracite. Coal Age, vol. 24, no. 2, July 22, 1923, pp. 43-62. Contains information regarding the questions whether in anthracite industry a reasonable return on investment can be paid to owners and operators, decent living conditions and an adequate wage based on American standards furnished to mine workers, proper return made to railroads and dealers, and coal be delivered to patrons of the industry at lower prices than those now charged; also what can be done to assure ample supply of anthracite with constant flow from mine to consumer.

Cutting Machine. Some Recent Developments in Electrical Coal Cutting Machines. Min. Jl., vol. 141, no. 4581, June 9, 1923, pp. 439-440, 2 figs. Describes machines for arc walling and short walling, also a development which is rapidly gaining favour, which consists in fitting of a Leonard & Rogers self-propelling gear, incorporating Duplex chain, to a long-wall coal cutter, and using the combination to function on arc wall principle.

Carbonization. A Study of Some Physical Laws Governing the Carbonization of Coal, A. W. Warner. Am. Gas Assn. Monthly, vol. 5, no. 7, July, 1923, pp. 431-441, 2 figs. Experiments from which five basic laws governing carbonization were deduced.

Low Temperature Carbonization, J. Taylor. Am. Gas Jl., vol. 118, no. 26, June 30, 1923, pp. 561-564, 4 figs. Construction of retorts and settings; details of operation in British gas works, properties of coalite produced.

Classification. The Classification of Coals, T. J. Drakeley. Fuel in Sci. & Practice, vol. 2, no. 6, July 1923, pp. 195-200, 4 figs. Review of different systems of classifying coal, analysis of coal.

Coking Test. A New Apparatus for the Coking Test of Coal, R. Lessing. Fuel in Sci. & Practice, vol. 2, nos. 5 and 6, June and July 1923, pp. 152-156 and 186-190, 7 figs. Descriptions of author's method, showing how it has been developed, present form of apparatus and method of operation.

Fuel Value. Coal and Its Value as Fuel (Die Steinkohlen und ihr feuerungstechnischer Wert), I. Starke. Feuerungstechnik, vol. 11, no. 16, May 15, 1923, pp. 169-171, 2 figs. Classification of coal by occurrence; heating value of coals, temperature of combustion, fuel economies.

Spontaneous Combustion. Spontaneous Combustion of Coal (Trakols sjalvantandning), Hilding Bergstrom. Jernkontorets Annaler, vol. 107, no. 2, 1923, pp. 39-45, 4 figs. Heating of coal pile, temperature determination and remedial measures.

Volatiles in, Determination of. Determining Volatiles in Coal and Anthracite (De bepaling van vluchtige stoffen in steenkoolen, anthraciet en de omrekening hiervan op droge stof en koolsubstantie), D. J. W. Kreulen. Chemisch Weekblad, vol. 20, no. 17, Apr. 28, 1923, pp. 225-229, 2 figs. Discusses Bochumer method, and results of experiments, including tables of volatiles from original coal substance and dry substance.

COAL DUST

Explosive Agent. Coal Dust as an Explosive Agent, George S. Rice. Iron & Coal Trades Rev., vol. 106, no. 2885, June 15, 1923, p. 893. Special reference to experimental work of U. S. Bur. Mines; describes investigations in U. S. and recent findings. From paper before Instn. Min. Engrs. See also Colliery Guardian, vol. 125, no. 3260, June 22, 1923, pp. 1575-1576.

COAL GAS

Purification. Some of the Latest Developments in Gas Purification, E. H. Bird. Chem. & Met. Eng., vol. 29, no. 1, July 2, 1923, pp. 16-18. Extension of use of sodium carbonate process for gas purification during year has developed additional data on construction of absorber and actifier units, tower packing, disposal of actifier air and plant operation.

COAL HANDLING

Pneumatic. The Pneumatic Handling of Coal. Indus. Management (Lond.), vol. 9, nos. 12 and 13, June 14 and 28, pp. 371-373 and 403-405, 5 figs. Points out failures that have occurred are not due to faulty principle, but rather to its faulty application through imperfect knowledge or lack of experience. Describes pneumatic plant at North Metropolitan power station, Brimsdown.

COAL MINES

Economical Life. Determining What Is Most Economical Life for a Mine, Frank Hass. Coal Age, vol. 23, no. 26, June 28, 1923, pp. 1043-1045, 6 figs. Consideration of amount that should be spent to obtain from investments best returns.

COAL MINING

British Columbia. Coal Mining in the Crow's Nest Pass, Robert Dunn. Pacific Min. News of Eng. & Min. Jl.-Press, vol. 2, no. 6, June 1923, pp. 162-166, 6 figs. Discusses coal field at Crow's Nest Pass, British Columbia; description of mines and operations; aggregate production over 5,000,000 tons.

COAL STORAGE

Detroit Water Works. Coal Storage for Year's Supply for Detroit Water-Works. Eng. News-Rec., vol. 91, no. 1, July 5, 1923, pp. 10-11, 2 figs. Duplicate coal-handling equipment gives continuity of service; dragline scrapers reclaim coal to feed hoppers.

COAL TAR

Low-Temperature. The Examination of Low-Temperature Coal Tars, Jerome J. Morgan and Roland P. Soule. Indus. & Eng. Chem., vol. 15, nos. 6 and 7, June and July 1923, pp. 587-591 and 693-697, 2 figs. Critical review of available methods of analysis of composition of tars produced in low-temperature carbonization of coal. June: Analysis of phenols, nitrogen bases, and of saturate hydrocarbons. July: Separation of aromatic and unsaturated compounds from a mixture.

COAL TIPPLES

Design. Well Designed Tipple in the Pocahontas Field (W.Va.), Merrill Hibbard. Coal Industry, vol. 6, no. 6, June 1923, pp. 280-282, 4 figs. Provision made for loading any combination of sizes on four tracks; special precaution necessary to handle friable coal from this field.

COKE

Bituminous-Coal. A Method of Making Non-Fingery Coke from Bituminous Coals High in Volatile Matter, Kotaro Shimomura. Chem. & Industry, vol. 42, no. 23, June 8, 1923, pp. 556-558, 4 figs. Method developed by author with object of making coke manufacturer independent of anthracites or coals of low volatile matter, in production of non-fingery coke.

Blast-Furnace. Combustibility of Blast Furnace Coke, Ralph A. Sherman and S. P. Kinney. Iron Age, vol. 111, no. 26, June 28, 1923, pp. 1839-1844, 6 figs. Depends mainly on size of pieces of coke; its relation to operation of furnace; discussion of re-oxidation theory and theory of concentration of heat. Paper read before Eastern States Blast Furnace & Coke Oven Assn.

Combustibility. The Combustibility of Coke, Ralph A. Sherman. Fuels & Furnaces, vol. 1, no. 2, June 1923, pp. 97-100. Describes experiments conducted by U. S. Bur. Mines. It was found that differences in blast-furnace and foundry operation cannot be attributed to differences in relative combustibilities of cokes.

Gas, Use as Fuel. Gas Coke as a Fuel (Le coke de gaz, combustible industriel), H. Decluy. Chaleur et Industrie, vol. 4, no. 37, May 1923, pp. 442-448. Composition and properties, production and applications of gas coke; steam production with gas coke.

COKE MANUFACTURE

Ammonia Yield, Increasing. Possibilities of Increasing Ammonia Yields in Coke Oven Practice, R. A. Mott. Gas World, vol. 78, no. 2015, Mar. 3, 1923, pp. 12-17 (includes discussion), 5 figs. Nitrogen content of coal and ammonia yield; coking temperatures and distribution of nitrogen; dissociation of ammonia; recovering nitrogen in coke; preservation of ammonia, various atmospheres employed; effect of contact materials; increased water vapour influence of old walls; part played by water in oven; rate of gas evolution, steaming ovens and coke gasification; difficulties of steaming process. Paper read before Coke Oven Mgrs.' Assn.

By-Product. Coke and By-Products in 1921, R. S. McBride. U. S. Geol. Survey, II:33, June 14, 1923, pp. 371-444, 11 figs. Production, disposal, and by-products of coke. Covers beehive and by-product coke but not coke produced in gas plants.

Modern Practice. A Few Notes on Modern Tendencies in Coking Practice, C. E. Wallin. Can. Inst. Min. & Met. Bul., no. 135, July 1923, pp. 447-450 and (discussion) 450-452. Factors entering into coking development. Paper before Min. Soc. of Nova Scotia.

COKE OVENS

By-Products. The Modern By-Product Coke Oven and Its Application, C. J. Ramsburg. Central Ry. Club Official Proc., vol. 31, no. 3, May 1923, 1374-1376. Review of development.

CONCRETE

Aggregates. Stone Screenings as Fine Aggregate for Concrete, Duff A. Abrams. Can. Engr., vol. 44, no. 24, June 12, 1923, pp. 577-579. Determination of relative merits of crushed stone screenings and natural sand as fine aggregate for concrete, details and results of tests. Paper read at Nat. Crushed Stone Assn. annual mtg.

PERMEABILITY. Investigations and Experiences Concerning the Permeability of Mortar and Concrete (Untersuchungen und Erfahrungen über die Wasserdurchlässigkeit von Mörtel und Beton), Otto Graf. Bauingenieur, vol. 4, no. 8, Apr. 30, 1923, pp. 221-226, 4 figs. Vital influence of treatment of mortar and concrete and of cement-lime-trass mortar; dependence of permeability of concrete on age, cement, water addition, etc. Results of tests carried out material testing station of Stuttgart Eng. College.

CONCRETE CONSTRUCTION, REINFORCED

RESERVOIRS AND DAMS. Grinding Mill Operating Successfully in Brazil, C. W. Comstock and R. A. Marshall. Concrete, vol. 22, no. 6, June 1923, pp. (Cement Mill Section) 121-125, 13 figs. Describes construction under way of a series of enormous reservoirs in states of Ceara, Parahyba and Rio Grande do Norte in northeastern part of the country to protect it against recurrent droughts, including dams; design of clinker grinding plant.

CONDENSERS, STEAM

SURFACE. An Improved Form of Surface Condenser, Luther D. Lovekin. Pac. Mar. Rev., vol. 20, no. 7, July 1923, pp. 353-354, 1 fig. Design and advantages of Lovekin condenser.

Interpretation of Surface-Condenser Readings, B. C. Sprague. Power, vol. 58, no. 2, July 10, 1923, pp. 47-49, 1 fig. Determination of condition of tube surfaces from condenser readings; readings obtainable and significance; important factors affecting heat transfer.

TUBES. Condenser Tubes, C. Blazey. Commonwealth Engr., vol. 10, no. 8, Mar. 1, 1923, pp. 285-287, 3 figs. Corrosion and protection of condenser tubes; grain size and crystal structure.

CONVEYORS

BELT, FOR CLAY HANDLING. Handling Clay with Belt Conveyors. Brick & Clay Rec., vol. 62, no. 13, June 26, 1923, pp. 1136-1137, 1 fig. Simple design, comparatively low cost, and requires little power to drive it. Factors to be considered in deciding upon conveyor for clay.

STEEL BELT. Flexible Steel Belts for Sugar Conveyors, N. B. Wilkes. La. Planter & Sugar Mfr., vol. 70, no. 22, June 2, 1923, pp. 478-480, 13 figs. Consists of a solid, perfectly straight and smooth hardened and tempered steel strip, cold rolled from a high grade of Swedish steel.

WORKSHOP. Using Workshop Conveyors to Reduce Costs, M. J. Anderson. Can. Machy., vol. 29, no. 26, June 28, 1923, pp. 15-17 and 35, 1 fig. Describes rearrangement and improvement of systems which made it possible to attain much larger output without additional floor space.

COOLING TOWERS

DESIGN. Cooling Towers and Ponds, Charles L. Hubbard. Southern Engr., vol. 39, no. 4, June 1923, pp. 50-54, 9 figs. Design and construction of cooling towers, use of cooling ponds, and data and computations.

COST ACCOUNTING

CHEMICAL WORKS. Methods of Costing in Chemical Works, F. M. Potter. Chem. Age (Lond.), vol. 8, nos. 207 and 208, June 2 and 9, 1923, pp. 588-589 and 612-615, 3 figs. Correct use of cost returns; gaseous losses; continuous improvement; maintenance of balance; mechanical handling and fuel costs plant maintenance; faulty conditions; accident and sickness costs.

LABOR. Keeping Time and Pay Records, Carbis A. Walker. Iron Trade Rev., vol. 73, no. 1, July 5, 1923, pp. 38-41, 10 figs. Forms for compiling reports in iron and steel plants, and system that has proved efficient.

COSTS

PRODUCTION. The Three Points of Attack on Production Costs, C. C. Hermann. Indus. Management (N. Y.), vol. 66, no. 1, July 1923, pp. 53-58, 5 figs. Analyzing the product, the plant, and the inter-relationship of operations.

CRANES

ELECTRIC EQUIPMENT. Electric Equipment of Cranes and Hoisting and Conveying Apparatus in the Late Decade (Einiges über die Entwicklung der elektrischen Ausrüstungen von Kranen, Aufzügen und Transportanlagen im letzten Dezennium), Ernst Schwarz. Elektrotechnik u. Maschinenbau, vol. 41, no. 23, June 10, 1923, pp. 341-346, 8 figs. Calculation of motors for cranes, a. c. and d. c.; control and switching devices; safety devices; starting and regulating resistance; electromagnets; etc.

CULVERTS

CONCRETE. Culverts and Small Bridges, E. L. Miles. Can. Engr., vol. 44, no. 25, June 19, 1923, pp. 600-661. Adequate drainage essential to maintenance of good roads; laying concrete pipe and box culverts; field tests for gravel. Paper read at Can. Good Roads Assn. annual convention.

CUPOLAS

DESIGN. The Foundry Cupola. Metal Industry (Lond.), vol. 22, no. 23, June 8, 1923, pp. 593-594. Discussion of most favourable conditions of cupola design.

LININGS. Cupola Linings, Walter J. May. Mech. World, vol. 73, no. 1900, June 1, 1923, p. 345. Features upon which life of cupola lining depends.

CUTTING TOOLS

GRINDING AND SETTING. Grinding and Setting of Metal Cutting Tools, J. H. Rodgers. Can. Machy., vol. 29, nos. 19 and 23, May 10 and June 7, 1923, pp. 14-17, 28 and 35, 13 figs. Effect of rake and clearance on efficiency of tool; overhang should be kept as short as possible; boring and threading holes, etc.; gives tool-grinding chart.

D

DAMS

CORE WALLS. Core Walls for Earth and Rock Fill Dams, C. H. Howell. Eng. World, vol. 22, no. 66, June 1923, pp. 365-367, 2 figs. Advantages and disadvantages of core walls built of masonry, concrete or rubble, and thos of "puddled" material; examples of core-wall construction.

DIELECTRICS

LOSSES. A Bridge Method for Determining Dielectric Losses at Wireless Frequencies, Morris D. Hart. Instn. Elec. Engrs., Jl., vol. 61, no. 319, June 1923, pp. 697-700, 6 figs. Principle employed is that of modified form of Wheatstone bridge; description of apparatus used.

DIESEL ENGINES

DESIGN. Elements of Diesel Engine Design, David Bruce. Oil Engine Power, vol. 1, nos. 1, 3, 4, 5 and 7, Jan., Mar., Apr., May and July 1923, pp. 27-28, 142-144, 184-187, 249-252 and 351-354, 20 figs. Brief description of engine, its underlying principles and the various ways in which these may be applied, the various formulas and practices adopted in drawing office, problems of balance and of twisting and bending moments in crankshafts, flywheel calculations, cylinders, pistons and bearing pressures, scavenge systems, valve timing. Paper read before Assn. Eng., Shipbldg. & Draftsman.

POWER-PLANT. Types of Modern Power Plant Oil Engines. Oil Engine Power, vol. 1, no. 7, July 1923, pp. 340-344 and 349-350, 10 figs. Describes Worthington crosshead-type vertical two-cycle engine having airless injection system combined with a pre-combustion chamber; has scavenge pumps at lower end of cylinders and incorporates balancing principles so successfully used in high-speed steam-engine power.

WATER-WORKS PRACTICE. The Diesel Oil Engine for Water Works Service, Charles E. Lucke. Also Direct Connection of Diesel Engines and Displacement Pumps, Rodney D. Hall; Displacement Pumps Gear Driven by Diesel Engines at Reduced R.P.M., H. M. Chase; Centrifugal Pumps for Diesel Engine Drive, Max Spillmann; and Water Works Equipment—Steam vs. Oil Engine, Rodney M. Hall. New England Water Works Assn.—Jl., vol. 37, no. 2, June 1923, pp. 145-183 and (discussion) 183-189, 23 figs. Development of Diesel engines for water-works service and its application to the different phases of the practice.

DRILLING

ROTARY METHOD. The Rotary. Oil Field Eng., vol. 25, no. 6, June 1923, pp. 126-128, 4 figs. Development of Hughes rotary rock bit and its effects.

DROP FORGING

EQUIPMENT. Modern Drop Forging Equipment, Bernard Brett. Practical Engr., vol. 67, nos. 1892 and 1893, May 31 and June 7, 1923, pp. 303-305 and 314-316, 11 figs. Equipment for drop hammers; describes lifter or appliance controlling tup, furnaces for providing drive, clipping press, and dies.

DURALUMIN

HEAT TREATMENT. Investigation of the Heat Treatment of Sand-Cast Duralumin, Samuel Daniels. Air Service Information Circular, vol. 5, no. 408, Apr. 1, 1923, 13 pp., 6 figs. Investigation to determine effect of chemical composition and heat treatment upon physical properties of sand-cast duralumin, and to develop a duralumin which, upon treatment, will possess certain given properties.

DUST

INDUSTRIAL, REMOVAL OF. Dangers of Industrial Dusts and Fumes, C. E. A. Winslow. Forging & Heat Treating, vol. 9, no. 6, June 1923, pp. 271-272. Atmospheric, metallic or mineral dusts constitute a serious menace to health; wet grinding or special dust removal systems advocated to reduce this danger.

E

EARTH

PRESSURE. Multitude and Direction of Earth Pressure (Betrachtungen über Grösse und Richtung des Erddruckes), H. Krey. Bautechnik, vol. 1, no. 24, June 8, 1923, pp. 219-222, 5 figs. Passive and active earth pressure; stress ellipses and inclinations; etc.

EDUCATION, ENGINEERING

CO-OPERATIVE. Ten Years of Co-operative Education, Herbert D. Casey. Machy. (N.Y.), vol. 29, no. 11, July 1923, pp. 861-862, 2 figs. Co-operative course organized as department of public schools in Springfield, Vt.

LABORATORY INSTRUCTION. Laboratory Instruction in Engineering, Roy Kegerreis. Eng. Education, vol. 13, no. 10, June 1923, pp. 620-625. Suggestive problems; term laboratory work is used broadly to include all processes of working out problems by trial, observation, experiment, and similar methods.

PROMOTION OF. Developing Engineering Education, H. C. Woods. Eng. Education, vol. 13, no. 10, June 1923, pp. 626-629. Suggestions for promotion of engineering education.

STUDENT ENROLLMENT IN UNIVERSITIES. Fluctuations in Student Enrollment in Engineering Courses in American Universities and Colleges, Alan Bright and W. F. Rittman. Eng. Education, vol. 13, no. 10, June 1923, pp. 632-642, 9 figs. Data furnished by the typical American universities and colleges show trends in interest in engineering education during past 10 years. See also (abstract) in Mech. Eng., vol. 45, no. 7, July 1923, p. 449, 2 figs.

ELECTRIC CIRCUITS, A.C

REGULATION DIAGRAM FOR. Quick Calculation of Line Regulation, Cary T. Hutchinson. Elec. World, vol. 81, no. 25, June 23, 1923, pp. 1465-1467, 1 fig. Chart which permits determination of characteristics that line must have to meet given performance.

ELECTRIC DISTRIBUTION SYSTEMS

COST DISTRIBUTION. The Most Economical Distribution of Costs of Electric Distribution Lines and Transformer Stations (Die wirtschaftlich günstigste Aufteilung der Kosten von Verteilungsleitungen und Transformatorenstationen), Walter Suntermann. Elektrotechnische Zeit., vol. 44, no. 21, May 24, 1923, pp. 485-486, 3 figs. Investigation of economic relationship between operating costs of parts of a transmission system (distribution lines and transformers) and those of high-tension line; results are shown on alignment chart for most commonly used voltage of 380-220 volts.

ELECTRIC FURNACES

GREAVES-ETCHELLS. Greaves-Etchells System of Electric Furnaces, Frank Hodson. Fuels & Furnaces, vol. 1, nos. 1 and 2, May and June 1923, pp. 21-24 and 107-108, 1 fig. Eight-electrode furnace which has three times transformer capacity of next largest steel furnace; furnace linings, flexibility of operation.

INDUCTION. High-Frequency Induction Furnaces (Högfrekvens-induktionsugnen), J. Hardén. Teknisk Tidskrift, vol. 53, no. 5, Feb. 3, 1923, pp. Elektroteknik 2 Section) 18-21, 6 figs. Arrangement of furnace, primaries, spark gaps, crucibles, thermal efficiency of boilers, etc.

Induction Furnace for Non-Ferrous Metals. Four à induction pour metaux non ferreux), Emile Demenge. Société des Ingenieurs Civils de France—Procès-Verbal, no. 10, May 11, 1923, pp. 362-366. Its advantages absence of electrodes and their control; describes an experimental furnace of 80 kw. giving entire satisfaction.

Progress in the Field of High-Frequency Induction Heating. Fortschritte auf dem Gebiete der Hochfrequenz Induktionsheizung), E. Ey. Bass. Elektrotechnische Zeit., vol. 44, no. 21, May 24, 1923, pp. 481-484, 9 figs. Development of and experiences with high-frequency electric furnaces during past two years, improvements in high-frequency generators, deals with melting, high temperature and vacuum, crucible, mufle, heat treating, and other furnaces.

IRON MELTING. Electric Furnaces for the Production of Cast Iron, Its Present Development (Der Elektroofen zur Erzeugung von Gusseisen, seine gegenwärtige Entwicklung), Wintermeyer. Elektrotechnische Anzeiger, vol. 40, no. 88, June 2, 1923, pp. 613-614. Electric [illegible] and its application in production of synthetic cast iron, advantages [illegible]

NON-FERROUS. Electric Melting of Non-Ferrous Alloys, H. W. [illegible], Fuels & Furnaces, vol. 1, nos. 1 and 2, May and June 1923, pp. [illegible] May. Present progress, three types of electric [illegible] granular resistor type. June. Description of equipment [illegible] furnace.

Refractories. Requirements of Refractories for Electric Furnaces, Clyde L. Wheeler. Am. Ceramic Soc.—Jl., vol. 6, no. 6, June 1923, pp. 753-760. Discussion of problems existing in important electric furnace processes; specific conductance and refractory requirements in steel iron and non-ferrous metal melting; heating furnaces for producing iron, ferrosilicon and calcium carbide, and refractories for melting refractory materials.

Resistance. Resistance Electric Furnace Installations. T. J. Ryan. Fuels & Furnaces, vol. 1, no. 1, May 1923, pp. 39-40. Describes small resistance type electric heating furnace installed at plant of Barco Metal Corpn.

Steel. Electric Furnaces for Heat Treatment of Steel. A. W. Lawrence. Fuels & Furnaces, vol. 1 no. 2, June 1923, pp. 101-106, 7 figs. Description of carburizing furnace for reconditioning locomotive side rods at Transcona Shops of Can. Nat. Rys.

Vacuum. Vacuum Furnace. Les fours à décharge dans le vide. J. Bossino. Nature Paris, no. 2566, June 9, 1923, pp. 365-366, 6 figs. Describes various types of carbide furnaces; work of Parsons and Campbell; notes on Tiede, Wartenberg, Fischer and other furnaces.

ELECTRIC GENERATORS, D.C.

Voltage Regulators. Generator Voltage Regulators—Direct-Current Type, J. H. Ashbaugh. Power, vol. 58, no. 3, July 17, 1923, pp. 92-94, 4 figs. Operation of a regulator for automatically controlling voltage of d.c. generators; how to put machines into service and take them out when using this device.

ELECTRIC LAMPS, INCANDESCENT

Developments. Progress in Electric Luminous Tubes (Fortschritte auf dem Gebiettre der elektrischen Leuchtruhren), Franz Skaupy. Licht u. Lampe, no. 10, May 10 1923, pp. 233-235, 5 figs. Construction and use of dimmers consisting of a 220-volt bulb a.c. or d.c., and luminous tubes such as Giesler, Moore, mercury-vapor, neon-gas, etc., giving examples of application.

ELECTRIC LOCOMOTIVES

A.C.-D.C. New 180-Ton A.C. or D.C. Locomotive of the New York, New Haven and Hartford Railway (Nouvelle locomotive électriquede 180 tonnes à courant continu ou alternatif, du New York, New-Haven and Hartford Railway). Génie Civil, vol. 82, no. 24, June 16 ,1923, pp. 565-569, 6 figs. A.C. double feed arrangement of 11,000 volts and d.c. of 150,000 volts; details of design; chateristics of American and English locomotives.

Narrow-Gage D.C. Narrow Gauge D.C. Electric Locomotives for Japan, P. L. Mardis. Ry. Rev., vol. 72, no. 24, June 16, 1923,pp. 1043-1045, 5 figs. Regenerative braking and multiple-unit operation provided in direct-current design developing 1200 hp. and 30,250 lb. tractive effort.

ELECTRIC PLANTS

Protection. Differential System for Protecting Three-Phase Plants (Et Differentialsystem til Beskyttelse af Trefaseanlaeg), R. Johns. Jensen. Teknisk Tidsskrift (Elektroteknikeren), vol. 19, no. 2, Jan. 24, 1923, pp. 9-13, 16 figs. Protection of machinery transformers, and feeder cables to substations by relays of Merz and Price system, at new Orsted central station in Copenhagen.

ELECTRIC METERS

Testing Laboratory. The Detroit Edison's Meter Laboratories, A.S. Albright. Elec. world, vol. 81, no. 26, June 30, 1923, pp. 1508-1512, 11 figs. How meters are calibrated and inspected on system where 340,000 of them are installed; standardizing and testing laboratories equipped to test 100,000 meters a year; meter-department organization.

ELECTRIC MOTORS

Induction. The Pulling into Step of an Induction-Type Synchronous Motor, Laurence H. A. Carr. Inst. Elec. Engrs., Jl., vol. 61, no. 319, June 1923, pp. 692-696, 5 figs Mathematical determination of limiting conditions under which an induction-type synchronous motor will full into step.

ELECTRIC RAILWAYS

Contact Wires, Bronze. Erie Replaces Steel Contact Wire With Bronze. Ry. Age, vol. 74, no. 30, June 30 1923, pp. 1693-1696, 11 figs. New contact wire is being strung on electrified section of railroad extending from Rochester to Mt. Mt:Morris, N. Y., distance of 34 mi.

Iowa. The Elecrtic Railway of Iowa. Elec. Traction, vol. 19, no. 6, June 1923, pp. 278-285, 6 figs. Statistics about electric railways in Iowa, which number 28 and have approximately 1100 miles of track.

Motors. The 3-Phase Induction Motor in Relation to the D.C. Motor with Separate Excitation (Die Drehstrom-Induktrionsmaschine als erweiterter Sonderfall der Gleichstrommaschine mit Fremderregung), W. Kummer. Schweizerische Bauzeitung, vol. 81, no. 23, June 9, 1923, pp. 281-283, 5 figs. Calculations supplementary to author's work entitled, Operation Curves and Safety of Different Methods of Regenerative Braking in Electric Railways, published in same journal, vol. 77, Mar. 26 and Apr. 2, 1921. (See reference in Eng. Index, 1921, p. 188).

ELECTRIC TRANSMISSION LINES

Extra High-Tension. A study on Economical Design of Extra High-Tension Transmission Line, M. Suzuki. Denki Gakkwai Zasshi (Jl. Inst. Elec. Engrs. of Japan no. 419, June 1923, pp. 481-521, 13 figs. Economical design of extra high-tension transmission lines, equations for tower height and weight and equations showing relation between tower weight and span, tower weight and conductor size, and tower weight and line voltage, formula for calculation of economical conductor size, economical transmission voltage and economical span, analysis of installation cost of transmission line and practical application of formula. (In Japanese)

High-Tension. Atmospheric Disturbances on High-Tension Lines (Les perturbations atmosphériques sur les lignes à haute tension), M. Marre. Electricien, vol. 39, no. 1326, June 15, 1923, pp. 265-269, 7 figs. Excess voltage; cost of interruptions, means of protection, static charges, direct and indirect strokes of lightning; etc.

High-Voltage Tension. Economics of High Voltage Transmission, Ralph Kelly. Elec. Light & Power, vol. 1, no. 6, June 1923, pp. 102-104 and 107, 6 figs. Discussion of number of kilowatts necessary to utilize 220 kv.; effect of grounding transmission line neutrals, commercial use of high voltages.

Overhead. Transmission and Distribution of Electricity by Overhead Lines, J. Edwin Storr. Elec. Times, vol. 63, no. 1653, June 21, 1923, pp. 642-644. Range and choice of voltages, designs for poles and foundations, foundation calculations, spacing of conductors, etc. (Abstract.)

Relaying, Selective. Selective Relay System of the 66,000-Volt Ring of the Duquesne Light Company, H.P. Sleeper. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923, pp. 723-727, 10 figs. Investigation shows advisability of using scheme of balanced directional relays for short-circuit protection, and selective differential current relays for ground protection, on 66,000-volt ring of Duquesne Light Co.; description and results of tests.

ELECTRIC UNITS

Standardization. The Standardization of Electrical Formulas, Symbols and Units. Versuch einer einheitlichen Darstellung der Formeln, Zeichen und Einheiten der Elektrotechnik, J. L. Marteau. Elektrotechnische Zeit., vol. 44, no. 22, May 31, 1923, pp. 529-532. An attempt to express electric and magnetic phenomena with use of only five basic units; desired system are said to be simpler to comprehend and clearer than the unnecessary electromagnetic and electrostatic units.

ELECTRICAL MACHINERY

Commutation. Development of Theory of Commutation (En by vag for kommutering steoriens utveckling), L. Dreyfus. Teknisk Tidskrift, vol. 53, no. 5, Feb. 3, 1923, pp. 13-18, 3 figs. Discusses new theory based on mathematical commutation equations and their solution, compares old and new theories.

ELECTROLYTES

Ionization. The Ghosh Theory Regarding Strong Electrolytes (De theorie van Ghosh over sterke elektrolyten), Ada Prins. Chemisch Weekblad, vol. 20, no. 18, May 5, 1923, pp. 237-242, 2 figs. Arrhenius theory of electrolytic dissociation; Ghosh theory and postulates, that strong electrolytes are completely ionized, structure of crystals in connection with this.

EMPLOYEES, TRAINING OF

Highway Builders. Training Highway Builders, R. de L. French. Can. Eng., vol. 44, no. 25, June 19, 1923, pp. 611-612. Conditions demand trained engineers; classes of men available for training, analysis of fundamental and special studies. Paper read at Can. Good Roads Assn. annual convention.

Telephone Plant. A School for the Plant Employes, Robert M. Bruce. Telephony, vol. 84, no. 21, May 26, 1923, pp. 17-19. Educational plan for training plant employees adopted by Rochester Telephone Corp., which gives men an understanding of fundamentals. Paper presented at Rochester Convention of Up-State Assn.

ENAMELING

Electric Furnaces for. Vitreous Enameling with Electric Heat, A. E. O. Munsell. Am. Ceramic Soc.—Jl., vol. 6, no. 7, July 1923, pp. 794-798, 5 figs. Describes suitability of metallic resistor furnace for application of vitreous enamels; comparisons with fuel-fired furnaces.

ENGINEERING

Relation Between Science and. Science and Engineering, J. H. Hunt. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 51-54 and 62. Definition of each; compares conditions under which a scientist works with those that affect work of engineering, time limitations for completed work, and relation of theory and practice; examples showing how engineer and scientist have vied with each other in making progress; predictions are made that other new materials will be discovered and that scientist will communicate scientific method of working to engineer of future.

EVAPORATORS

Vapor-Recompression. Calculation of Vapor Recompression Evaporators, L. A. Pridgeon. Chem. & Met. Eng., vol. 28, no. 25, June 25, 1923, pp. 1109-1111, 3 figs. It is possible to calculate with moderate degree of accuracy heat economy and capacity of vapor-recompression evaporators. Paper presented before Am. Inst. Chem. Engrs.

EXCAVATING MACHINERY

Lubrication. Lubrication of Excavating Machinery. Lubrication, vol. 9, no. 6, June 1923, pp. 61-69, 10 figs. Classification of excavating machinery; general lubrication; internal-combustion engines; gears, chains, and wire rope.

EXPLOSIVES

Storage. Storage of Explosives, A. C. Callen. Coal Mine Management, vol. 2, no. 5, May 1923, pp. 54-60, 1 fig. Notes on size, location and construction of magazines; lightning protection; portable magazines; special precautions.

F

FANS

Standardization. American Fan Standardization Code. Domestic Eng. (Lond.), vol. 43, no. 6, June 1923, pp. 122-127, 5 figs. Code on testing and rating of fans, blowers, and centrifugal air compressors, formulated by committee of Am. Soc. Heat. & Vent. Engrs. and Nat. Assn. Fan Mfrs.

FIRE PROTECTION

Fuel-Oil-Tank Fires. A New Method for Extinguishing Oil Fires, Charles W. Geiger. Power Plant Eng., vol. 27, no. 13 July 1, 1923, pp. 692-693, 2 figs. Solid sheet of water directly above surface of burning oil prevents ingress of oxygen; new type of fire-extinguishing apparatus for fuel-oil-tank fires.

FIREBRICK

Sprinklers. Fire Protection for Buildings of Small and Medium Size, Charles L. Hubbard, Bldg. Age, vol. 45, no. 6, June 1923, pp. 66-62, 6 figs. Sprinkler Systems, piping arrangement for sprinklers, water supply, other inside protection.

Materials, Pennsylvania. The Fire Brick Materials of Pennsylvania, George H. Ashley. Am. Ceramic Soc.—Jl., vol. 6, no. 7, July 1923, pp. 837-849. Pennsylvania produces over 40 per cent of all clay firebrick and over 70 per cent of all silica firebrick made in United States; kinds of materials used.

FLOOD CONTROL

Pueblo District. Flood Protection Adopted by Pueblo Disctrict, C. A. Bock. Eng. News-Rec., vol. 91, no. 2, July 12, 1923, pp. 48-51, 3 figs. Plan adopted will provide for flood more than twice as great as that of 1921; channel through city to be relocated and retarding basin to be built upstream; cost less than damage of last flood.

FLOW OF FLUIDS

Measuring Apparatus. Demonstration of Steady Flow of Fluid, Shuichi Hayashi. Kyoto Imperial Univ., Memoirs of College of Science, col. 6, no. 3, Mar. 1923, pp. 171-172, 6 figs. Apparatus by means of which stream lines of running liquid as well as gaseous substance in state of three-dimensional motion were made made clearly visible.

Theory. Conduction of Fluids (La conductibilité des Fluides et les similitudes énergiques), P. Drosne. Chaleur et Industrie, vol. 4, no. 37, May 1923, pp. 408-412, 5 figs. Flow of fluids at great difference of pressure and velocity producing mainly mechanical effects, and flow of fluids at small or very small differences of pressure and velocity producing mainly thermic effects.

FLOW OF WATER

Pipes. Flow test for Clay and Metal Culvert Pipe. Highway Engr. & Contractor, vol. 9, no. 1, July 1923, pp. 45-48, 8 figs. Details of tests made by U. S. Bureau Public Roads at hydraulic laboratory of State Univ. of Iowa, on vitrified clay pipe and corrugated metal pipe, and results obtained.

FLUE-GAS ANALYSIS

EFFECT OF SULPHUR CONTENT OF COAL. How Sulphur in Flue-Gas Conposition and Computations, C. Harold Berry. Power vol. 58, no. 3, July 17, 1923, pp. 95-96, 1 fig. Simple statement of general nature of problem, and conclusions reached by author.

The Effect of Sulphur in Fuel on Flue-gas Composition and Computations, C. Harold Berry. Power, vol. 58, no. 3, July 17, 1923, pp. 113-115, 1 fig. Study of effect of sulphur content of coal upon flue-gas analysis and possible error this may cause in computing weight of dry flue gas per pound of fuel.

EXCESS-AIR DETERMINATION. Excess-Air in Gas Fired Apparatus, J. M. Davies and T. T. Gill. Gas Age-Rec., vol. 51, no. 23, June 9, 1923, pp. 727-728, 2 figs. Method of determining excess-air in any gas-fired apparatus from CO_2 content of flue gases; separate curve can be plotted for any grade of gas.

FOUNDATIONS

UNDERPINNING A MONUMENT. Underpinning the Washington Mounment. Sci. Am., vol. 129, no. 1, July 1923, pp. 32 and 72, 5 figs. Enlarging foundations to carry 550-ft. shaft.

FOUNDRIES

BRASS CRUCIBLES. Important Points on Brass Foundry Crucibles. Can. Foundryman, vol. 15, no. 6, June 1923, p. 16. Standard sizes of brass crucibles.

IRON AND SAND RECOVERY. Recovery of Iron and Sand in American Foundries (Zurückgewinnung des Eisens und des Sandes aus dem Giessereiabriaum in Amerika), Graue. Giesserei-Zeitung, vol. 20, no. 13, June 1, 1923, pp. 239-242, 3 figs. Recovery of iron and coke from cupola-furnace residues; recovery of molding and core sand; processes in use in America.

STEEL. New Steel Foundry at Fairfield Car Works. Iron Age, vol. 112, no. 3, July 19, 1923, pp. 137-140, 7 figs. Describes basic open-hearth plant of Tennessee Coal, Iron & Railroad Co., at its Fairfield Car Works, Birmingham, Ala., designed for manufacturing miscellaneous car castings on a large production basis; special features are modern facilities for handling materials, sanitation and comfort of employees.

FUELS

ECONOMICAL USE. Fire and Heat; Laws of Heat Transmission (Le Feu, La Chaleur; Les lois de la transmission de la chaleur), Charles Roszak. Société Industrielle de l'est—Bul., no. 168, Jan.-Mar. 1923, pp. 21-50. Utilization of fuels and transmission of heat obtained from them; factors in calorific energy heat transmission, including conductivity, convection and radiation; efficient combustion of fuel.

GREAT BRITAIN. Notes on the Work of the British Fuel Research Board, C. H. Lander. Fuel in Sci. & Practice, vol. 2, no. 6, July 1923, pp. 191-194. Concise account of work and aims of Fuel Research Board of Great Britain. Problems of fuel economy.

RECOVERY FROM ASHES. Recovery of Fuel from Ashes, H. A. Prager. Chem. Age (Lond.) vol. 8, no. 209, June 16, 1923, pp. 638-640, 4 figs. Saving which can be effected by adoption of processes designed to reclaim combustible matter from ash dumps; describes Ullrich magnetic plant which has been adopted quite extensively in Europe.

SOURCES. World Sources of Mineral Fuels, E. G. Sievers. Gas Age-Rec., vol. 51, nos. 24 and 25, June 16 and 23, 1923, pp. 757-761 and 793-796, 5 figs. Study of economic importance of fuel resources and their bearing upon life of the nation; areas in which coal, oil and gas are found in United States; petroleum statistics and possibilities as a fuel; natural gas as fuel.

See also Coal; Coke; Oil Fuel; Peat; Pulverized Coal.

FURNACES

BOILER. *See Boiler Furnaces*

LININGS. Refractory a Factor in Furnace Life, J. S. Pieters. Forging & Heat Treading, vol. 9, no. 6, June 1923, pp. 260-262, 1 fig. Conditions furnace must meet; typical furnace difficulties; how to solve furnace problem. Failure of furnace linings usually originate at joints between bricks; use of monolithic linings greatly increases life of furnace.

ROTARY, HEAT BALANCE OF. Heat Balance of a Rotary Furnace (Bilan thermique d'un four rotatif), Ch. Bertin. Revue des Matériaux de Construction et de Travaux Publics, nos. 164 and 165, May and June 1923, pp. 17-100 and 121-123, 8 figs. Heat of combustion; calories for evaporation of water; calories for decomposition of carbonate and for reactions; losses through chimney, by radiation and by cooling.

FURNACES, ENAMELING

LARGEST IN WORLD. The Largest Enameling Furnace in the World. Blast Furnace & Steel Plant, vol. 11, no. 6, June 1923, p. 313. Furnace constructed in Berlin, Germany has heating chamber of 23 by 16.4 by 16.4 ft.; heat distribution uniform throught, obtained by triple gas heating with both gas and air under pressure control; brown coal in form of briquest or as raw coal can be used. Translated from Zeit. des Vereines deutscher Ingenieure.

OIL-FIRED. Improved Type Enameling Furnace, Henry L. Read. Fuels & Furnaces, vol, no. 2, June 1923, pp. 91-93, 3 figs. Describes oil-fired muffle furnace for burning enamel on steel and cast iron recently developed; single burner is distinctive feature; remarkably uniform temperature with low oil consumption is secured.

FURNACES, HEATING

OIL-BURNING. An Installation for Heavy Fuel Oil, W. C. Buell. Iron Age, vol. 112, no. 3, July 19, 1923, pp. 129-132, 5 figs. Details of design and operation of heating furnace equipment of Hubbard & Co., Pittsburgh, Pa., designed to avoid high cost of light fuel oils and limitation in supply.

G

GAGES

IMPACT STRAIN. An Improved Impact Strain Gage, Earl B. Smith. Highway Engr. & Contractor, vol. 8, no. 6, June 1923, pp. 45-47, 7 figs. Also Good Roads, vol. 64, no. 23, June 6, 1923, pp. 217-218, 3 figs. Designed by U. S. Bur. of Public Roads to secure an instrument which would respond to and accurately measure deformations resulting from suddenly applied forces and impact.

GASES

SPECIFIC HEAT. The Variation of the Specific Heat of Air with Temperature J. R. Partington and W. G. Shilling. Faraday Soc. Trans., vol 18, part 3, Feb 1923, pp. 386-390 and (discussion) 390-393, 2 figs. Experiments in which attempt has been made to obtain reasonably accurate data for variation of specific heats of gases with temperature.

GARBAGE DISPOSAL

SEPARATE REFUSE AND. The Fallacy of Separate Garbage and Refuse Collection, George A. Johnson. Am. City, vol. 28, no. 6, June 1923, pp. 562-564. **(Abstract.)** Report on collection and disposal system in Boston, Mass.

GAS MANUFACTURE

THEORETICAL PRINCIPLES, APPLICATION OF. The Variables in Gas Manufacture, H. O. Andrew. Gas Age Rec., vol. 51, no. 25, June 23, 1923, p. 799. Practical of theoretical principles in coal and water gas manufacture, controlling water gas operations by rate of oil input, uniform coal gives best results.

GASOLINE

NATURAL-GAS. Gasoline from Natural Gas—1921, E. G. Sievers. Gas Age-Rec., vol. 51, no. 26, June 30, 1923, pp. 821-824. Compression gasoline-recovery method; charcoal process for gasoline recovery; combination compression and absorption methods; blending of gasolines; economics of natural-gas gasoline industry.

GEARS

BEVEL. Computing Pitch of Bevel Gears, George F. Nordenholt. Machy. (N.Y.) vol. 29, no. 11, July 1923, pp. 886-888, 1 fig. Calculation of pitch by applying Tredgold's approximation and then computing pitch of "formative spur gear".

Spiral Bevel Gears. Engineering, vol. 135, nos. 3521 and 3522, June 22 and 29, 1923, pp 649-652 and 677-678, 8 figs. Principles; spiral angle; hand of spiral; driving load; tooth proportions; methods of cutting, finishing cutter settings; formulas for spitral bevel gears.

CHANGE GEARS FOR FIXED CENTRES. Designing Change Gears for Fixed Centres. Machy. (Lond.), vol 22, no. 560, June 21, 1923, pp. 362-366. Designing gear sets for pick-off type of change gears, which consist of gears that are interchangeable on pins or shafts having a fixed center distance, used in designing production tools.

GIRDERS

REINFORCED-CONCRETE. Huge Concrete Girders and Trusses in New Theater, Roy C. Mitchell. Eng. News-Rec., vol. 91, no. 1, July 5, 1923, pp. 4-9, 12 figs. Grauman's theater and office building in Los Angeles contains reinforced-concrete roof trusses 126-ft. span, large cantilever truss under balcony and girders up to 126-ft. span.

SURFACE. Surface Grinding From the Rough Douglas T. Hamilton. Abrasive Industry, vol. 4, no. 6, June 1923, pp. 167-169, 8 figs. In designing a new machine the parts were proportioned so that they could be located readily for grinding.

GUNS

CANNON. Development of Automatic Cannon T. M. Jervey. Army Ordnance, vol. 3, no. 18, May-June, pp. 350-353, 3 figs. Reasons for delay in development, increasing need for automatic cannon, suggestions for design.

SMALL ARMS. A Review of Small Arms Development, Lee O. Wright. Army Ordnance, vol. 3, no. 18, May-June, 1923, pp. 309-317, 7 figs. Includes shoulder rifles, machine guns, their ammunition and accessories. Defects developed during war pointed out, together with steps taken to correct them.

GYPSUM

PRODUCTS. The Gypsum Industry, A. Brittain and C. Elliott. Ceramic Soc.—Trans., vol. 22, part 1, 1923, pp. 44-66 and (discussion) 66-69, 3 figs. Consideration of general methods employed for conversion of mineral into its manufactured products, and application and testing of these products.

H

HANDLING-MATERIALS

FURNACES. Handling Materials in Furnaces, Frank W. Brooke. Iron Trade Rev., vol. 73 ,no. 2, July 12, 1923, pp. 111-112, 6 figs. Relation of materials-handling methods to design and operation of furnace. Abstract of paper before Am. Electrochem. Soc.

See also Coal Handling.

HARBOR IMPROVEMENT

VALPARAISO. Harbor Construction at Valparaiso (Havenbygning i Valparaiso), B. Sohlberg. Teknisk Ukeblad, vol. 70, no. 12, Mar. 23, 1923, pp. 111-114, 12 figs. Difficulties connected with quay construction due to exposure to northern storms; details of work under construction to accommodate increase in maritime traffic.

HARDNESS

TESTING. Some Recent Developments in Hardness Testing, Edward G. Herbert. Engr., vol. 135, no. 3522, June 29, 1923, pp. 686-687, 2 figs. Analysis of qualities generally comprised under the term hardness; nomenclature.

Testing Material Hardness on a Commercial Basis, E. F. Lake. Can. Machy., vol. 29, no. 23, June 7, 1923, pp. 32-34, 1 fig. Adaptation and advantages of different methods; some of difficulties encountered; how some readings mislead.

HEAT

MECHANICAL EQUIVALENT OF. The Mechanical Equivalent of Heat, T. H. Laby. Commonwealth Engr., vol. 10, no. 8, Mar. 1, 1923, pp. 1279-284, 3 figs. Requirements of a mechanical-equivalent-of-heat experiment and principle thereof; details regarding design of apparatus.

RADIATION. The Influence of Air Currents on Heat Radiating Surfaces, H. C. B. Berkhout. Domestic Eng., (Lond.), vol. 43, no. 6, June 1923, pp. 113-114. Describes experiments on heat emitted from a hot surface to air currents that pass over it, conducted by Prof. W. Nusselt and W. Jurgens of Mechanical Laboratory of Technical Academy of Carlsruche.

HEATING, STEAM

BUILDINGS. Heating of Medium-Sized Buildings, Charles L. Hubbard. Domestic Eng., vol. 103, no. 10, June 9, 1923, pp. 487-490, 3 figs. Heating of homes, small apartments and hotels, laying special stress on airline vacuum system. Advantages of steam heating.

INDUSTRIAL PLANTS. Heating of Industrial Plants (Le chauffage des locaux industriels), H. Benner. Chaleur et Industrie, vol. 4, no. 37, May 1923, pp. 313-414, 5 figs. Discusses a simple modification in steam heating for considerably increasing efficiency by adding a second radiator below first for utilizing heat of steam in automatic cleaner.

HIGHWAYS

ECONOMICS. The Economics of Highway Grades, T. R. Agg. Iowa State Coll. Agri. & Mech. Arts (Bul. 65), vol. 21, no. 39, Feb. 28, 1923, 48 pp., 37 figs. Tentative economic theory of highway grades, based on motor-drawn traffic, length of grade, resistance to translation of particular road surface, and maximum tractive effort of the vehicle.

HOISTS

ELECTRIC. Recent Developments in Electric Hoists, Graham Bright. Coal Industry, vol. 6, no. 6, June 1923, pp. 289-295, 8 figs. Describes latest developments in electric mine hoists, discussing various types in use and their application.

HUMIDITY

MEASUREMENT. Determination of Relative Humidity at Temperatures below 32 deg. F., George A. Horne. Ice & Refrigeration, vol. 64, no. 6, June 1923, pp. 486-487. Experimental work with sling psychrometer. Presented before Am. Assn. Ice & Refrigeration.

See also Air Conditioning

HYDRAULIC DRIVE

MACHINE TOOLS. Hydraulic Feed Drive Adapted to Machine Tools, Walter Ferris. Can. Machy., vol. 29, no. 24, June 14, 1923, pp. 16-18, 7 figs. Accuracy and flexibility of speed control, ability to stand abusive accelerating and stalling loads without overheating, effective application to mechanical equipment.

HYDRAULIC TURBINES

CALCULATION WITH BERNOULLI'S EQUATION. Bernoulli's Equation on the Theory of Turbines (Om Bernoullis ekvationer och ansatsert ill en komplettering av turbinteorien), Hjalmar O. Dahl. Teknisk Tidskrift, vol. 53, no. 7, Feb. 17, 1923, pp. (Mekanik 2 Section) 13-16, 6 figs. Examples of calculations.

HYDRO-ELECTRIC DEVELOPMENTS

ONTARIO. Hydro-electric Developments in Ontario, F. A. Gaby. Mech. Eng., vol. 45, no. 7, July 1923, pp. 410-415 and (discussion) p. 416, 6 figs. Present and projected developments of hydro-electric power, together with particulars regarding largest single hydro-electric development in world, the Queenston-Chippawa installation. (Abridged.)

PROBLEMS. Some Problems of Water Power Development, C. F. Mackness. Beama, vol. 12, nos. 61 and 62, May and June 1923, pp. 274-283 and 356-364, 12 figs. Discusses underlying engineering principles, indicating difficulties in choosing best of number of possible solutions for each leading factor in problem. Deals with power production, plan of development, water storage, auxiliary water supply, etc.; various kinds of development; civil-engineering problems; mechanical engineering.

QUEBEC. Hydro-electric Possibilities of Quebec, Julian C. Smith. Mech. Eng., vol. 45, no. 7, July 1923, pp. 407-409 and 429, 1 fig. Potential and actual hydro-electric development of Province of Quebec and its probable rate of growth in future. (Abridged.) Discussion on p. 416.

VERMONT. Davis Bridge Development of the New England Power Company, A. C. Eaton and E. B. Collins. Elec. World, vol. 81, no. 24, June 16, 1923, pp. 1410-1413, 6 figs. Consists of storage reservoir having usable capacity of 111,000,000 acre-ft. and plant with installed capacity of 60,000 hp., operating under mean head of 350 ft.; part of Deerfield River project.

WICONSIN. Big Falls Development of Flambeau River, L. B. Breedlove. Power, vol. 58, no. 3, July 17, 1923, pp. 84-87, 6 figs. Three-unit plant of 9900 kva. capacity operating under net head of 52ft. and average flow of 1600 sec-ft., to be tied in with four other hydro-electric developments of Lake Superior District Power Co.,; two 3300-kva. units now installed; dam and spillway construction; special reinforcing of scroll case by means of steel bands secured to rim of speed ring.

HYDRO-ELECTRIC PLANTS

CALIFORNIA. Don Pedro Dam, Power Plant and Transmission Line, W. A. Scott. Eng. World, vol. 22, no. 66, June 1923, pp. 361-363, 10 figs. Details of dam and hydro-electric plant of Tuolumne River, in California, and 33-mi transmission line from power plant to substation; dam is concrete arched structure, gravity type, built on curvature of 674-ft. radius.

I

ICE MANUFACTURE

RAW-WATER SYSTEM. Possibilities of Making Clear Raw Water Ice without Air Agitation ,Van Rensselaer H. Greene. Ice & Refrigeration, vol. 64, no. 6, June 1923, pp. 494-495. Discusses various raw-water systems and new system which does not make use of air agitation. Presented before Am. Assn. Ice & Refrigeration.

ICE PLANTS

DESIGN. Design of an Ice Making Plant H. J. Macintire. Southern Engr., vol. 39, no. 3, May 1923, pp. 42-45, 6 figs. Figuring heat removed per pound of ice; cooling agitating air, size of tank and amount of piping.

OPERATION, EFFICIENT. Inefficiency in Operation of Ice Plant and the Ultimate Cost to the Owner ,Halbert P. Hall. Ice & Cold Storage, vol. 26, no. 203, June 1923, pp. 149-150. Points out conditions that can increase cost of operation in manufacture of ice; deals with plants now in operation. Paper read before Eastern Ice Mfrs.' Assn.

INDEXING

MAGAZINE ARTICLES. How to Keep Magazine Articles and Find Them, Harrison W. Graver. Management & Administration, vol. 6, no. 1, July 1923, pp. 79-83, 4 figs. Describes indexing system of this journal and of Engineering Societies Library; how index is used and directions for making it.

INDUSTRIAL MANAGEMENT

PRODUCTION METHODS. Mass-Production Methods. Times Trade & Eng. Supp., vol. 12, no. 256, June 2, 1923, p. 277. Disadvantages of system for England; expenses involved, fixed design, field of application, etc.

PURCHASING. A Gage of Purchasing Efficiency. Chem. & Met. Eng., col. 28, no. 24, June 18, 1923, pp. 1064-1065. Accounting method that enables executives to judge purchasing agent and his judgment of markets.

INSULATION, ELECTRIC

DIELECTRIC STRENGTH RATIO. Dielectric Strength Ratio Between Alternating and Direct Voltages, J. L. R. Nayden and W. H. Eddy. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923, pp. 706-712, 1 fig. Investigations made with direct and with alternating voltages, on liquid and solid insulations of homogeneous and non-homogeneous structure, over range of temperature, thickness and rate of voltage application; dielectric strength ratios were determined and are given and discussed.

INSULATORS, ELECTRIC

FIELD TESTING. Progress in Field Testing of Insulators, Frank, C. Doble. Elec. World, vol. 81, no 24, June 16, 1923, pp. 1397-1401, 10 figs. Importance of periodical investigations; problem of detecting conditions which may lead to failure; results from practice; flexibility of method pursued.

PORCELAIN. The Production of Porcelain for Electrical Insulation, Frank H. Riddle. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923 pp. 743-747, 6 figs. Manufacturing methods and application of theorectical points. Raw-material storage; preparation of body; pugging.

STANDARDIZED TESTS. Standardized Insulator Tests. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923, pp. 739-743. Report of Insulator Sub-committee of A.I.E.E. Standards Committee.

INSULATING MATERIALS HEAT

PROPERTIES. Insulating Materials (Les matériaux isolants), Jules Dautrebande Chaleur et Industrie, vol. 4, no. 37, May 1923, pp. 419-420. Deals with felt, paper, silk, kieselguhr, and other insulating materials, their properties, coefficient of conductivity, etc.

INTERNAL-COMBUSTION ENGINES

AIR-CLEANER TESTS. Efficiency of Dust Separation in Air Cleaners for Internal Combustion Engines, Arthur H. Hoffman. Agricultural Eng., vol. 4, no. 6, June 1923, pp. 89-95, 11 figs. Complete report of California air-cleaner tests including description of apparatus and methods of testing.

FUEL ECONOMY. Internal Combustion and Economy, Tage D. Madsen. Inst. Mar. Engrs.—Trans., vol. 35, June 1923, pp. 1-16 and (discussion) 16-34. Fuel problems encountered in shipping industry. Economy lying in use of heavy-oil engine.

THEORY. Contribution to the Theory of Internal Combustion Engines (Contribution à la théorie des moteurs à combustion interne), Marcus Brutzkus. Académie des Sciences—Comptes Rendus des Séances, vol. 176, no. 23, June 4, 1923, pp. 1621-1623. Discusses chemical reaction of combustion which takes place in time available (about 0.05 sec.), and most suitable properties of fuels for the purpose; combustion under variation of pressure and of concentration; enumerates three laws.

See also Aeroplane Engines, Automobile Engines, Diesel Engines, Oil Engines, Semi-Diesel Engines.

IRON

CARBON CONTENT. Notes on Carbon in Foundry Irons and Castings. Utility of its Control and Practical Difficulties, M. Siegle. Foundry Trade Jl., vol. 27, no. 356, June 14, 1923, pp. 484-488, 12 figs. Silicon and carbon content in pig irons and their effects, chemical classification of pig-irons, sulphur content, melting, etc.

CORROSION. Corrosion of Iron in Concrete. Concrete & Constructional Eng., vol. 18, no. 6, June 1923, pp. 393-394. Recommendations by Bruno Zschokke, of the Zurich Inst. for Testing Matls to prevent corrosion.

IRON CASTINGS

REVERSED CHILLED. Reversed Chilled Castings and Similar Phenomena (Der umgekehrte Hartguss und ähnliche Erscheinungen), E. Dübi. Schweizerische Bauzeitung, vol. 81, nos. 19 and 20, May 12 and 19, 1923, pp. 227-229 and 249-252, 19 figs. Author reviews briefly works of other investigators and gives results of his own investigation on causes and origin of reversed chilled castings.

IRON FOUNDING

CAMBER PROBLEMS. Solving Camber Problems, F. C. Edwards. Metal Ind. (Lond.), vol. 22, no. 24, June 15, 1923, pp. 623-624, 3 figs. Problems frequently encountered in foundry; effect of alteration of pattern.

CHAPLET AVOIDANCE. Avoiding Chaplets, James Edgar. Metal Ind. (Lond.), vol. 22, no. 25, June 22, 1923, pp. 637-638, 4 figs. Disadvantages of chaplets, use at bottom of mold; modifications of design, use of balance print.

IRON METALLURGY

ELECTRIC SMELTING. Electric Melting of Iron (Elektrisk jernsmeltning), H. Bie Lorentzen. Teknisk Ukeblad, vol. 70 no. 8, Feb. 23, 1923, pp. 72-75, 5 figs. Describes electrodes, furnace construction and operation. etc.

IRON, PIG

ELECTRIC, PRODUCTION OF. Production of Pig Iron in the Electric Furnace (La fabrication de la fonte au four électrique), Clausel de Coussergues. Société des Ingénieurs Civils de France—Procès-Verbal, no. 10, May 11, 1923, pp. 353-354. Discusses development since Heroult's furnace at Sault Sainte Marie; electric blast furnace and its comparison with ordinary blast furnaces.

L

LABOR

WAGES AND HOURS. Wages Hours and Employment in American Manufacturing Industries. Nat. Indus. Conference Board—Research Report, no. 59, 158 pp. 8 tables, 9 charts. Survey covering period of July 1914 to January 1923, with supplemental data up to April 1923.

LABORATORIES

NATIONAL PHYSICAL. The National Physical Laboratory. Iron & Coal Trades Rev., vol. 106, no. 2886, June 22, 1923, p. 943. Summary of work accomplished during 1922 by laboratory.

RESEARCH. Research Plant of the National Bureau for Scientific and Industrial Research and Inventions (L'installation de recherches et d'expériences électriques de l'Office national des Recherches scientifiques et industrielles et des inventions.) J.-L. Breton. Revue Générale de l'Electricité, vol. 13, no. 22, June, 2, 1923, pp. 909-923, 24 figs. Description of equipment, including switchboard arrangement, transformers, generators, motors, converters, equipment of electro chemical and other laboratories.

TESTING. The Arts et Métiers Testing Laboratory and Its Work During 1919 to 1922 (Le Laboratoire d'Essais du Conservatoire des Arts et Métiers, ses travaux durant les exercices 1919 à 1922). Revue Générale de l'Electricité, vol. 13, no. 24, June 16, 1923, pp. 1016-1019. Financial and technical details of its activities, including physical tests, metals, building materials, machinery and chemical tests.

LATHES

TOOL-ROOM. New Tool-Room Lathe. Iron Age, vol. 111, no 26, June 28, 1923, p. 1835, 2 figs. Design of geared head a feature; new universal relieving attachment on 15-in. heavy-duty lathe, placed on market by R. K. LeBlond Machine Tool Co., Cincinnati.

LEATHER

ARTIFICIAL, MANUFACTURE OF. The Process of Manufacturing Artificial Leather, A. H. Berwald. Automotive Mfr., vol. 65, no. 3, June 1923, pp. 22-24, 8 figs. Raw materials used and how they are handled and treated; special machinery. Reprinted from Du Pont Mag.

LEVELING

BAROMETRIC. Barometric Levelling, P. E. Palmer. Dominion Land Surveyors' Assn., Jl., vol. 1, no. 3, Jan. 1923, pp. 5-8, 3 figs. Instrument used is ordinary aneroid with a 2 [illegible] in dial and a range of 6000 to 80000 ft., usually graduated to 20 ft. Description of field methods, reduction of readings, limits of accuracy.

LIGHT

VELOCITY OF. On the Principle of the Light-Velocity, Toshizô Matsumoto. Kyoto Imperial Univ., College of Sci.—Memoirs, vol. 6, no. 5, Mar. 1923, pp. 187-190. Evolves equations based upon Einstein theory.

LIGHTING

AUTOMATIC APPARATUS, MANUFACTURE OF. The Manufacture of Automatic Lighting Apparatus. Machy. (Lond.), vol. 22, no. 560, June 21, 1923, pp. 371-376, 14 figs. Operations in plant of Horstmann Gear Co., Ltd., Bath, England, in manufacturing controlling apparatus for automatic lighting and extinguishing, such as for street gas lamps.

LIGHTING

CO-OPERATION OF ARCHITECT AND ELECTRICAL ENGINEER. Architect and Electrical Engineer, M. H. Samuels. Elec. World, vol. 82, no. 1, July 7, 1923, pp. 6-8, 4 figs. Importance of their co-operation, responsibility for faults in illumination falls on engineer; his occasional shortcomings; things that must be considered in making plans.

HIGH ILLUMINATION INTENSITY. Source of Light Giving Very High Surface Intensity (Uebereine Lichtquelle von sehr hoher Flächenhelligkeit), H. Gerdien and A. Lotz. Zeit. fur Technische Physik, vol. 4, no. 4, 1923, pp. 157-162, 15 figs. Results of experiments for production of a light exceeding that of pure carbon are 20 to 50 times in surface intensity.

STREET. City Zoning of Street Lighting, Charles J. Stahl. Elec World, vol. 81, no. 26, June 30, 1923, pp. 1517-1521, 9 figs. Improvements in public illumination should be carried out under comprehensive programs; co-ordinated with and included in city zoning plans; usual criticisms of street lighting and remedy.

Effective Lighting Plan for a Small City, Earl A. Anderson and E. D. Chapman. Elec. World, vol. 82, no. 2, July 14, 1923, pp. 73-74, 3 figs. Fremont, Ohio, affords excellent example of way in which demand for improved illumination of streets due to intencity automobile traffic can be met in places of small population.

LIME

AIR SLAKING. The Air Slaking of Lime F. H. Rhodes, W. H. Jones and W. R. Dougan. Chem. & Met. Eng., vol., 28, no. 24, June 18, 1923, pp. 1066-1069, 5 figs. Rate as well as kind of deterioration of siliceous, magnesium and high-calcium lime when exposed to air is studied and discussed.

KILNS. Lime Kiln Thermal Efficiency, Victor J. Azbe. Cement, Mill & Quarry, vol. 22, no. 12, June, 1923, pp. 22-24. Author pointed out that it was possible to operate a kiln without excess smoke conditions and still lose from 25 to 50 per cent of the fuel efficiency. Paper before National Lime Assn.

LOCOMOTIVE

BOOSTERS FOR. The Tender Tractor—A New Booster Development. Ry. Rev., vol. 72, no. 24, June 16, 1923, pp. 1000-1009, 18 figs. Locomotive tender weights utilized to broaden useful field for booster in practical application on Delaware & Hudson.

DEVELOPMENT. The Outline of Steam Locomotive History, Samuel M. Vauclain. Ry. Rev., vol. 72, no. 25, June 23, 1923, pp. 1065-1070, 21 figs. History of development. (Abstract.) Paper read before Am. Ry. Assn.

ELECTRIC. *See Electric Locomotives.*

LIGNITE-BURNING. Mountain Type Locomotive Designed to Burn Lignite. Ry. Rev., vol. 72, no. 24 June 16, 1923, pp. 992-999, 13 figs. New C. B. & Q. R. R. passenger power operated on longest locomotive runs with low-grade fuel.

MOUNTAIN TYPE. Mountain Type Locomotive, Canadian National Railways. Can. Ry. & Mar. World. no. 305, July 1923, pp. 311-314, 5 figs. Bituminous-coal passenger-train locomotives, tractive power 49,600 lb. Detailed description.

PILLIOD-SLEEVE-VALVE. Pilliod Sleeve Valve Performance on the Monon R. R. Ry. Rev., vol. 72, no. 24, June 16, 1923, pp. 988-992, 4 figs. First report of service on Mikado-type locomotive shows theoretical advantages and practical maintenance features.

TANK. New German-Built Locomotives for Bulgaria. Ry. Gaz., vol. 38, no. 24, June 15, 1923, p. 880, 2 figs. Powerful 2-cylinder compound tank locomotives having 0-12-0 wheel arrangement built by Hanover Machine Co.

LUBRICATING OILS

DILUTION. The Dilution of Lubricating Oil. Motor Transport (Lond.), vol. 36, no. 956, June 25, 1923, pp. 771-772, 1 fig. How to reduce the contamination of engine oil by fuel and water which encourages failure and rapid wear of bearings.

LUMBER

AUSTRIA AND ITALY. Lumber in Austria and Italy, W. F. Upson and Leon Dominian. Commerce Reports —Supp., Trade Infornation Bul., no. 110, June 25, 1923. Includes related reports on Italian lumber trade by A. A. Osborne.

M

MACHINE SHOPS

BRITISH. Derby Works of the International Combustion Engineering Co., Ltd. Engineer vol. 135, no. 3521, June 22, 1923, pp. 652-654, 14 figs. partly on supp. plate. Details of new works for construction of underfeed stokers.

MACHINE TOOLS

EFFICIENCY AND OUTPUT. Machine Tool Efficiency and Output (Bidrag til Belysning af Arbejdsr-askinernes Drifts-Okonomi), Fr. Christoffersen. Teknisk Tidsskrift (Tekniske Forenings), vol. 47, no. 10, May 9, 1923, pp. 93-97, 3 figs. Time of production; methods of arriving at cost; calculations.

MULTIPLE-TOOLING. Traverse in Tooling Operations. Mech. World, vol. 73, no. 1901, June 8, 1923, pp. 354-355, 7 figs. Effects of introduction of newer machine tools in which multiple tooling or multiple work-holding is important feature.

MACHINERY

FRICTION IN. Friction in Machines (Les frottements dans les machines), Jean Lévy. Technique Moderne, vol. 15, no. 12, June 15, 1923, pp. 357-364, 9 figs. Variation of coefficient of friction with velocity and load; viscosity and liquid friction; lubrication; frictional resistance; loads on lubricated surfaces; concludes that for a given bearing load may be increased directly as velocity of rotation and viscosity of oil, and that for a given oil permissible load is not constantly proportional to velocity.

MAGNETS

PERMANENT. Permanent Magnets, and the Relation of their Properties to the Constitution of Magnet Steels, E. A. Watson. Instn. Elec. Engrs., Jl., vol. 61, no. 319, June 1923, pp. 641-660, 25 figs. Properties required in permanent magnet; magnets not of uniform composition, containing two principal constituents; suggestions for further research work

MAPPING

RELIEF DETERMINATION. Topographic Detail in Wooded Areas, G. H. Herriot. Dominion Land Surveyors' Assn., Jl., vol. 1, no. 3, Jan. 1923, pp. 13-15, 4 figs. Instruments and methods used by engineers of District no. 1, of U.S. Forest Service.

MEASURING INSTRUMENTS

THERMOTECHNICAL. Modern Thermotechnical Measuring Instruments for Metallurgical Works (Neuere warme-und betriebstechnische Messgerate), Guido Wunsche. Stahl u. Eisen, vol 43, no 23, June 7, 1923, pp 753-757, 9 figs. Apparatus for accurate determination of gas pressures, development of gaging scales; measuring diaphragms; automatic control and regulation; regulation; of mixtures; etc.

METALS

BASE. A Review of the Base Metal Industry with Special Reference to the Resources of the British Empire, Richard Redmayne. So. African Eng., vol. 34, nos. 5 and 6, May 31 and June 30, 1923, pp. 97-99 and 125-126. Reviews position of copper, lead, zinc, tin and aluminum. Paper read before Soc. of Arts.

CALORIZING. The Use of Calorized Metal in Places Subject to High Temperatures, G. D. Mantle. Fuels & Furnaces, vol. 1, no. 1, May 1925, pp. 25-28, 3 figs. Definition, application, results.

TESTING. Mechanical Tests of Metals (La pratique des essais mécaniques des métaux), Jean Durand. Génie Civil, vol. 82, no. 22, June 2, 1923, pp. 525-528, 5 figs. Discusses elongation, resiliency, and hardness testing, and apparatus used.

MINERS' LAMPS

SAFETY. Electric Lamps in Cape Breton Collieries, John Moffatt. Can. Min. Jl., vol. 44, no. 26, June 29, 1923, pp. 491-492. Installation of Edison electric safety lamps and benefits derived.

MINES

LINING, REINFORCED-CONCRETE. New System of Reinforced-Concrete Lining for Mines, H. Brenner. Iron & Coal Trades Rev. vol. 106, no. 2884, June 8, 1923, p. 857, 3 figs. New system being used extensively in Upper and Lower Silesia, competing successfully with other systems, such as timbering, masonry, brick-work, ordinary concrete, etc. Translated from Glückauf.

UNDERGROUND VENTILATION. Underground Ventilation at Butte, Daniel Harrington. U.S. Dept. Interior, Bur. Mines, Bull. 204, 1923, 131 pp., 45 figs. Progress made in providing copper and zinc mines at Butte with safe, comfortable, and healthful air conditions. Temperature, humidity, and composition of mine air.

MOTOR BUSES

DESIGN. The Design and Maintenance of Passenger and Commercial Motor Vehicles, G. J. Shave. Inst. Transport—Jl., vol. 4, no. 8, June 1923, pp. 304-308. It is shown that motor-truck chassis cannot be successfully employed for omnibus and that passenger-carrying vehicle should be specially designed; details of ties and springing, body work, ventilation, and transmission.

LIGHTING GENERATOR FOR. North East Generator for Buses. Motor Transport (N. Y.), vol. 28, no. 10, June 15, 1923, pp. 280-281, 2 figs. New heavy-duty 12-volt model for bus lighting brought outby North East Elec. Co. has output rating of 300 watts. Proper wiring is described.

MOTOR TRUCKS

OPERATING COSTS. Truck Operating Costs, Ben H. Petty. Purdue Univ., Bul. Eng., Experiment Station, no. 10, vol. 7, no. 1, Feb. 1923, 44 pp., 13 figs. Results of investigation of operating costs in Indiana; simple presentation as to how and why a truck operator should record operating cost data.

PISTON DISPLACEMENT. Piston Displacement Factors Found for Motor Trucks, P. M. Heldt. Automotive Undustries, vol. 49, no. 2, July 12, 1923, pp. 66-67, 1 fig. Discusses relation to vehicle loaded weight driving wheel diameter and direct gear-drive ratio; analysis follows lines of similar study previously made for passenger cars.

N

NICKEL

RESEARCH. Research in Industry, C. V. Corless. Chem. Age (Lond.), vol. 8, no. 2091, June 16, 1923, pp. 646-647. Director and Manager of Mond Nickel Co., Canada gives some particulars of research carried out by this company, development of Mond nickel process; uses of nickel, research laboratories, origin of carbonyl process, scope of scientific research, development of research.

O

OIL ENGINES

HEAT LOSSES. Losses in Heat Engines and Means of Reducing Them, W. P. Silince. Petroleum World, vol. 20, no. 274, July 1923, pp. 289-290. Internal-combustion machinery; combined oil and steam plant; principle of the Still engine; starting and running on steam. Abstract of paper before Diesel Engine Users Assn.

OIL FUEL

CRACKING. The Cracking of Venezuela Fuel Oil, Gustav Egloff. Petroleum World, vol. 20, no. 274, July 1923, pp. 285-286. Results already obtained and possibilities of the future.

OILS

MECHANICAL HANDLING OF. Mechanical Handling of Oils (La manipulation automatique des hydrocarbures), M. Carbonaro. Société des Ingenieurs Civils de France—Procès-Verbal, no. 11, May 25, 1923, pp. 396-408. Oil stations organized as storage places; automobile and aviation service; pumping, measuring and distribution of oil; handling; etc

TESTING. Testing Steam-Cylinder Oils, W. F. Osborne. Mech. World, vol. 73, no. 1903, June 22, 1923, pp. 391-392. Factors entering into comparative tests of two cylinder oils, to determine which is more suitable for engineer"s local conditions.

OPEN-HEARTH FURNACES

BASIC PROCESS. Contribution to Metallurgy of Basic Open-Hearth Process and to Question of Influence of Oxygen Content on Mechanical Properties of Low-Carbon Steel With Special Reference to Red-Shortness (Beitrag zur Metallurgie des basischen Martinverfahrens und zur Frage des Einflusses des Sauerstoffgehaltes auf die mechanischen Eigenchaften des Flusseisens, insbesondere des Rotbruches), Herbert Mondon. Stahl u. Eisen, vol. 43, nos. 23 and 24, June 7 and 14, 1923, pp. 745-752 and 782-788, 16 figs. Melting tests; results of physical, chemical and metallographic investigations; behavior of oxygen

REVERSING VALVES. Air and Gas Reversing Valves, W. Trinks. Fuels & Furnaces, vol. 1, no. 3, July 1923, pp. 153-156, 1 fig. Effect of type of reversing valves on design and operation of regenerative furnaces with particular reference to open-hearth furnaces.

OXY-ACETYLENE CUTTING

ADVANTAGES AND APPLICATIONS. Oxy-acetylene Process of Cutting Metals. Machy (N. Y.), vol. 29, no. 11, July 1923, pp. 857-859, 3 figs. Advantages of process and modern applications.

OXY-ACETYLENE WELDING

PIPE LINES. Oxy-Acetylene Welding of Oil Carrying Pipe Lines. Acetylene Jl., vol. 25, no. 1, July 1923, pp. 20 and 24-25, 8 figs. Essentially a continuous length without joints and will withstand severe strain. Expansion and contraction compensated for by slack in line.

WATER WHEELS. Service Engineer Shows Value of Welding Process. Can. Machy., vol. 29, no. 23, June 7, 1923, pp. 39-40, 2 figs. Building up worn ridges on webs of large bronze water wheels, secret of success lay in proper preheating.

OXYGEN

INDUSTRIAL. Research Work on Industrial Oxygen, T. Campbell Finlayson. Chem. Age (Lond.), vol. 8, no. 209, June 16, 1923, pp. 642-643 and discussion, 643-644. Results of research work instituted with object of finding some simple process which would produce oxygen at a price not exceeding one shilling per 1000 cu. ft. and would involve low capital expenditure, details of apparatus. Abstract of paper read before Instn. Chem. Engrs.

LIQUID. Liquid Oxygen As an Explosive (El oxigeno Liquido usado como explosivo), Angel. Pembert. Revista Mexicana de Ingenieria y Arquitectura, vol. 1, no. 4, June 15, 1923, pp. 177-192, 5 figs. Reproduction and translation of application of liquid oxygen in Mexican Mines for blasting [illegible].

P

PACKING

METHODS. Modern Packing Methods. Indus. Management (Lond.), vol. 9, no. 12, June 14, 1923, pp. 359-362. Notes on tin lined and waterproof cases, size and weight of cases, packing tools and machinery, small parts, problem of cost, other boxes, limitations of steel.

PAINTS

ACCELERATED WEATHERING. Recent Progress of Investigations on Accelerated Weathering of Paints and Varnishes, H. A. Nelson. Paint Mfrs. Assn. of U. S. Sci. Section, Circular 184, June 1923, pp. 294-299, 6 figs. Results of previous work, recent additions to equipment, exposure cycle, typical exposure results.

TITANIUM WHITE. Titanium White (Le blanc de titane), H. Rabate. Revue Industrielle, vol. 53, no. 20, June 1923, pp. 197-206, 11 figs. White pigments used in paint industry, history of titanium, its production, and use as white pigment, physical and chemical properties.

Titanox Paints, L. D. Hagar. Paint Mfrs. Assn. of U. S., Sci. Section, Circular 184, June 1923, pp. 287-290. Development of opaque white pigment from black crystalline ores of titanium, ilmenite, and rutile.

PAPER

DRYING. Report on Drying of Paper, S. B. Jones, and W. F. Goldsmith. Paper Trade Jl., vol. 77, no. 1, July 5, 1923, pp. 49-55, 15 figs. Results of moisture-removal tests; abridgement of paper drying code. Paper before Tech. Assn. Pulp & Paper Ind.

SIZES, SIMPLIFICATION OF. Simplification of Paper Sizes, Am. Mach., vol. 59, no. 1, July 5, 1923, pp. 23-24. Abstract of report of sectional committee on book and magazine paper to committee on simplification of paper sizes appointed by Bur. of Standards.

TEARING TESTS. Report of the Paper Testing Committee on the Tearing Test of Paper, Sidney D. Wells. Paper Trade Jl., vol. 76, no. 26, June 28, 1923, pp. 49-53. Description of tests carried out and results obtained; recommendations. Paper read before Tech. Assn. Pulp & Paper Industry.

PAPER MANUFACTURE

BIBLIOGRAPHY. Bibliography of Papermaking for 1922. Paper Trade J., vol. 76, nos. 16, 17, 18, 19, 20, 22, 23, 25, and 26, Apr. 19, 26, May 3, 19, 17, 31, June 7, 21, and 28, 1923, pp. 49-52, 53-56, 52-56, 48-50, 55-58, 62-64, 54-65 and 48. Prepared by Tech. Assn. Pulp and Paper Industry Committee on Abstracts and Bibliography.

PULP WOODS. Suitability of Various American Woods for Pulp and Paper Making, R. H. Grabow. Jl. of Forestry, vol. 21, no. 5, May 1923, pp. 462-474. Woods for sulphite, soda, mechanical and sulphate pulps.

PAPER MILLS

HEAT TRANSFER. Heat Transfer and Vapor Economizer, J. L. Williamson. Paper, vol. 32, no. 8, June 13, 1923, pp. 15-16. Economy of proper methods of heat transfer; economizer and water spray methods.

PAVEMENTS

TAR SAND. Athabasca "Tar Sands" for City Streets, C. C. Sutherland. Can. Engr., vol. 44, no. 23, June 5, 1923, pp. 551-555, 3 figs. Discussion of suitability of bituminous sands of northern Alberta for city street work; experience gained in laying this material on sidewalks at Edmonton; tar sands cannot compete with imported asphalt.

PEAT

UTILIZATION. Peat (Vildomoserne). Ingeniören, vol. 32, no. 17, Apr. 28, 1923, pp 193-201, 6 figs. Opinions of K. Prytz. J. Munch-Petersen, and V. Faaborg-Andersen. Ulilization of peat; occurrence in Denmark; report of peat commission as to production and utilization of peat.

PIERS

ELECTRICAL EQUIPMENT. Electrical Equipment on Erie's Weehawken Pier. Ry. Elec. Engr., vol. 14, no. 6, June 1923, pp. 167-169, 7 figs. Convenient lighting system and numerous elevators combine to expedite the transfer and storage of materials.

PISTONS

ALUMINUM. Production of Aluminum Pistons and Casings (Herstellung von Aluminum Gusskolben und-gehäusen), K. Kerpely. Giesserei Zeitung, vol. 20, no. 12, May 15, 1923, pp. 222-225, 13 figs. Discusses aluminum and its alloys; properties of aluminum pistons; methods of production.

DESIGN. Light Alloys Play Prominent Part in Recent Piston Design Development. Automotive Industries, vol. 48, no. 26, June 28, 1923, pp. 1381-1391, ,26 figs. Mechanical drawings showing recent developments in pistons.

PINS. Rickenbacker Adopts Lapping Process on Piston Pin Bearing Surfaces, J. Edward Schipper. Automotive Industries, vol. 49, no. 1, July 5, 1923, pp. 22-24, 6 figs. Describes lapping process used by Rickenbacker Motor Co. to reduce usual irregularities in piston-pin and piston-ring bearing surfaces.

POWER FACTOR

TECHNICAL AND COMMERCIAL ASPECTS. Power Factor: its Technical and Commercial Aspects, H. E. Yerbury. Instn. Elec. Engrs., Jl., vol. 61, no. 319, June 1923, pp. 675-691, 4 figs. Highest possible efficiency of electrical undertaking can be attained only by studying all the factors militating against low selling price per unit.

POWER GENERATION

AUTOMATIC PLANTS. Economies Effected by Installation of Automatic Generating Plants, R. C. Denny. Jl. Electricity & West. Ind., vol. 50, no. 11, June 1, 1923, pp. 435-438, 4 figs. Plants in operation in California. Report of Sub-Committee on Automatic Generating Stations of Apparatus Committee before Pacific Coast Elec. Assn.

POWER PLANTS

ARCTIC MACHINE COMPANY. Power Plant of the Arctic Ice Machine Co., L. E. Pollard. Southern Engr., vol. 39, no. 4, June 1923, pp. 35-44, 9 figs. How an old plant was remodeled to bring it up-to-date; main features and arrangement of various apparatus.

WIND-DRIVEN. Wind Power Plants (Om Vindkraftenlaeg), I. E. Johansen. Teknisk Tidsskrift, vol. 47, no. 3, Jan. 31, 1923, pp. 15-20, 4 figs. Utilization of wind by windmills and sailing ships; details of construction of a new wind motor.

POWER TRANSMISSION

BELT DRIVE. *See Belt Drive.*

RADIO-ELECTRIC. Radio-electric Transmission of Energy (La transmission radio-électrique de l'énergie), Maurice Leblanc. Radioélectricité, vol. 4, no. 6, June 1, 1923, pp. 181-184, 5 figs. Discusses transmission of energy (a) over short distances, and its application to traction of trams, automobiles, etc. and (b) over great distances, and difficulties involved.

TYPES OF DRIVES. Power Transmission in Southern Industries. Southern Engr., vol. 39, no. 4, June 1923, pp. 55-60, 74 figs. Discusses rope-drive transmission, leather and rubber belting, chain drives, speed variation, shafting, pulleys, couplings, and clutches, plain, roller and ball bearings, shaft hangers with concrete construction, electric motors in industry.

PRODUCER GAS

HYDROGEN DETERMINATION. Determination of Hydrogen in Generator Gas (Ueber die Bestimmung des Wasserstoffes in Generatorgas), Wilhelm. Feuerungstechnik, vol. 11, no. 16, May 15, 1923, pp. 171-173, 3 figs. Production of generator gas, describes new H_2 meter, and arrangement of measuring instruments for generator gas.

PULVERIZED COAL

BOILER FIRING WITH. Pulverized Coal, E. H. Tenney. Combustion, vol. 9, no. 1, July 1923, pp. 55-73, 9 figs. Report from Nat. Elec. Light Assn. Prime Movers Committee report. Statements received from companies operating pulverized-fuel-fired boilers, showing increased application of pulverized fuel, and its advantages.

Pulverized Fuel for Power Plants, A. G. Christie. Gas Age-Rec., vol. 51, no. 25, June 23, 1923, pp. 791-792. Discussion presented before Prime Movers Committee of N. E. L. A., showing that choice between stokers and powdered fuel depends upon conditions of problem, comparative advantages of stoker and pulverized-fuel equipment.

FINENESS OF. Powdered Coal, F. S. Sinnatt and L. Slater. Fuel in Sci. & Practice, vol. 2, nos. 5 and 6, June and July, 1923, pp. 142-146 and 175-181, 2 figs. June. Deals with questions of determining degree of fineness of powdered coal, produced by pulverizing in ball mill, and shows that sieving tests cannot give complete information. July: Methods for determining size of particles in a powder, sizing by microscopic exanination; comparison of different coals.

SMELTING-FURNACE FIRING. Advantages of Pulverizing Coal for Firing Smelting Furnaces, Etc. Salt Lake Min. Rev., vol. 25, no. 5, June 15, 1923, pp. 19-20. Crushing and firing advantages; drawbacks to use of pulverized coal.

Will Pulverized Coal Be Substituted for Fuel Oil in Smelting Operations?, T. H. O'Brien. Coal Age, vol. 23, no. 25, June 21, 1923, pp. 1013-1014. Freight rates and number of heat units big factor in comparing fuels; pulverized coal has higher ther thermal efficiency than mine-run; cheap electrical power from water-power developments may compete with fuel oil and coal.

PUMPING PLANTS

ST. THOMAS, ONT. Water Works Pumping Station, St. Thomas, W. C. Miller. Can. Engr., vol. 45, no. 1, July 3, 1923, pp. 101-103, 4 figs. Main and standby plants each have a capacity of 5,600,000 gal. per day against 125 lb. head; three motor-driven 2-stage centrifugal pumps and three 8-cylinder gasoline engine driven 2-stage centrifugal pumps.

PUMPS

RECIPROCATING, SPECIFICATION FOR. Pumps, Reciprocating, for Liquids. Abridgments of Specifications. Class 102 (i), 1909-15, 322 pp. Includes steam-engine air-pumps and combined pumps for liquids and gases.

PUMPS, CENTRIFUGAL

DESIGN. Centrifugal Pump Problems, George Higgins. Commonwealth Engr., vol. 10, no. 9, Apr. 1, 1923, pp. 341-351, 8 figs. Described tests carried on at hydraulic laboratory of University of Melbourne to obtain information as aid in designing simple centrifugal pumps.

ELECTRIC DRIVE FOR. Electric Drive for Centrifugal Pumps (La commande électrique des pompes centrifuges), M. Bizot. Electricien, vol. 54, no. 1325, June 1, 1923, pp. 241-246, 10 figs. Construction and operation of centrifugal pumps; application of electric drive; pumps direct-coupled to induction motors; automatic control devices.

PYROMETERS

APPLICATION IN MALLEABLE FOUNDRIES. Application in Electric Pyrometers in Malleable Foundries (Verwendung elektrischer Pyrometer in Tempergiessereien), A. Ruoff. Werkstattstechnik, vol. 17, no. 11 June, 1, 1923, pp. 328-330, 8 figs. Describes pyrometer manufactured by Hydro Apparate-Bauanstalt and its application in medium-size malleable foundries, resulting in considerable saving of coal.

ARDOMETER. The Ardometer. A New Radiation Pyrometer for the Measurement of High Temperatures, D. Flir. Fuels & Furnaces, vol. 1, nos. 1 and 2, May and June 1923, pp. 17-20 and 94-96, 8 figs. Describes instrument and gives its special advantages.

USE. Data on Pyrometers. Fuels & Furnaces, vol. 1 no. 3, July 1923, pp. 183-184, 2 figs. Review of Bull. no. 37 of Heat Economy Bur. of German Iron & Steel Inst. (Verein Deutschen Eisenhuttenleute) containing large number of data on use of pyrometers. Designs for mesauring fluctuating temperatures; temperature at which various proctecting tubes may be used and their properties.

R

RADIO TELEGRAPHY

ELECTRICAL PLANT. The Electrical Plant of Transocean Radio Telegraphy, E. F. W. Alexanderson, A. E. Reoch and C. H. Taylor. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 7, July 1923, pp. 693-703, 12 figs. Describes expansion of transocean communication system of Radio Corp. of America to unified group of electrical plants all controlled for communication purposes from central traffic in New York City, with summary of technical conditions covering design of radio central station and of technical conditions to be met in operatiog efficiently a modern radio-communication system.

SIGNALS, RECORDING OF. The Recording of Signals in High-Speed Radio Telegraphy, N. W. McLachlan. Beama, vol. 12, no. 62, June 1923, pp. 329-336, 9 figs. General outline of scheme; propagation of radiation through space; reception; recording.

STATIONS. International Radio Communication and the Sainte Assise Radiotelegraph Station Near Paris (Les radio communications internationales et la station radiotélégraphique de Sainte-Assise près Paris), G. Malgorn. Génie Civil, vol. 82, no. 22, June 2, 1923, pp. 509-520, 18 figs. Modern radioelectric centers; various systems of sustained-wave sending, necessity of a large radio-electric center in France; radiotelegraphy in other countries, arangement and equipment of Sainte Assise station.

DEVELOPMENTS. Latest Progress in Radiotelephony (Les derniers progrès de la telephonie sans fil), Edmond Marcotte. Arts & Metiers, vol. 76, no. 29, Feb. 1923, pp. 441-455, 25 figs. Field of activity; three-electrode tubes, generation of sustained waves by means of three-electrode tubes, application of three-electrode tubes as detectors and amplifiers, and to multiple telephony.

RAILWAY ELECTRIFICATION

FINANCIAL INVESTIGATION. Financial Investigation of the Prospects of Railway Electrifications, Philip Dawson. Inst. Transport—Jl., vol. 4, no. 8, June 1923, pp. 279-286 and (discussion) 286-296, 17 figs. on pp. 297-303. Results of investigation are presented in set of diagrams, and discussed, increase in train service due to electrification. Main lines electrified or in course of electrification in Europe and United States of America.

SOUTH AMERICA. Railway Electrification in South America. Tramway & Ry. World, vol. 53, no. 29, June 14, 1923, pp. 281-287, 9 figs. Inauguration of electric traction on suburban lines of Buenos Aires West. Ry, power station, boiler-house plant, coal and ash-handling plant, engine room, and condensing plant.

VIRGINIA. The Virginian Electrification, R. L. McClellan. Aera, vol. 11, no. 12, July 1923, pp. 1660-1663, 4 figs. Railroad to be made to permit hauling of heavier trains at higher speed and less ton-mile cost than heretofore has been possible.

RAILWAY EQUIPMENT

MAINTENANCE. Maintenance Methods used by the New Haven, H. T. Morris. Ry. Elec. Engr., vol. 14, no. 6, June 1923, pp. 163-166, 9 figs. A system of periodic inspection of all multiple-unit cars on N. Y., N. H. & H. RR. keeps equipment in prime condition.

RAILWAY MANAGEMENT

ORGANIZATION. Organization for Conducting the Business of the Southern Railway Company (England). Ry. Gaz., vol. 38, no. 24, June 15, 1923, pp. 881-887. Regulations for conducting business of board and committees; departmental organization defining duties, powers and responsibilities of officers.

RAILWAY MOTOR CARS

BENZOL. Benzol Railway Motor Cars (Benzol-mechanische Eisenbahn-Triebwagen). Verkehrstechnik, vol. 40, no. 21, May 25, 1923, pp. 180-182, 4 figs. Energy of internal-combustion engine is transmitted direct mechanically with high efficiency; details of design and construction; manufactured by Deutsche Werke A. G.

DEVELOPMENT. The Development of the Self-Propelled Railway Car, Charles J. McPherson. Engrs. & Engr., vol. 40, no. 5. May 1923, pp. 133-138, 9 figs. Details of various types.

STORAGE-BATTERY. Storage Battery Cars of the Canadian National E. B. Walker. Ry. Elec. Engr., vol. 14, no. 6, June 1923, pp. 175-179, 6 figs. Construction of cars; battery charging and maintenance; operation data.

RAILWAY OPERATION

TRAIN CONTROL. Automatic Train Control Developments. Ry. Elec. Engr., vol. 14, no. 6, June 1923, pp. 179-185, 13 figs. System employed by Genl Ry. Signal Co. and Ind. Equipment Corp.

The Braking Phase of Automatic Train Control, W. Gordon Fischer, Ry. Rev., vol. 72, no. 25, June 23, 1923, pp. 1098-1103. Points out that accepted phraseology is practically a misnomer for brakes really and not signals control train. (Abstract.) Paper read before Cincinnati Ry. Club.

RAILWAY REPAIR SHOPS

ECONOMIES IN. Economies in a Railroad Repair Shop, L. S. Love. Iron Age, vol. 112, no. 1, July 5, 1923, pp. 1-4, 13 figs. Using special testing appliances; reclaiming worn steel and tools; acetylene-welding equipment; cost-keeping machines employed.

RAILWAY STATIONS

TICKET PRINTER, ELECTRIC. Electric Railway Ticket Printer (Siemens-Schalter-Fahrkartendrucker). Siemens-Zeit., vol. 3, no. 5, May 1923, pp. 197-205, 14 figs. Describes fully automatic, electrically driven machine which prints railway tickets at instant of demand.

RAILWAY TIES

MAINTENANCE. Tie Renewals, J. E. Jacobs. Eng. & Contracting (Railways), vol. 59, no. 6, June 20, 1923, pp. 1363-1364. Practical suggestions on use and handling of ties given in paper before Maintenance of Way Assn. of Kansas City Southren Ry.

WOOD FOR. The Suitability of Western Species for Cross-Ties, Ovid M. Butler. Jl. of Forestry, vol. 21, no. 5, May 1923, pp. 475-482. Information secured in service and laboratory tests on cross-tie value of many western species.

RAILWAY TRACK

MAINTENANCE. Track Maintenance in City Streets, W. D. Chamberlain. Pacific Ry. Club-Proc., vol. 7, no. 1, Apr. 1923, pp. 21-30. Importance of good organization of force required for track maintenance and construction; reconstruction methods; equipment; joints and paving.

Use of Compressed Air in Track Maintenance and Construction, W. H. Armstrong. New England R. R. Club—Proc., May 8, 1923, pp. 95-105 and (discussion) 105-111. Description of pneumatic tie tamper and its application to track construction and maintenance; stone ballast.

RAILWAYS

AERIAL. Extra-Rapid Aerial Railways (Chemins de fer aériens extra-rapides), R. Dumé. Electricien, vol. 39, no. 1326, June 15, 1923, pp. 270-271, 2 figs. Describes Paris project an aerial flying express consisting of airship running under cableway, propelled like airplanes, reaching speed of 250 km.p.h.; projected by F. Laur.

RECLAMATION

CANADA. Drainage Feature of Land Reclamation, E. F. Drake. Can. Engr., vol 44, no. 24, June 12, 1923, pp. 571-574, 3 figs. Resume of operations of Drainage Division of Dominion Government and brief description of principal projects.

REFRACTORIES

GLASS-MANUFACTURING FURNACES. Refractories for the Glasshouse, J. L. Crawford. Fuels & Furnaces, vol 1, no 2, June 1923, pp 73-76 Demands made on refractories in crown, side walls and ports of glass tank furnaces and materials best meeting same.

MORTAR FOR Requirements of a Refractory Mortar, Robert F. Lindsay Fuels & Furnaces, vol 1, no 1, May 1923, pp 14-16. Specifications of a refractory mortar, or bonding material, to be used within temperature range of a No. 1 fire brick.

REFRIGERATING MACHINES

COMPRESSION, SUPERHEATER HEAT UTILIZATION IN. Utilizing Superheater Heat in Compression Refrigerating Machines (Die Nutzbarmachung der Ueberhitzungswärme bei Kompressionskältemaschinen), Edmund Altenkirch. Zeit. für die gesamte Kalte-Industrie, vol. 30, no. 5, May 1923, pp. 57-59, 2 figs. Suction of vapors in dry saturated state and condensing adiabetically is considered as most practical; its disadvantages and efforts to overcome them

RELATIVITY

EINSTEIN'S THEORY Einstein's Theory of Relativity and Gravitation, L. T. Rutledge Eng. Jl., vol 6, no. 7, July 1923, pp 341-342 Philosophy of relativity; time and space and mechanical principle of relativity, special and general theory; applications

MODEL TO ILLUSTRATE Model to Illustrate Theory of Relativity Am Inst Elec Engrs Jl, vol 42, no 7, July 1923, p 712 Device which directly conveys to the eye, principle statements and results of Einstein's original (restricted) theory of relativity, recently perfected by Prof Karapetoff.

RESEARCH

EXTENSION OF The Extension of Experimental Methods, A. S. Townsend Forging & Heat Treating, vol 9, no 6, June 1923, pp 250-253 Need for specific information in creative thought and originality is strongly emphasized, a clear understanding of how to experiment is essential

RETAINING WALLS

CELLULAR TYPE. A Brief Description of the Cellular Type of Retaining Wall used for Holding Embankments, G. Wallace Callahan. Cement & Eng. News, vol. 35, no. 2, Feb. 1923, pp. 21-22, 5 figs. Consists of two parallel retaining walls joined at certain distances by cross walls.

RIVETING

MACHINES FOR. A New Semi-Hot Bolt and Rivet Header. Forging & Heat Treating, vol. 9, no. 6, June 1923, pp. 257-259, 3 figs. Describes semi-hot automatic-feed rivet and bolt header, weighing 31,500 lb., which eliminates unnecessary shutdowns for adjustments, materially increasing production; life of gripping dies increased by reducing holding time.

ROAD CONSTRUCTION

EXCAVATION, EARTH-VOLUME CALCULATION. How Should Overhaul Quantities on a Grading Project be Computed? Contract Rec. & Eng. Rev., vol. 37, no. 26, June 27, 1923, pp. 634-637, 6 figs. Three methods are commonly used, viz.: centre to centre of mass method; mass diagram method; and station to station method. Last scheme is recommended as standard in report made to Associated Gen. Contractors of Am.; requirements of a standard method of determining overhaul.

ROADS

REPAVEMENT, PAYMENT FOR. Payment for Repavement. Pub. Works, vol. 54, no. 6, June 1923, pp. 206-209. Tables giving data on percentage of cost of original pavement and of repaving assessed against abutting property by several hundred cities.

ROADS, ASPHALT

SURFACING. Uses of Asphalt in Highway Construction, I. W. Patterson. Can. Engr., vol. 45, no. 1, July 3, 1923, pp. 109-115, 6 figs. Features influencing selection of numerous separate types of asphalt surfaces; practical considerations concerning construction and maintenance of asphalt surfaces; Paper before Can. Good Roads Assn.

ROADS CONCRETE

RESURFACING. Maximum Age for Resurfacing Concrete Roads, R. De L. French. Eng. Jl., vol. 6, no. 1, July 1923, pp. 322-324, 1 fig. Digest of report on inspection of 350 mi. of concrete highway.

SINGLE-TRACK. Concrete Single Track Roads, Allan Mair Jackson. Can. Eng., vol. 44 no. 26, June 26, 1923, pp. 619-620. Economical method of road construction adopted in Brant County, Ont.; concrete slab on one side of road and gravel track on other. Paper read at Can. Good Roads Assn. convention.

See also Contract-Rec & Eng. Rev., vol. 37, no. 36, June 27, 1923, pp. 626-623.

WINTER CONSTRUCTION. Winter Construction of Concrete Roads. Eng. News-Rec., vol. 90, no. 25, June 21, 1923, pp. 1082-1084, 3 figs. Advantage to contractor important, and careful tests indicate that engineer loses nothing in strength and finish of his pavement.

ROLLING MILLS

BROAD-FLANGED BEAMS. Rolling Broad-Flanged Beams at Differdingen, K. Raabe. Iron & Coal Trade Rev., vol. 106, no. 2884, June 8, 1923, p. 860-861, 7 figs. Describes Differdingen Gery mill for rolling broad-flanged beams; plant consists of blooming mill, intermediate mill, and finishing mill. Translated from Stahl u. Eisen.

ROLLING PROCESSES. Processes for Rolling Metal (Die Nutzarbeit des Walzvorganges), L. Weiss. Zeit. für Metallkunde, vol. 15, no. 5, May 1923, pp. 133-136, 5 figs. Magnitude of volume displaced in rolling and effect of speed of transformation on interior friction; resistance caused by high pressure of flow; apparant and real pressure of flow; curves

ROLLS, CAST-STEEL. Production of Cast Steel Rolls for Rolling Mills (La fabrication des cylindres de laminoirs en acier moulé), A. Lang. Fonderie Moderne, vol. 17, June 1923, pp. 183-186, 3 figs. Discusses iron and steel cast rolls, their advantages and drawbacks; molding; cracks and how to avoid them; annealing; faults.

SHEET MILLS. New Merchant Mill of Tennessee Co. Iron Age, vol. 112, no. 3, July 19, 1923, pp. 142-145, 5 figs. Describes merchant mill at Fairfield steel works of Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.; continuous and looping trains, cooling beds, continuous furnace and roll racks are features.

S

SAFETY

INDUSTRIAL. Industrial Safety, Int. Labour Rev.; vol. 7, no. 6, June 1923, pp. 948-958. Mental causes of accidents; the Safety-First Movement in United States, Great Britain, and Belgium.

SAND

GRINDING. Grinding of Sand. Times Trade & Eng. Supp., vol. 12, no. 257, June 9, 1923, p. 301, 1 fig. Law of comminution formulated as result of experimental work by British Portland Cement Research Assn

SAND, MOLDING

BOND TESTING. Give Details of Bonding Test. Foundry, vol. 51, no. 13, July 1, 1923, pp 545-547, 7 figs. Details of method of testing sand for bond, strength of bond is determined by carefully adhering to method thoroughly worked out to give concordant results; moisture of sand is an important factor Report presented at Am. Foundrymen's Assn. convention

COMPOSITION AND PROPERTIES The Second Melting Foundry (Etude sur la fonderie de deuxième fusion), P Vermer Arts & Métiers, vol 76, no 31, Apr 19, 1923, pp. 539-545, 3 figs. Discusses foundry sands, their composition and properties, microscopic study, proper selection, etc

PERMEABILITY The Permeability of Foundry Sand Brass World, vol 19, no 6, June 1923, pp 177-179, 4 figs. Describes new French method for determining permeability, developed by Georges-Louis Borne, explains its everyday application.

PROPERTIES. Moulding Sands, O Smalley Foundry Trade Jl, vol 27, nos 354 and 355, May 31 and June 7, 1923, pp 435-438 and 457-459, 2 figs Specification for molding sand, core sand, method of determining degree of fineness testing, properties of various sands

SEMI-DIESEL ENGINES

PEUGEOT-TAURAIS The Peugeot-Tartrais Heavy Oil Engine (Le moteur à huiles lourdes Peugeot-Tartrais), G Delanghe Génie Civil, vol 82 no 23 June 9, 1923, pp 547-552, 8 figs Semi Diesel type engine, details of construction and operation

SEPARATORS

ASH, MAGNETIC Development of Dry Magnetic Process for Recovering Coal from Ashes (Die weitere Entwicklung des trockenmagnetischen Verfahrens zur Rückgewinnung von Brennstoffen aus Feuerungsrückständen) Gewerbefleiss, vol 102, no 5, May 1923, pp 124-127, 3 figs Describes magnetic separators of various types, and their power consumption

SEWAGE DISPOSAL

HAMILTON, ONT., CANADA. Three Schemes of Disposal Suggested as Solution of Hamilton's Sewage Problems. Contract Rec. & Eng. Rev., vol. 37, no. 24, June 13, 1923, pp. 582-587 and 591, 4 figs. Describes three systems in detail with plates and estimates of costs of construction and operation, engineers recommend remodelling of West End plant and replacement of three East End works by a plain sedimentation scheme.

SEWERS

CLAY PIPE. Clay Sewer Pipe Manufacture. H. G. Schurecht. Am. Ceramic Soc.—Jl., vol. 5, nos. 6, and 7, June and July 1923, pp. 717-729, 5 figs., and 831-836, 8 figs. June: Effect of variable alumina, silica and iron oxide in clays on some properties of salt glazes. July: Heat distribution in sewer-pipe kilns.

SEGMENT-BLOCK. Test of Segment Block Sewer. Can. Engr., vol. 44, no. 26, June, 26, 1923, p. 623, 1 fig. Details of test made at plant of Dominion Sewer Pipe & Clay Industries, Ltd., Swansea, Ont., Canada, load of 3000 lb. per sq. ft. sustained by 6-ft. section before collapse of bank; sides were only partially supported.

See also Contract Rec. & Eng. Rev., vol. 37, no. 26, June 27, 1923, pp. 630-632.

SHERARDIZING

COATINGS, QUALITY OF. Protection by Sherardized Coatings. Metal Industry (Lond.), vol. 22, no. 23, June 8, 1923, pp. 588-589, 4 figs. Data on effect of time and temperature on rate of deposition and quality of coating produced.

SPRINGS

LEAF. Analysis of Tension and Flexure in Leaf Springs (Une analyse des tensions et flexions dans les ressorts à lames), D. Landau. Technique Automobile et Aérienne, vol. 14, no. 121, 1923, pp. 33-45, 16 figs. Mathematical analysis of springs of great endurance.

STACKS

REINFORCED-CONCRETE. Recent Reinforced-Concrete Stacks. (Zeitgemässe Eisenbetonschornsteine), Paul Frei. Tonindustrie-Zeitung, vol. 47, no. 47, June 13, 1923, pp. 367-369, 2 figs. Resistance to wind pressure; advantages of reinforced-concrete construction; stacks with and without lining; describes different types of construction.

STEAM-ELECTRIC PLANTS

LIGNITE-BURNING. Lignite Electricity Works (Rohbraunkolle-Elektrizitätswerke). Elektrotechnischer Anzeiger, vol. 40, nos. 88 and 89, June 2 and 5, 1923, pp. 611-612 and 623-624. Saving in cost of production by erecting works near lignite deposits; advocates separate operation of boiler house, machine house and switch house, and gives details of contruction and equipement of each.

WEYMOUTH, MASS. Some Engineering Features of the Weymouth Station, I. E. Moultrop and Joseph Pope. Power, vol. 58, no. 2, July 10, 1923, pp. 42-46, 5 figs. Describes selection of steam conditions, high-pressure installation ,boiler plant and feedwater heating, and auxiliary drive of new power station of Edison Elec. Illuminating Co. of Boston, now under construction at Weymouth; will have ultimate capacity of about 300,000 kw.; initial main generating equipment will consist of two 32,000-kw. turbines each driving a main 30,0000 kw. generator and a 2000-kw. auiliary generator direct-connected to shaft of main generator. Paper read before A.I.E.E. convention.

STEAM TURBINES

[GOVERNORS AND VALVE GEARS]. Steam-Turbine Governors and Valve Gears—Dashpots, Synchronizing Springs and Pilot Valves, Eustis H. Thompson. Power, vol. 57, no. 26, June 26, 1923, pp. 1018-1020, 3 figs.

STEAM ENGINES

[BELOW]. The Watson Vertical Uniflow Steam Engine. Engineering, vol. 115, no. 2998, June 15, 1923, p. 742, 5 figs. Engine developed for driving of ship stokehold fans, but equally suitable for work of other kinds.

STEEL

CORROSION IN SULPHURIC ACID. The Effect of Velocity on the Corrosion of Steel in Sulphuric Acid, W. G. Whitman, R. P. Russell, C. M. Welling and J. D. Cochrane, Jr. Indus. & Eng. Chem., vol. 15, no. 7, July 1923, pp. 672-676, 4 figs. Corrosion under acids and under natural waters; discusses fundamental equation and its dependence on metal, hydrogen-ion concentration, ferrous-ion concentration and removal of hydrogen; previous work and present investigation; reasons for decreased gas evolution and for increased oxygen depolarization with increased velocity.

TRAMWAY, ELECTRICAL RESISTANCE OF. The Electrical Resistance of Tramway Steel. Electricity, vol. 37, no. 1700, June 8, 1923, p. 297. Treats resistance of joints, rail bonds, electrolysis, and prevention of electrolysis.

DRILL. Review of Present Status of Drill Steel Breakage and Heat Treatment, Hardness and Heat Treatment of Mine Drill Steel Shanks. Am. Inst. Min. & Met. Engrs.—Trans., no. 1255-M, June 1923, 29 pp., 8 figs. Discussion of paper of Francis B. Foley, Charles Y. Clayton and Henry S. Burnholz, and of Charles Y. Clayton.

STAINLESS. Stainless Steel and its Engineering Applications, Harry Brearley. So. African Instn. Engrs.—Jl., vol. 21, no. 10, May 1923, pp. 273-288, 14 figs. Properties and applications of stainless steel.

"Stainless Steel" in the Chemical Industry. Chem. Age (Lond.), vol. 8, no. 207, June 2, 1923, pp. 590-591. Composition, properties, advantages of chromium steels, and disadvantages of stainless steels.

STEEL CASTINGS

HEAT-TREATMENT. Some Notes on the Heat-Treatment of Steel Castings, Francis, Wilson. Metal Ind. (Lond.), vol. 22, no. 25, June 22 1923, pp. 649-650, 3 figs. Change in structure of metal during heat-treatment process; expansion and contraction; regulating changes, eliminating brittleness, etc.

HEAVY-TYPE GENERATOR. Casting Heavy-Type Generator Castings. Iron Trade Rev., vol. 73, no. 1, July 5, 1923, pp. 42-43, 3 figs. Method of casting part of rotor of 87-000-hp. unit being built at Schenectady works of Gen. Elec. Co. Casting is 21 ft. in diam. when finished, and 10 of them are required in construction of single generator.

MANUFACTURE. The Manufacture of Steel Castings and Preparation of Sand. F. A. Melmoth. Foundry Trade Jl., vol. 27, no. 357, June 21, 1923, pp. 499-506, 16 figs. Discussion is confined to castings of light and medium weight. Description of various operations involved in production of such castings in large quantities.

The Manufacture of Steel Castings in the United States. Major R. A. Bull. Foundry Trade Jl., vol. 27, no. 356, June 14, 1923, pp. 477-480. Reviews history of industry gives its general divisions and discusses basic open-hearth and acid open-hearth practices.

STEEL, HEAT TREATMENT OF

CYANIDE HARDENING. Facts Worth Knowing about Cyanide Hardening. Can. Machy., vol. 29, no. 25, June 21, 1923, pp. 19 and 24. Temperature and time of heating are important factors; tools heated in this way generally retain their shape and dimensions; lime-water or pure cold water for quenching.

PYROMETRY IN. Heat-treatment of Steel with Special Reference to Production. J. W. Urquhart. Machy. (Lond.), vol. 22, no. 560, June 21, 1923, pp. 367-369. Temperature determination, magnetic detector, electric furnaces and magnetic control, fusible salt detectors, optical methods of heat determination, standard pyrometry, nature of critical range, degrees of heat covering peak of Ac range.

STEEL INDUSTRY

POWER AND FUEL CONSUMPTION. Power and Fuel Consumption of the Iron and Steel Industries of the Pittsburgh District. Sumner B. Ely and W. F. Rittman. Mech. Eng., vol. 45, no. 7, July 1923, pp. 401-406, 13 figs. Account of investigation of present power requirements and potential future power possibilities in Pittsburgh district, conducted by Carnegie Inst. of Technology, (1) with relation to community and its development as whole and (2) with relation to various specific industries of community.

STREET RAILWAYS

CARS. Electric Tramway Rolling Stock, W. L. Ireland. Tramway & Ry. World, vol. 53, no. 29, June 14, 1923, pp. 295-304, 18 figs. Fundamental factors which must be considered in making changes in design; double-deck cars and single-deck cars. Paper to be read at Congress of Tramways & Light Assn.

New Philadelphia Cars will have Many Modern Devices. Elec. Ry. Jl., vol. 61, no. 26, June 30, 1923, pp. 1073-1076, 8 figs. Single-end type is designed for either two-man or one-man operation; all cars to be equipped with safety devices; complete auxiliary equipment. 520 passengers.

Pittsburgh's New "Light Six" Train. Elec. Ry. Jl., vol. 61, no. 22, June 2, 1923, pp. 919-922, 5 figs. Describes new type of two-car train composed of low-floor cars, developed by Pittsburgh Rys.; two motors on trailer, arranged for forward only and without separate controller, emergency braking.

TRAILERS. Three-Door Trailers in Toronto. Elec. Ry. Jl., vol. 61, no. 25, June 23, 1923, pp. 1033-1034, 3 figs. Trailers are attached to Peter Witt motor cars, are operated on pay-as-you-pass plan, and have three doors, of which one can be changed by conductor from entrance to exit, as traffic demands.

STREET RAILWAYS, TRACK

RELAYING. Relaying Street Railway Tracks and Maintaining Traffic Operation (Die Gleiserneuerung der Strassenbahnen unter Berücksichtigung der Aufrechterhaltung des Betriebes), H. Sober. Verkehrstechnik, vol. 40, nos. 21 and 22, May 25 and June 1, 1923, pp. 177-179 and 187-189, 10 figs. Relaying operations of single and double tracks (a) with interrupted traffic (b) with uninterrupted traffic, and (c) during intervals when cars are not running.

STRUCTURAL STEEL

BUILDINGS. Structural Steel for Buildings. Eng. & Contracting (Building.), vol. 59, no. 6, June 27, 1923, pp. 1450-1454. Practice adopted by Am. Inst. Steel Construction for design, fabrication, and erection.

CONSTRUCTION SPECIFICATIONS. Cheaper Steel Construction is Objective of A. I. S. C. Can. Engr., vol. 44, no. 26, June 26, 1923, pp. 615-618, 3 figs. Proposed new specification for steel construction formulated by Technical Committee of Assn. of Fabricating Companies; working stresses increased; Rankine column formula; new stiffener spacing rule; derivation and defence of formulas.

STANDARDS. Rolled Steel Sections (British Standard Dimensions and Properties). British Eng. Standards Assn., no. 6, May 1923, 71 pp. Tables for equal angles, unequal angles, bulb angles, bulb plates, channels, beams, tee bars, and metric equivalents for same.

SUBSTATIONS

OPEN-AIR HIGH-PRESSURE. High-Pressure Open-Air Sub-Stations. Elec. Rev., vol. 92, no. 2376, June 8, 1923, p. 902, 2 figs. Details of 25,000-volt Kilmarnock installation.

SUPERHEATED STEAM

ECONOMY OF. The Economy of Superheater Steam Indus. Management (Lond.), vol. 9, no. 12, June 14, 1923, pp. 365-366, 2 figs. Points out that superheaters give theoretical saving of approximately 15 per cent. and actual saving of from 5 to 12 per cent of fuel burned.

SURVEYING

RANGE-FINDER. The Range-Finder on Surveys, W. A. Fletcher. Dominion Land Surveyors' Assn., Jl., vol. 1, no. 4, Apr. 1923, pp. 5-10, 5 figs. Description of Barr and Stroud instrument; range-finder adjustment; suitability of range-finder for general exploratory surveys.

THEODOLITES. A New Double-Reading Micrometer Theodolite. Dominion Land Surveyors' Assn., Jl. vol. 1, no. 5, July 1923, pp. 12-13, 5 figs. Instrument designed by C. F. Cassella & Co., London, for use on geodetic and exploration surveys where accuracy of highest order is desired.

Hildebrand's 8-Cm. Theodolite With Screw Microscope and Its Use in Municipal Surveying (Der Hildebrand-8cm-Theodolite mit Schraubenmikroskopen und seine Verwendung bei Stadtvermessungen), Karl Ludemann. Zeit. fur Instrumentenkunde, vol. 43, no. 5, May, 1923, pp. 145-161, 4 figs. Critical description of design and construction.

UNDERGROUND. Tacheometry as a Method of Underground Surveying, Henry Briggs and James Cooper. Instn. of Min. Engrs., Trans., vol. 65, Part 1, Mar. 1923, pp. 30-43 and (discussion) 43, 13 figs. History, methods, instruments, and accuracy.

SWITCHBOARDS

EQUIPMENT. Selection of Switchboard Equipment, S. W. Mauger. Power Plant Eng., vol. 27, no. 13, July 1, 1923, pp. 680-683, 5 figs. Considerations involved in selection of switchboard equipment for industrial power plants of from 1000 to 6000 kva.

T

TAYLOR SYSTEM

BUILDING INDUSTRY. Of What Value Is the Application of the Taylor System to Labor Efficiency in the Building Industry? (Welchen Wert hat die Anwendung des Taylor-Systems auf die Arbeitsleistungen in Baugewerbe?), H. Agatz. Baumgenieur, vol. 4, no. 8, Apr. 30, 1923, pp. 231-233. How Taylor system can be applied to advantage in building industry.

TELEPHONE

CRACKING NOISES IN RECEIVER. Cracking Noises in Telephones (Knackgeräusche und statische Entladungen am Fernhörer), H. Bahr. Elektrotechnische Zeit., vol. 44, no. 18, May 3, 1923, pp. 410. Based on series of tests, author concludes that assumption of that sharp cracking noises in receiver are hitting of membrane upon magnets or heavy bending of membrane is not fully correct and that these noises may be also caused by electrodynamic or condenser action of coils themselves.

TELEPHONY

Problems. Problems in Telephony Solved and Unsolved, J. A. Fleming. Elec. Rev., vol. 92, no. 2377, June 15, 1923, pp. 929-930 also Elecn., vol. 90, no. 2352, June 15, 1923, pp. 642-644. Chief unsolved problem is invention of receiver acoustically more efficient than present type of magneto receiver, and with equal or better speech-reproducing power. Discusses aerial wave energy; nature of speech sounds and the ear; telephone as energy-translating appliance: transmitter and repeater problems; carrier-current telephony; high-frequency currents; commercial telephony; radiotelephony; etc.

TEXTILE MILLS

Electrical Equipment. The Electrical Equipment of a Cotton Mill. Elec. Rev., vol. 92, no. 2376, June 8, 1923, pp. 899-902, 11 figs. Rochdale mills of No.2 Dunlop Rubber Cotton Mills, Ltd. are entirely electrically driven, and consist of large spinning and weaving establishments, euuipped with up-to-date machinery for production of cotton cord, fabric, etc. used in manufacture of Dunlop cord tires.

THERMO DYNAMICS

Nernst Third Law. Nernst's Heat Theorem (Das Wärmetheorem von Nernst in rechnerischer und zeichnerischer Darstellung), Schmolke. Dinglers polytechnisches Jl., vol. 338, no. 9, May 12, 1923, pp. 91-95, 3 figs. Enunciates a third thermo dynamic law, giving numerical and graphic presentations.

THERMOSTATS

Regulation. Research of Thermostats (Recherches sur les thermostats), A. Tian. Journal de Chimie Physique, vol. 20, no. 2, June 1, 1923, pp. 132-166, 2 figs. Disadvantages and defects of present thermostats; thermostats with one, two or more enclosures; regulation of thermostats; results of experiments.

TIRES, RUBBER

Air-Cushion. Shoeing a Car with Low-Pressure Air, J. E. Hale. Soc. Automotive Engrs.—Jl., vol. 13, no. 1, July 1923, pp. 41-50, 41 figs. Describes results of deliberate attempt to make motor vehicles ride on air that is at low pressure, through usage of air-cushion tire having greater carcass flexibility than is usual and by enlarging size of tire section so as to provide greater area of contact between tire and pavement; effect of car operation; durability and tire cost.

Cord. Flat Band Built Cord Tires. India Rubber World, vol. 68, no. 4, July 1, 1923, pp. 625-627, 10 figs. Describes unique method that utilizes maximum strength of cords and affords full control of each stage in balanced tire construction.

Large-Section. Experiments Indicate Possibilities of Large Section Tires, S. P. Thacher. Automotive Industries, vol. 48, no. 26, June 28, 1923, pp. 1375-1378, 7 figs. Advantages of balloon-type pneumatic and reasons for its development.

Patent Specifications. Wheel Tyres, Pneumatic and Other Elastic, and Rims for Use Therewith. Abridgment of Specifications, class 144 (ii), period 1909-15, 1923, 385 pp. Patents for inventions.

TRACTORS

Industrial Plants, Use in. How the Railless Railroad Solves the Unskilled Labor Problem, Matthew W. Potts. Chem. & Met. Eng., vol. 28, no. 24, June 18, 1923, pp. 1061-1064, 4 figs. Tractor and trailer transportation eliminates man-handling around plant; gives advantage of hauling long trains without necessity of following any given path.

TRANSFORMERS

Three-Phase vs. Single-Phase. Three-Phase Vs. Single Phase Transformers for Distribution Power Service, E. Y. Porter. Jl. Electricity & West. Ind., vol. 50, no. 11, June 1, 1923, pp. 455-458, 12 figs. Important features of this class of transformers; methods of mounting; means and appliances for determinging actual load of distribution transformers. Report Distribution Transformer Sub-Committee of Apparatus Committee before Pacific Coast Electrical Assn.

TRANSPORTATION

Canadian Routes. Transportation Routes in Canada, Frederick W. Cowie. Eng. Jl., vol. 6, no. 7, July 1923, pp. 313-321, 3 figs. Their relation to enduring production.

Mass. Planning Mass Transportation Facilities, T. Fitzgerald. Engrs. Soc. West. Pa—Proc., vol. 39, no. 2, Mar. 1923, pp. 47-68 and (discussion) 69-77. Object and importance of mass transportation; foundations of community development; factors affecting plans; influence of topography; street congestion and rerouting; steam railways; bus; separate grade terminals for surface cars; rapid transit.

TUBES

Seamless Steel. Mill Produce Small Size Tubes, E. F. Ross. Iron Trade Rev., vol. 72, no. 26, June 28, 1923, pp. 1877-1882, 9 figs. New plant of Weldless Tube Co. makes seamless tubing of 3½-in. diam. and smaller; requirement was especially designed to speed up production, forming department provided.

U

UNEMPLOYMENT

Payments to Unemployed. Notes on Unemployment Problems. Int. Labour Rev., vol. 7, no. 6, June 1923, pp. 898-932. Bills on unemployment insurance; working of existing systems of insurance; unemployment insurance by industries; unemployment relief for foreign workers; agencies for placement; provision of work. Conditions in France, Germany, Italy, Great Britain, Roumania, Netherlands, and other countries.

V

VACUUM TUBES

Three-Electrode. A New Three-Electrode Tube (Sur un nouveau tube triode). Industrie Electrique vol. 32, no. 742, May 25, 1923, pp. 185-186, 5 figs. Describes Doule tube, operated as a rectifier but having a sodium anode kept at required temperature, consistuting a very sensitive detector.

VARNISHES

Hardness. A method for the Determination of the Comparative Hardness of Varnish Films, W. H. Wilkinson. Paint Mfrs. Assn. of U. S., Sci. Section, Circular 184, June 1923, pp. 302-304, 3 figs. Comparison of previous methods and description of new one..

VENTILATION

Schoolrooms. The Ventilation of Schoolrooms, George T. Palmer. Am. City, vol. 28, no. 6, June 1923, pp. 571-574, 1 fig. Resumé of results of four years research conducted by New York State Commisssion on Ventilation

VIBRATIONS

String and Spring. On Mechanical Devices for Demonstration of Vibrations of String and Spring, Shuichi Hayashi. Kyoto Imperial Univ. ,Memoirs of College of Science, vol. 6, no. 3, Mar. 1923, pp. 165-169, 10 figs. Describes instruments devised by author for studying sounds of different pitches

VISCOSIMETERS

Types. Principles of Viscometry. Indus Australian & Min. Standard, vol. 69, nos. 1796 and 1797, May 3 and 10, 1923 pp. 712-713 and 734-735. Abstract of lecture before Soc. Chem. Industry of Victoria, containing discussion on: elementary principles of viscometry, by W. Stone; operation of Michell viscometer, by F. E. A. Stone; operation of Macmichael viscometer, by H. L. Longbottom; and construction and merits of various efflux viscometers and operation of Stone's absolute viscometer, by R. Boan.

W

WASTE ELIMINATION

Industrial. Industrial, Waste, Oliver Sheldon. Indus. Management (Lond.), vol. 9, no. 12, June 14, 1923, pp. 357-358. Waste is epitomized as anything which prevents most efficient use of personnel, plant, material, power, opportunities and capital, and it is shown how losses in industry arising from these causes may be prevented.

WASTE HEAT

Cement Kilns. Waste Heat from Cement Kilns Operates Entire Mill, H. A. Schaffer. Chem & Met. Eng., vol. 29, no. 1, July 2, 1923, pp. 18-19. Points out that with efficient prime movers and grinding equipment entire cement plant may be operated on power from waste-heat boilers.

WATER POWER

Studies. Water Power Studies, William T. Taylor. Elec. Rev., vol. 92, nos. 2377 and 2378, June 15 and 22, 1923, pp. 924-926 and 991-993, 8 figs. Stream flow.

WATER SUPPLY

Sydney, Australia. The Cordeaux and Avon Reservoirs for Sydney water Supply. Engr., vol. 135, no. 3518, June 1, 1923, pp. 570-573, 12 figs. Partly on supp. plate. Description of dams under construction and of the plants at the two works.

WATER TREATMENT

Softeners. Steel Mill Installs Modern Softeners, G. S. Reynolds. Blast Furnace & Steel Plant, vol. 11, no. 6, June 1923, pp. 337-339, 4 figs. Investigation shows necessity of improving power and cooling-water conditions, by introduction of latest water softeners.

Welding. *See Autogenous Welding; Oxy-Acetylene Welding.*

WINDING ENGINES

Drum. A Large Winding Drum. Engineer, vol. 135, no. 3521, June 22, 1923, p. 670, 4 figs. partly on p. 662. Describes new winding, drum, installed in winding engine of British coal mine, which is 24 ft. in diam. by 12 ft. in width

ENGINEERING INDEX—Supplementary List

A

ACCOUNTING

Small Plants. Bookkeeping for the Small Plant, C. J. Morrison. Am. Mach., vol. 59, no. 1, July 5, 1923, pp. 19-21, 4 figs. Requirements for setting up bookkeeping system; numbering accounts, checks and stubs; making entries in purchase book and ledger; drawing up statements.

AUTOMOBILE FUELS

Tests. Winter Tests Show Lower Mileage with Heavy Fuels, H. C. Dickinson and John A. C. Warner. Soc. Automotive Engrs. Jl., vol. 13, no. 1, July 1923, pp. 87-92, 3 figs. Results of tests made by Research Dept. of Soc. Automotive Engrs. under winter conditions of 1923 to determine whether relative fuel mileages for different fuels are dependent on temperature at which car operation is conducted.

AUTOMOBILES

Headlights. Importance of Better Automobile Head-Lamps and Proper Adjustment, R. N. Falge and W. C. Brown. Soc. Automotive Engrs. Jl., vol. 13, no. 1, July 1923, pp. 25-29, 9 figs. Tests made with common type of head lamp with a parabolic reflector to show effects produced by placing source of light in different positions, describes type of lens that will compensate for commercial variations in position of filament and at same time distribute light effectively, converging or diverging rays laterally while maintaining top or cut-off substantially at level of head lamp, requirements for uniform and satisfactory service of lamps and such parts as filaments, sockets, reflectors, lenses, etc.

B

BOILER FIRING

Efficiency. Art of Firing (Beitrag zur Heizkunst). Feuerungstechnik, vol. 11, no. 17, June 1, 1923, pp. 180-182, 2 figs. Air distribution and non-uniformity of coal, good manual stoking gives cheapest steam, value of flame chamber, high ignition temperature, and low end temperature.

BOILERS

Inspection. Boiler Inspection, R. J. Furr. Southern Engr., vol. 59, no. 3, May 1923, pp. 38-41. How boiler inspector goes about inspecting a boiler and some of the points to be observed.

Repairing. Repairs to Lap Joint Failures of Water Pockets of Yarrow Boilers, Alec Broughton. Indus. Australian & Min. Standard, vol. 69, no. 1800, May 31, 1923, pp. 882-884, 6 figs. Description of a typical repair job on Yarrow boilers, with lower drums of elliptical section, fitted in many vessels of H. M. Navy in prewar and early war years, origin of trouble described, and consequent repair job, lies in unsymmetrical shape of water pockets. Abstract of paper read before Instn. Engrs.

Tests. Small Plant Equipped for Extensive Tests to Check Weekly Performance, J. W. Geiger and H. L. Solberg. Power, vol. 58, no. 2, July 10, 1923, pp. 53-55, 3 figs. Tests conducted by Lafayette Box Board and Paper Co., Lafayette, Ind.; economizers and feedwater heaters used in connection with four 3,000-sq. ft. 150-lb. boilers, automatic damper control regulates supply of warm air from drying room, one condensing and two 35-lb. back pressure Corliss engines drive process machinery.

Vertical-Tube. The Ladd Belleville Vertical Tube Boiler (La chaudière Ladd Belleville à tubes verticaux). Vie Technique et Industrielle, vol. 5, no. 44, May 1923, pp. 107-108, 2 figs. Brief description of design and operation.

Waste-Gas-Fired. Boilers Operating under Blast Furnace and Other Waste Gases, F. Johnstone Taylor. Colliery Guardian, vol. 125, no. 3257, June 1, 1923, p. 1326, 2 figs. Notes on modern systems.

Water Tube. *See Boilers, Water Tube.*

C

CANALS

Boat Lifts. Design of Boat Lift with 36 Meter Lift (Entwurf eines Schiffshebewerkes von 36 m Hub "Bauart Harkort"), H. Kamer. Bauingenieur, vol. 4, no. 10, May 31, 1923, pp. 286-294, 4 figs. Describes Harkort type of boat lift designed for Hohenzollern Canal, near Niederfinow.

CAST IRON

PEARLITE. Pearlitic Cast-Iron: Its Production, Mechanical Properties and Possibilities, H. Bauer. Foundry Trade Jl., vol. 27, no. 355, June 7, 1923, pp. 153-156, 6 figs. Results of tests, possible uses. Translated from Stahl u. Eisen.

COKE HANDLING

AVOIDANCE OF SMALL SIZES. The Care of Coke (Koksschonung), Binder. Gas- u. Wasserfach., vol. 66, no. 22, June 2, 1923, pp. 313-316, 3 figs. Describes operations of a gas works working two shifts in 24 hours, coke production and small coke, recommendations for plant and operations to avoid small coke as far as possible.

MECHANICAL. Mechanical Handling of Coke at the Perrache Plant of the Lyon Gas Company (La manutention mécanique du coke à l'usine de Perrache, de la Compagnie du Gaz de Lyon), Ch. Dantin. Génie Civil, vol. 82, no. 23, June 9, 1923, pp. 541-543, 9 figs. partly on supp. plate. Description of new automatic plant; capacity 180,000 tons per year at 0.75 francs per ton; overhead monorail conveying.

D

DAMS

EARTH. Methods and Machinery Used in the Construction of the Scituate Dam of the New Providence Water-Supply, George A. Griffin. Contractors' & Engrs.' Monthly, vol. 6, no. 5, May 1923, pp. 47-52, 4 figs. Construction details of one of the largest earth dams in United States.

E

EARTH

PRESSURE OF. Sand Pressure (Ueber den Sanddruck), Ph. Forchheimer. Schweizerische Bauzeitung, vol. 81, no. 24, June 16, 1923, pp. 293-296, 6 figs. Study of earth pressure with references to earlier works of author and other investigators.

ELECTRIC CONDUCTORS

BRONZE. Technical and Economic Importance of Bronzes for High-Frequency Overhead Lines (Die technische und wirtschaftliche Bedeutung der Bronze für Hochspannungsfreileitungen). Robert Edler. Elektrotechnik u. Maschinenbau, vol. 41, no. 21, May 27, 1923, pp. 305-311. Shows necessity of determining in each case whether use of bronze in place of copper will be advantageous, as copper supply of Austria does not cover one-third of consumption; successful use of copper steel wire.

ELECTRIC METERS

TESTING. Testing and Maintenance of Electric Meters, W. H. Talbott, Jl. Electricity & West. Ind., vol. 50, no. 11, June 1, 1923, pp. 446-448. Maintenance of switchboard instruments, meters, and relays has received particular study during past year. Report Meter Committee before Pacific Coast Elec. Assn.

ELECTRIC PLANTS

DIESEL-ENGINE. A 1,500 Hp. Diesel Engine Electric Plant. Southern Engr., vol. 39, no. 3, May 1923, pp. 35-38, 6 figs. Details of Diesel engine installation of Citizens Light & Power Co., New Orleans, La.

F

FLAMES

TEMPERATURES. Flame Temperatures, W. Trinks. Fuels & Furnaces, vol. 1, nos. 2 and 3, June and July, 1923, pp. 65-70 and 165-168, 12 figs. Gives set of graphs from which flame temperature can be read directly and explanation of their use.

FLOW OF WATER

HOT WATER. Flow of Hot Water Under Pressure and Its Possible Application (Sur l'écoulement de l'eau chaude sous pression et son application possible), M. Grauce. Revue de l'Industrie Minérale, no. 59, June 1, 1923, pp. 331-343, 10 figs. Compares energy of hot water with that of steam; hot-water piping theory of trompe; application of hot water for purpose of trompe, especially vacuum trompe.

FLUMES

CONCRETE. Building a Concrete Flume in Rough Country, H. K. Fox. Eng. News-Rec., vol. 91, no. 1, July 5, 1923, pp. 20-21, 5 figs. Railroad built along line from source of materials and then taken up as flume is built in reverse direction; 2½-mi. conduit and flume line built by San Joaquin Light & Power Corp., Cal.

H

HEATING AND VENTILATING

CONSERVATORIES. Heating, Ventilating and Humidifying One of the World's Largest Private Conservatories. Heat. & Vent. Mag., vol. 20, no. 6, June 1923, pp. 39-43, 8 figs. Unique methods followed in design of equipment for Dupont horticultural buildings at Longwood, Inc.

HIGHWAYS

STATE, ECONOMICAL DEVELOPMENT OF. The Economic Development of State Highways, Thomas H. MacDonald. Good Roads, vol. 64, no. 23, June 6, 1923, pp. 214-216 and 218-219. Explains "7 per cent" system; principles of financing; deferred payments.

I

INDUSTRIAL MANAGEMENT

ROUTING THROUGH ASSEMBLY. Routing Automobiles Through Assembly. Management & Administration (Management Eng. & Administration Combined), vol. 6, no. 1, July 1923, p. 48. A sembling engines; chassis assembled on opposite side of room; turning chassis broadwise and upside down.

STABILIZING EMPLOYMENT. Safeguarding Industry by Stabilizing Employment, W. I. King. Taylor Soc.—Bul., vol. 8, no. 3, June 1923, pp. 85-89 and (discussion) 89-95. Based upon information collected by Natl. Bur. Economic Research; measuring changes in employment.

WORKSHOPS. Improvements in Workshop Management (Verbesserungen im Werkstattenbetrieb), G. Lunz. Verkehrstechnik, vol. 40, no. 22, June 1, 1923, pp. 185-187. Criticizes time-piece rate in German railway shops, and explains new method based on minimum number of workers and maximum output, and bonus payment.

INSULATORS, ELECTRIC

PORCELAIN. Porcelain Insulators, H. P. Moss. Commonwealth Engr., vol. 10, no. 8, Mar. 1, 1923, pp. 288-291, 6 figs. Standard specification of design and testing of porcelain insulators, issued by British Eng. Standards Assn.

L

LATHES

AUTOMATIC PISTON. Machine Tools for Railway Shops. Ry. Gaz., vol. 38, no. 23, June 8, 1923, pp. 850-851, 2 figs. Ryder automatic lathe for piston and piston-ring manufacture.

LOCOMOTIVES

ERIE R. R. Latest Locomotive Types for the Erie R. R. Ry. Rev., vol. 72, no. 24, June 16, 1923, pp. 980-988, 3 figs. Tractive and steaming capacity of previous designs augmented by application of specialties to new freight and passenger power.

4-6-0. New 4-6-0 Type Express Locomotives, London Midland & Scottish Railway. Ry. Gaz., vol. 38, no. 26, June 29, 1923, p. 956, 4 figs. partly on p. 957. Data on new 4-cylinder locomotive, giving total weights in working order and dimensions, has tenders of new design having capacity of 3,000 gal. water and 6 tons coal; tractive effort 29,470 lb.

M

MARINE BORERS

SAN FRANCISCO HARBOR. Teredos in San Francisco Harbor (Voldsomme Pæleormsodelæggelser i San Franciscos Havn og amerikanske Pæleormsforskninger), G. Lorentz. Ingeniøren, vol. 32, no. 12, Mar. 24, 1923, pp. 138-139, 1 fig. Investigation made by Danish Society and Am. Nat. Research Council; discusses recent teredo epidemic and describes their destructive work.

MEASURING INSTRUMENTS

STANDARDIZATION OF ELECTRICAL. The Standardization of Electrical Measuring Instruments, H. B. Brooks. Am. Inst. Elec. Engrs., Jl., vol. 42, no. 7, July 1923, pp. 713-722. Points out advantages of national standard specifications for manufactured articles, history of standardization in England, comparison of British, French and German specifications, consideration in United States; features of tentative specifications. Published by permission of Bur. of Standards.

O

OIL ENGINES

FALK. A New Heavy-Oil Engine. Power, vol. 58, no. 2, July 10, 1923, pp. 50-58, 7 figs. Description of Falk 550-hp. solid-injection four-cylinder vertical engine designed for both stationary and marine service; for marine propulsion four engines drive one propeller through reduction gears.

OVENS

DRYING. Fuels and Their Handicaps as Related to Drying Ovens, H. M. Lane. Fuels & Furnaces, vol. 1, no. 1, May 1923, pp. 4-5. Considers electricity, gases, oil, coal, and coke. Latter is most economical.

OVERVOLTAGES

PROTECTION AGAINST. Technical Viewpoint on Excess Voltage Protection (Einige technische Gesichtspunkte zur Beurteilung der Ueberstromschutzeinrichtungen in Hochspannungsnetzen, M. Schleicher. Elektrische Betrieb, vol. 21, no. 10, May 24, 1923, pp. 109-111. Discusses systems with and without auxiliary line, special cables with auxiliary line added, and auxiliary line laid separately, and their functioning.

P

PIPE, CAST-IRON

CORROSION. Underground Corrosion. Gas Industry (Manufactured Gas Edition), vol. 23, no. 6, June 1923, pp. 204-208. Two articles: Steel Pipe, Protection From Corrosion, by W. M. Murphy; Underground corrosion as Affecting Cast Iron Pipe, by H. Y. Carson.

PUMPING PLANTS

SCREENS, REVOLVING. Revolving Screens for Low-Lift Pumping Station, Detroit Filters, Theodore A. Leisen. Eng. News-Rec., vol. 91, no. 1, July 5, 1923, p. 14, 2 figs. Primary mission to intercept floating and slush ice; adhering matter flushed into through leading to sewer.

R

RAILWAY CONSTRUCTION

N. Y. CENTRAL, N. Y. Rapid Progress Being Made on Castleton Cut-Off. Ry. Age, vol. 74, no. 30, June 30, 1923, pp. 1681-1686, 13 figs. Work on new New York Central line to relieve congestion at Albany; bridge structure is about one mile in length heavy construction on east side of river; unusual culvert-construction problem.

REACTORS

CURRENT-LIMITING. Forcing Most Economical Load Division by Reactors, A. H. Sweetnam. Elec. World, vol. 81, no. 25, June 23, 1923, pp. 1463-1465, 2 figs. Investigation of values on Boston system leads to decision to install reactors with taps permanently built into reactor structure; limits voltage drop.

REFUSE DISPOSAL

FACTORY. The Scientific Utilization of Factory Refuse, David Brownlie. Chem. Trade Jl. & Chem. Engr., vol. 72, no. 1881, June 8, 1923, pp. 693-694. Proper utilization of general refuse in chemical works said to be source of fuel economy methods and equipment.

RUBBER INDUSTRY

UNITED STATES. The Rubber Industry. U. S. Bur. of Census, Census of Manufacturers, 1921, 24 pp. General statistics, statistics of wage earners, production, imports and exports.

S

SAND

PLANTS. The Design of Sand Plants, Edmund Shaw. Rock Products, vol. 25, nos. 25 and 26, Dec. 16 and 30, 1922, and vol. 26, nos. 1, 2, 3, 9, 11 and 30, Jan. 13, 27, Feb. 10, May 5, June 2 and 30, 1923, pp. 24-27, 89-90, 20-23, 30-32, 20-22, 26-27, 36-38, 69-71, 35 figs. Deals with different forms of plants producing washed sand, and improvements which have recently been made in design to make them produce better quality of sand; settling boxes and their calculation, plant layout and construction sand plants connected with dry land deposits; etc.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Experience with Activated-Sludge Plant at Eldorado, Kan., Albert H. Jewell. Eng. News-Rec., vol. 90, no. 25, June 21, 1923, p. 1085. After oil boom, septic tank and chlorination plant changed to activated sludge.

T

TELEPHONY

AUTOMATIC. New Automatic Telephone System of the Rhätische Railway. Neue Selbstanschluss-Fernsprechanlagen der Rhätischen Bahn., Georg Forster. Zentralblatt der Bauverwaltung, vol. 43, nos. 45-46, June 6, 1923, pp. 268-270, 7 figs. Describes arrangement of centrals, wiring diagrams; table and wall instruments.

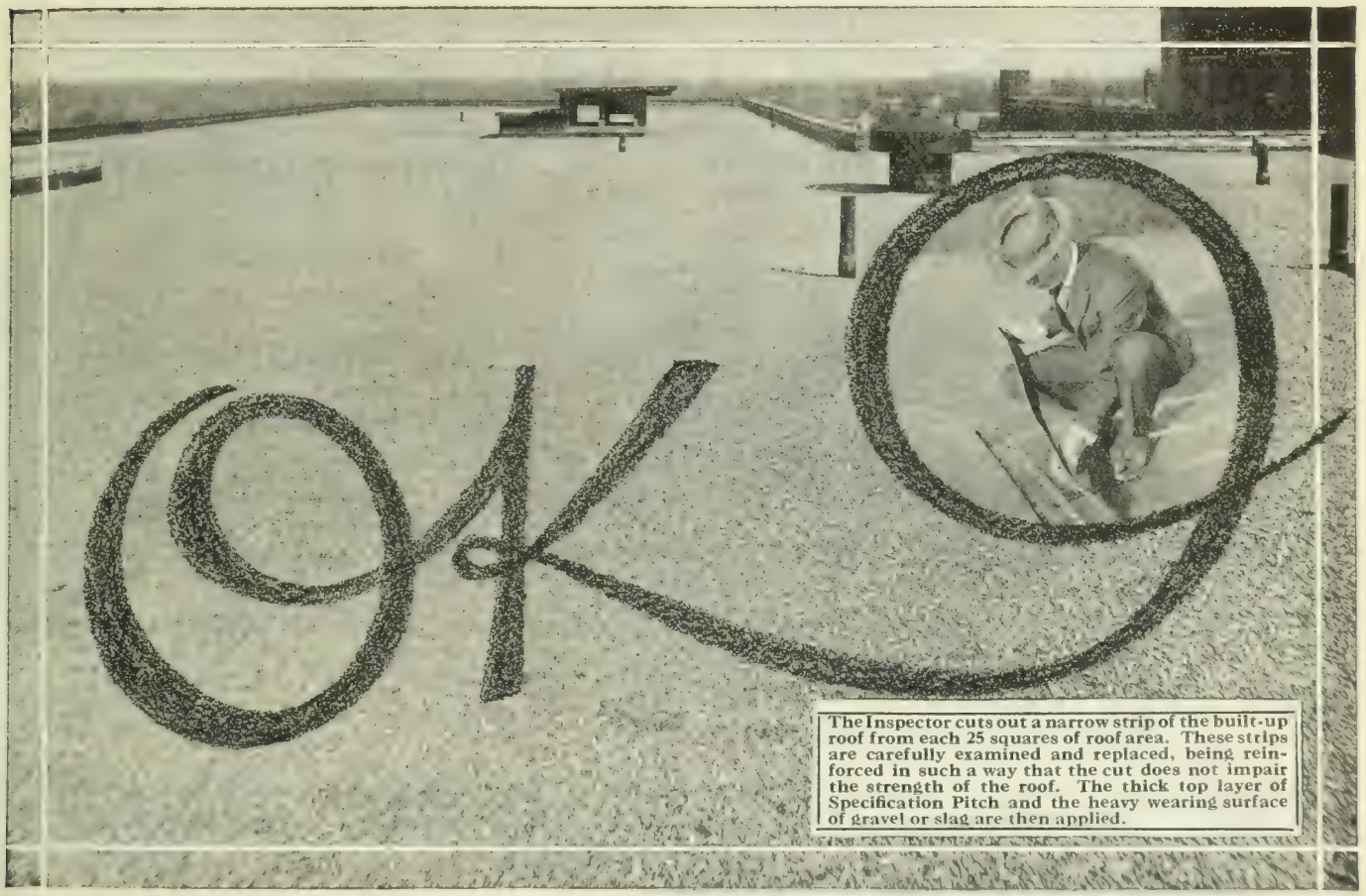
TRANSFORMERS

OIL-IMMERSED. Oil-Immersed Transformers. Beama, vol. 12, no. 62, June 1923, pp. 372-378, 8 figs. Describes various types of static transformers built by Brush Elec. Eng. Co., and gives reasons for their preference for "core" type of construction instead of shell type; construction details; practical hints for erection and use.

W

WATER GAS

BLAST GAS, DUST REMOVAL FROM. Removing Dust from Water-Gas Blast Gas, A. M. Beebe. Am. Gas Jl., vol. 118, no. 24, June 16, 1923, pp. 523-525. Official report of committee on Elimination of Dust from Water Gas Blast Bases, read before Empire Gas & Elec. Assn., three methods of dust arresting of precipitation; describes electrical dust precipitating installation, giving operating figures and results.



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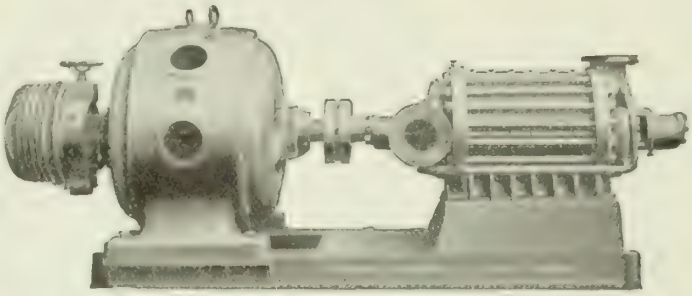

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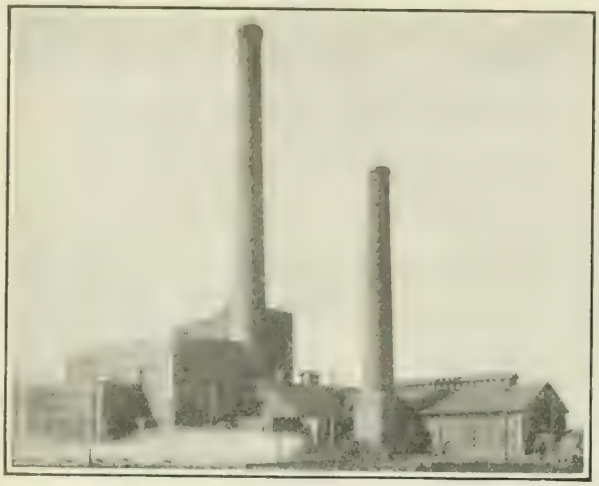

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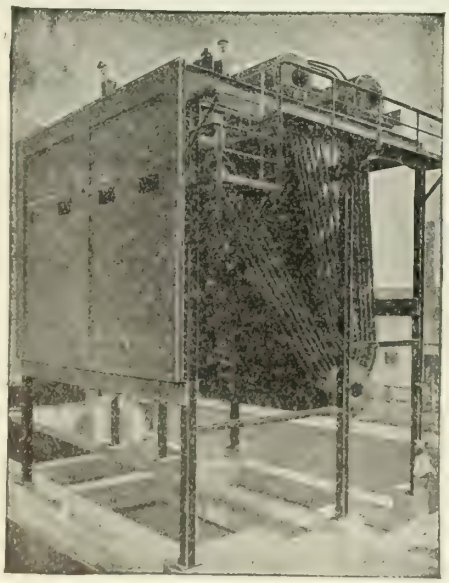

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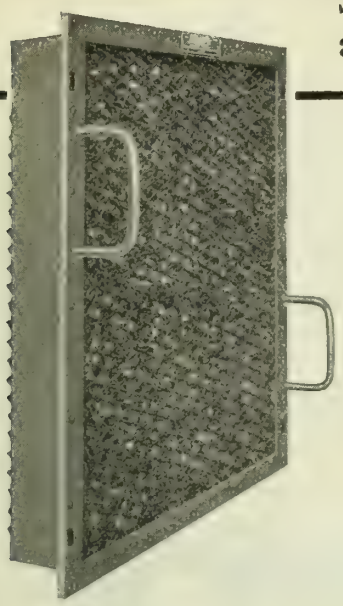

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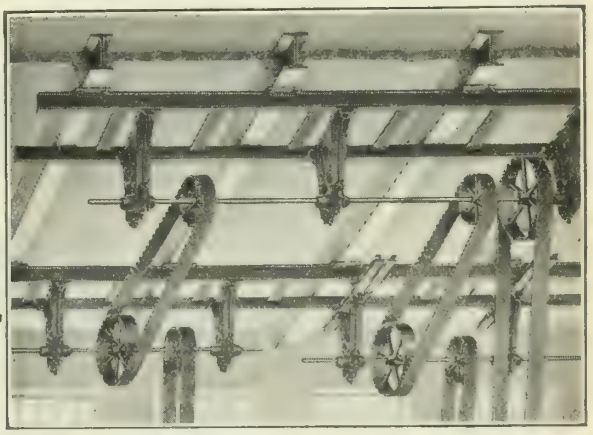

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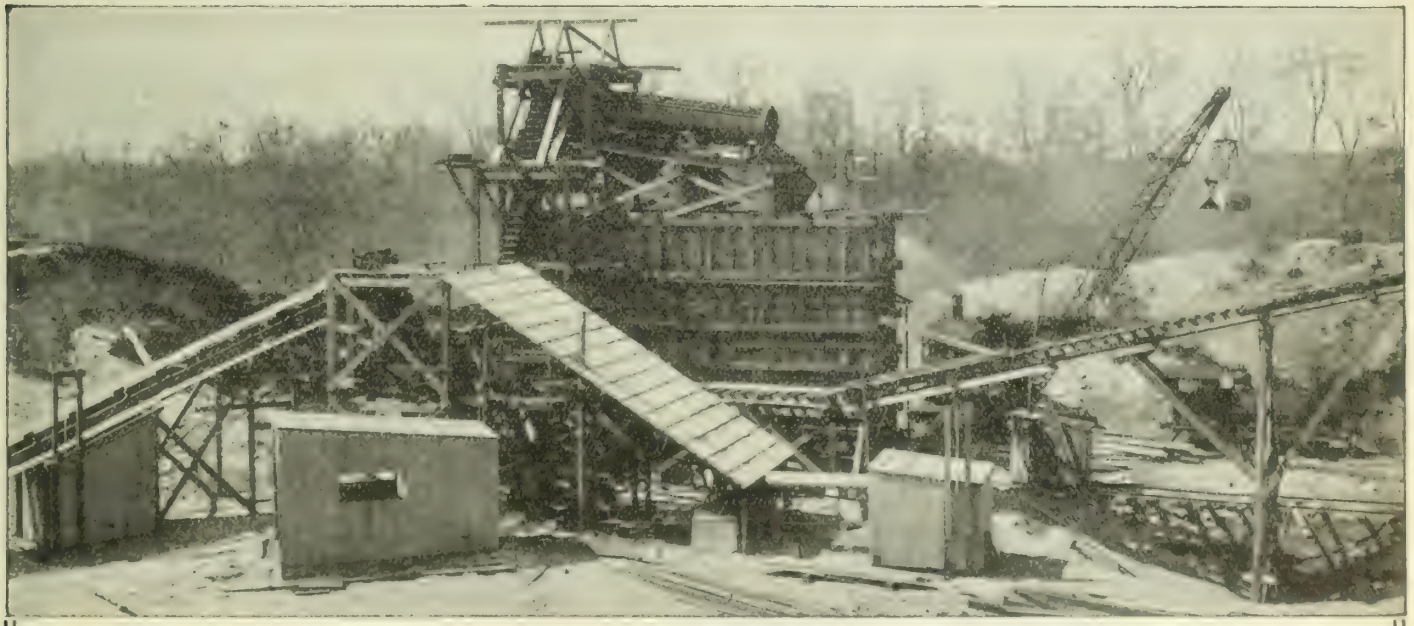

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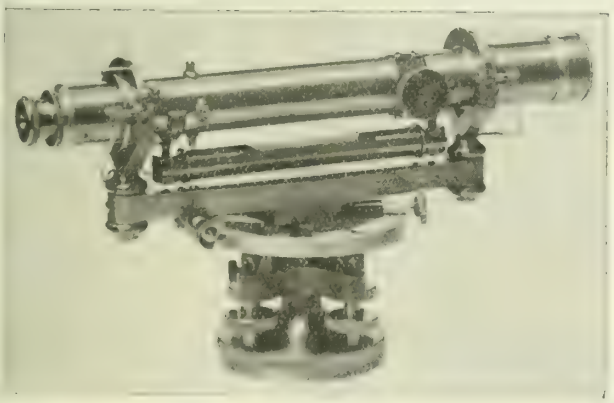

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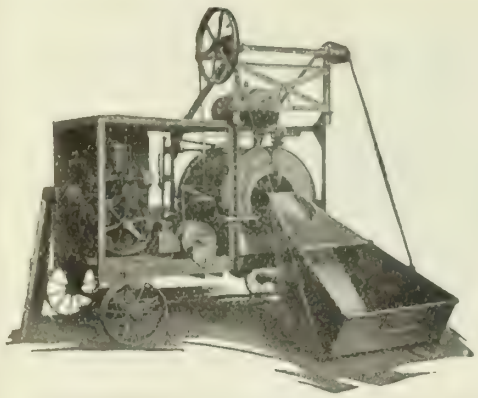

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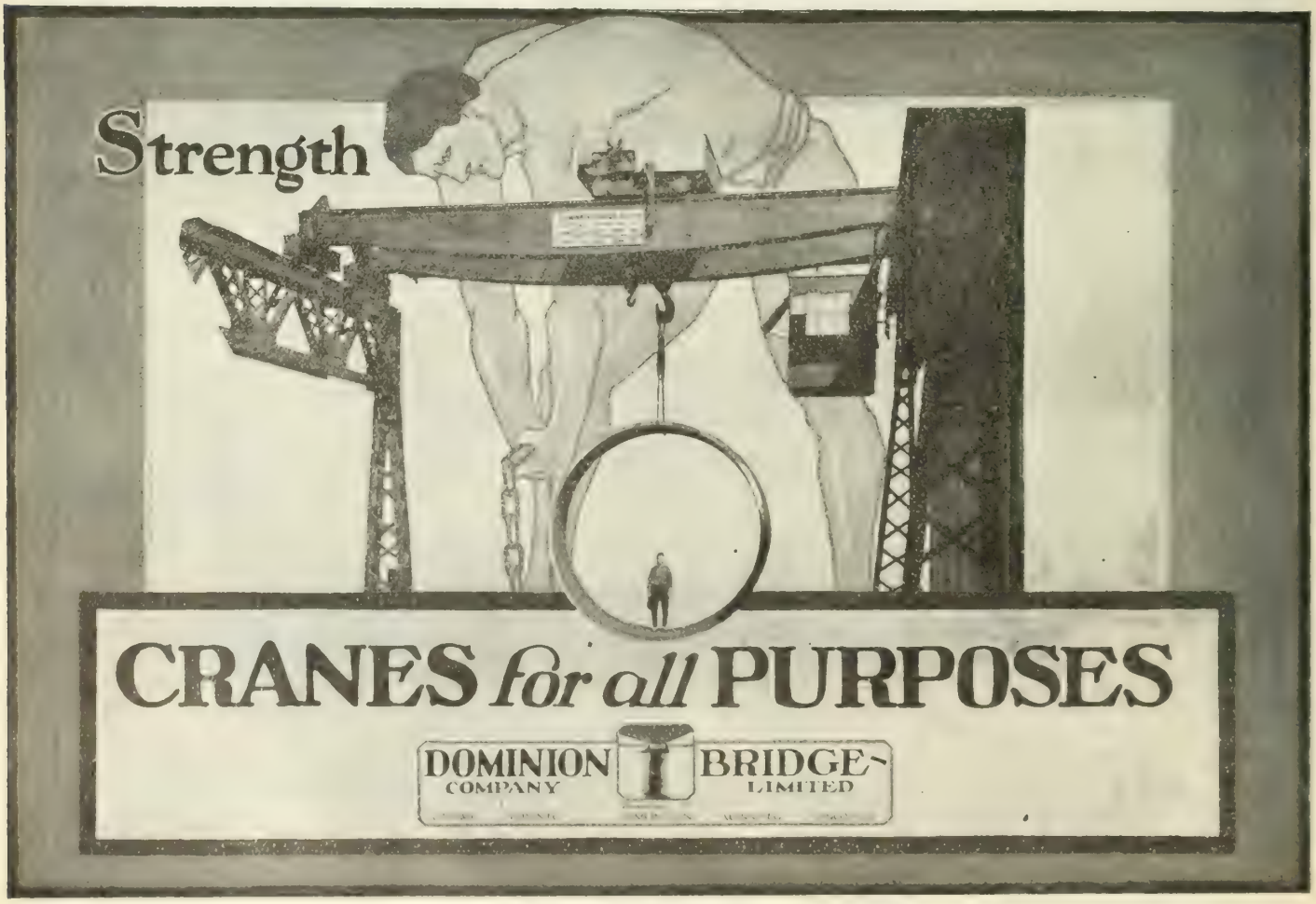

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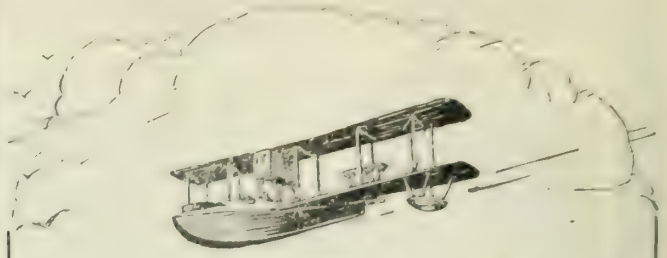

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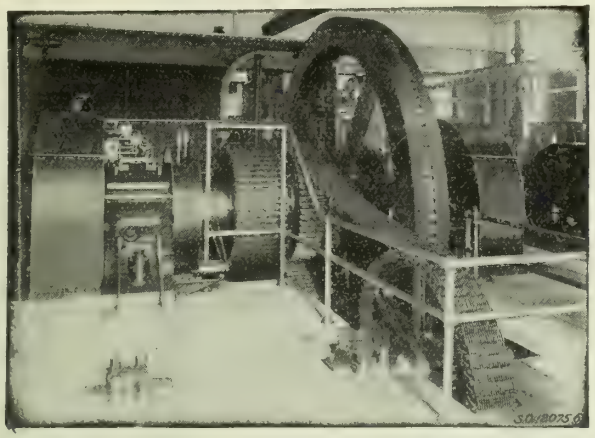

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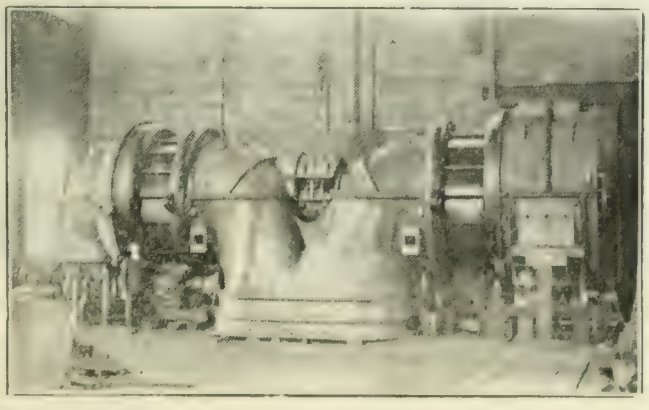

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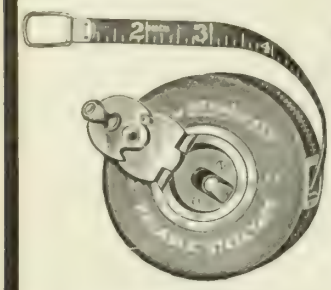

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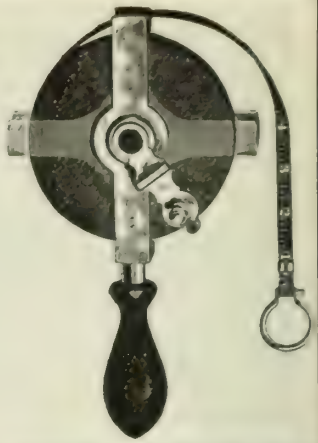

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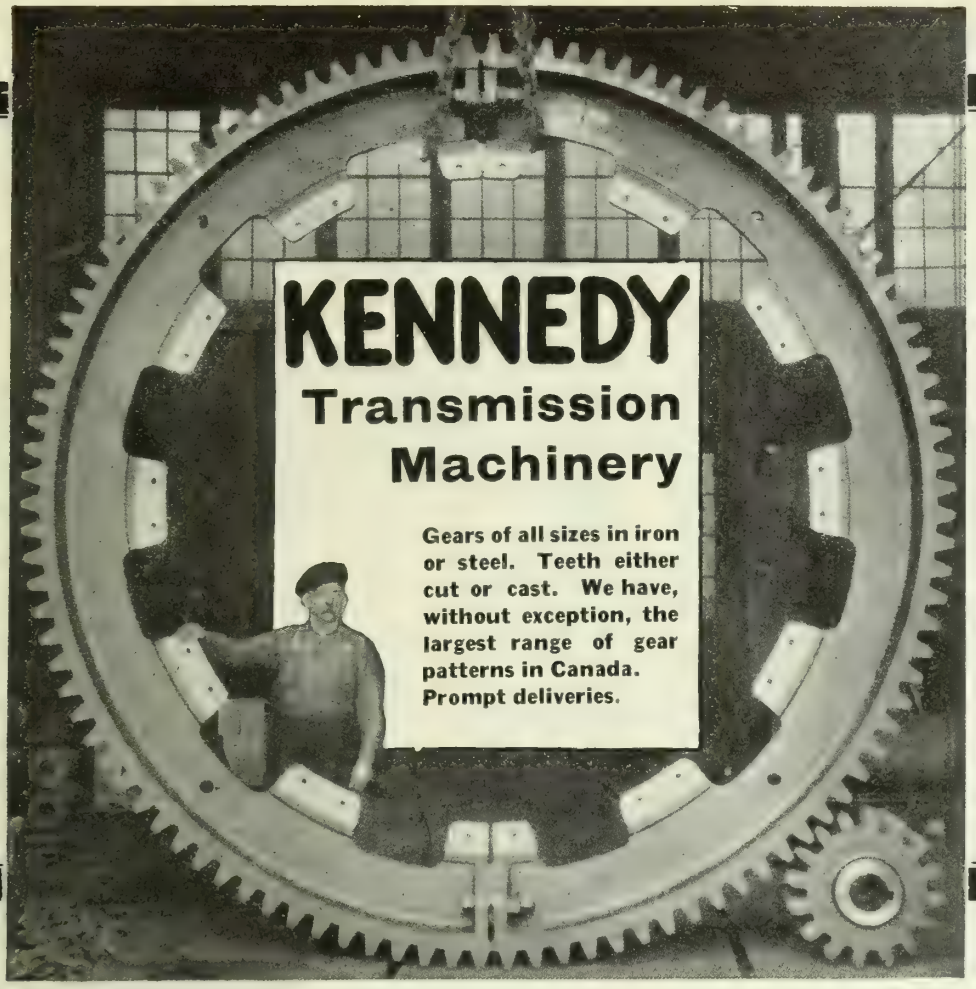

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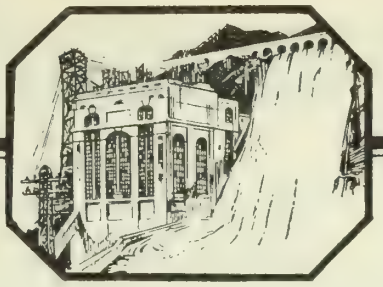

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For Alphabetical List of Advertisers see page 82

A

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P

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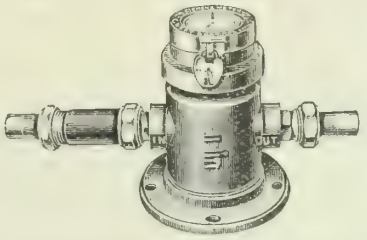

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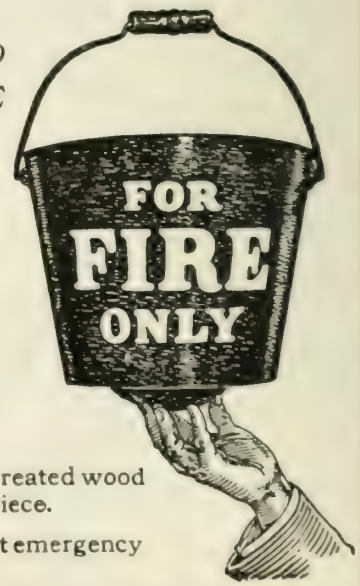

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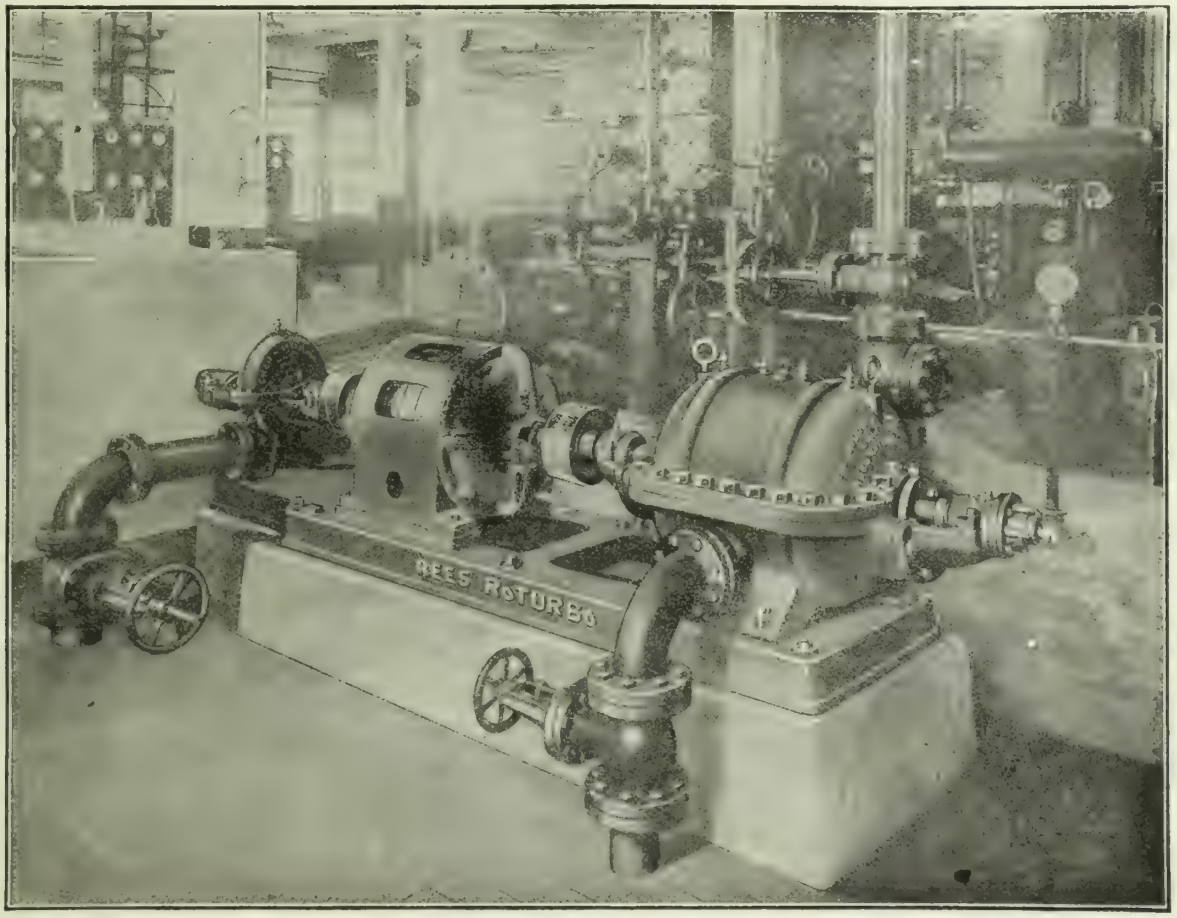

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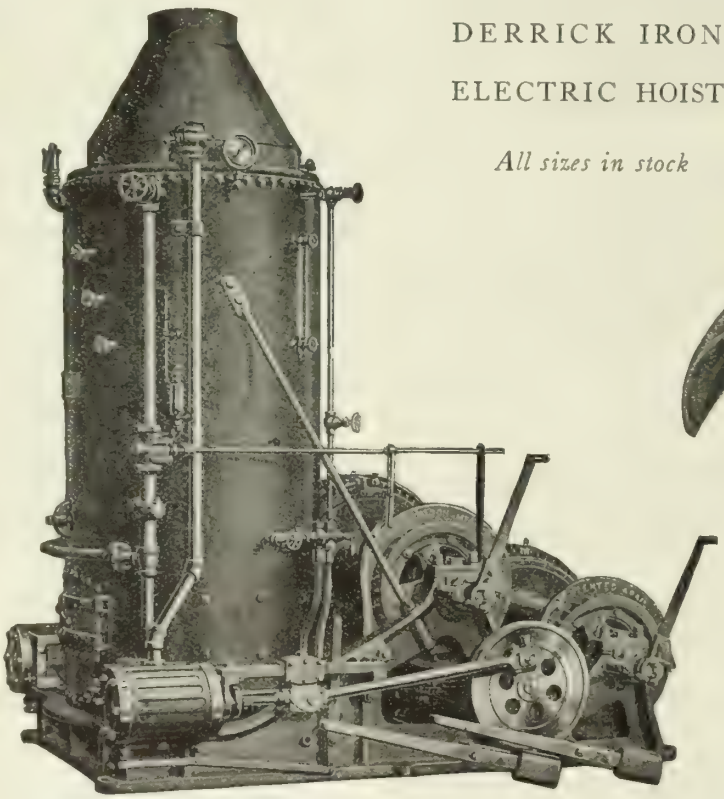
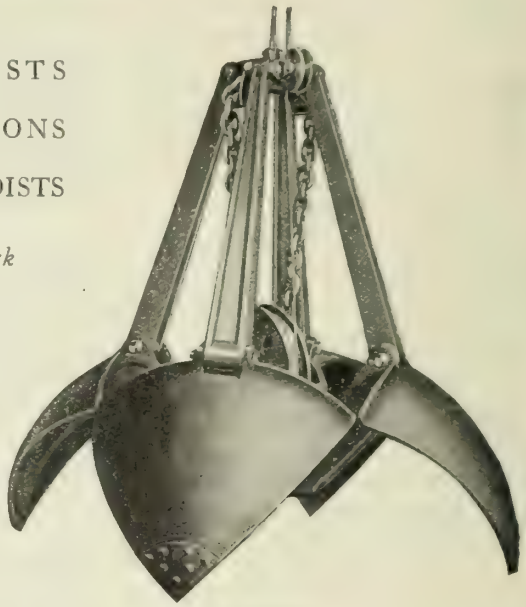


Double Drum Steam Hoist



Orange Peel Grab

GRAB BUCKETS

All types and sizes in stock

Agents:

B. C. EQUIPMENT CO. - - - - Vancouver
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CANADIAN MEAD-MORRISON CO.
LIMITED
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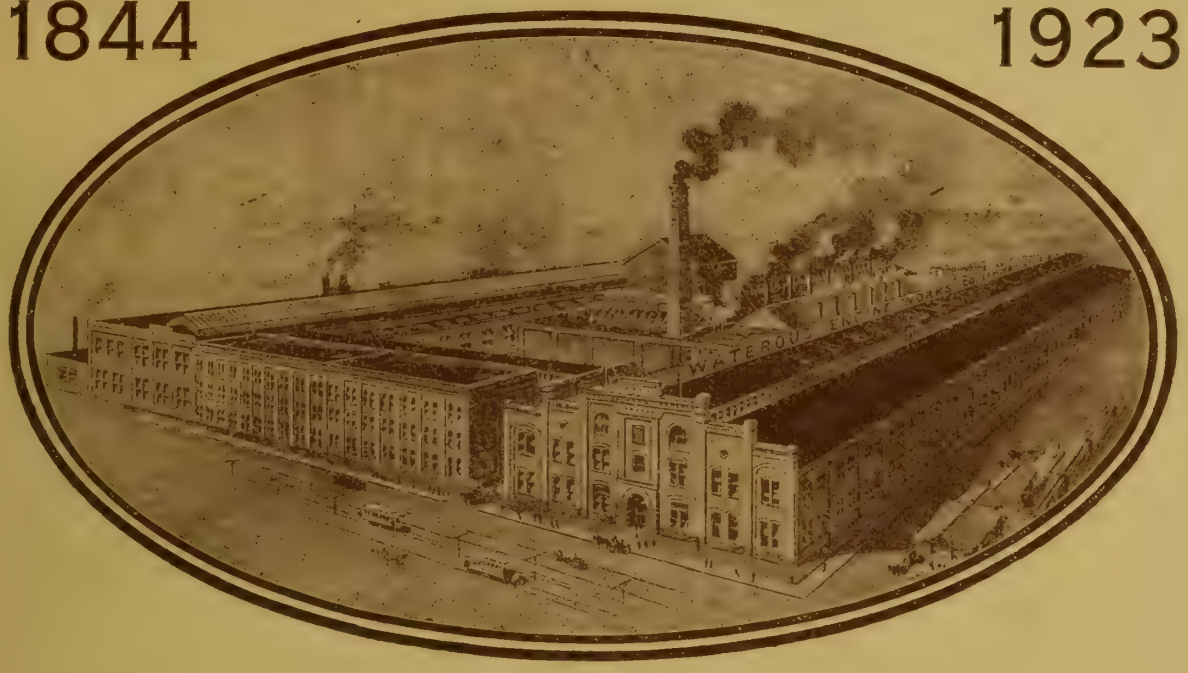
WORKS: MONTREAL WELLAND ONT.

1844 1923



Haul-Ups and Conveyors

Slashers
Stackers
Magazine Grinders
Caterpiller Grinders
Four and Three Pocket Grinders
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Chippers
Chip Screens
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Centrifugal Screens
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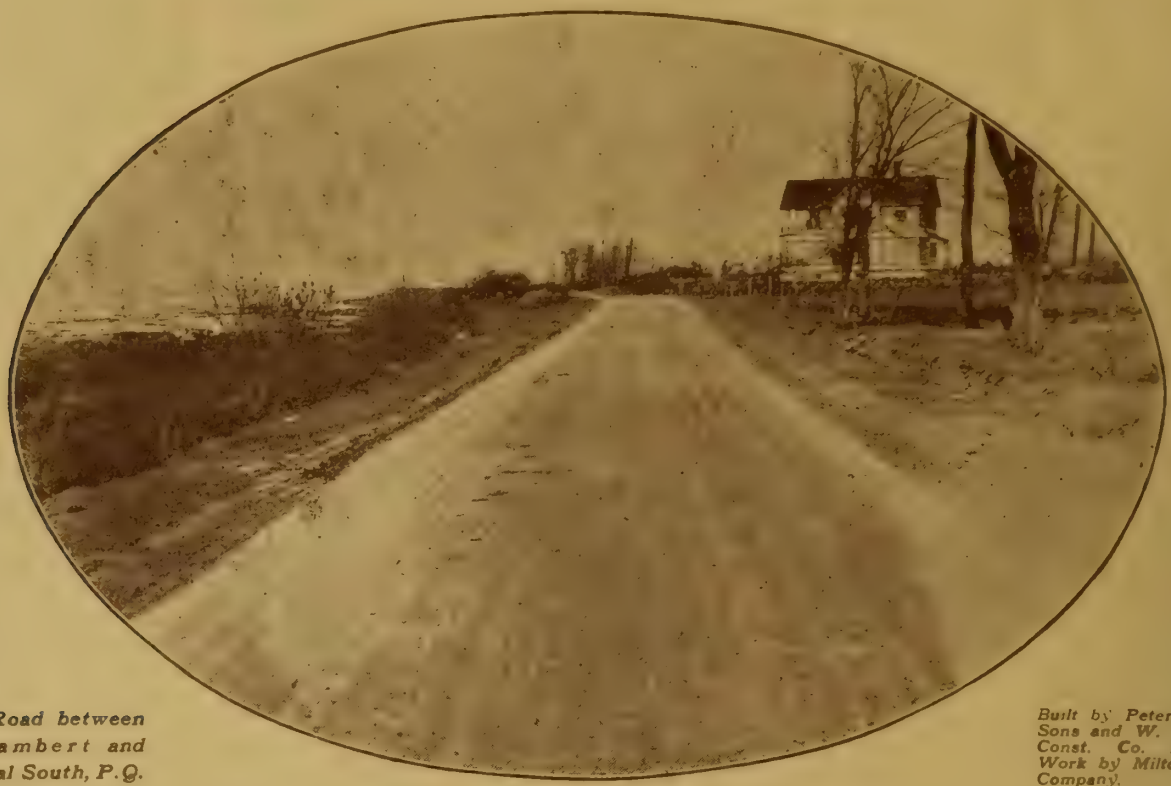
WATEROUS PULPWOOD MACHINERY

Waterous

BRANTFORD, ONTARIO, CANADA



River Road between St. Lambert and Montreal South, P.Q.

Built by Peter Lyall & Sons and W. I. Bishop Const. Co. Inspection Work by Milton Hersey Company.

Over Old Macadam

An old macadam road makes a splendid foundation for an asphalt pavement. Compacted by traffic over a number of years, it has the necessary strength to support quite heavy loads and only needs a smooth waterproof, resilient surface of Imperial Asphalt to fit it for modern traffic requirements. The economy of thus utilizing an old road, combined with the accepted advantages of Asphalt, is well worth considering in any road improvement programme.

ROAD ENGINEERING DEPARTMENT

Imperial Oil Limited

Toronto **Canada**

IMPERIAL
Asphalt
PRODUCTS

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

MARITIME GENERAL PROFESSIONAL MEETING

OCTOBER 1923

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

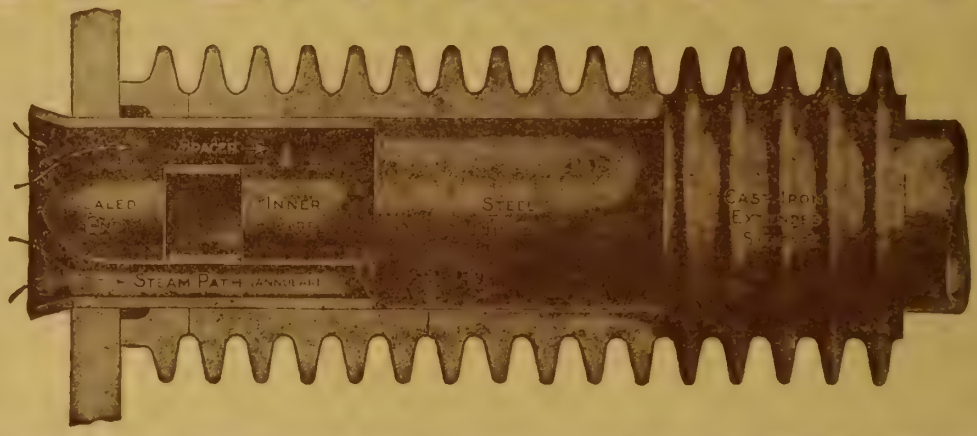
AT 176 MANSFIELD STREET, MONTREAL

Vol. VI No. 10

Twenty years without an equal and now in use in over 4,000,000 hp. of Stationary boilers.

Typical Foster Superheater for use in vertically baffled horizontal water-tube boilers

FOSTER SUPERHEATERS



Typical Foster Extended Superheating Surface. (Patented) A short uncovered portion at each end of the tube permits the ends to be inserted and expanded into the connecting headers

Advantages of Foster Extended Superheating Surface

INASMUCH as the unique construction of superheating surface in Foster Superheaters has for twenty years had no equal for its purpose and has been more used than all other designs put together, the following reasons for its supremacy should be thoroughly understood by all interested in the production and use of superheat.

1. *Steel for strength, cast-iron for durability:* The seamless steel tubes are designed to withstand a bursting pressure several times that of service, and the surrounding rings more than double the actual resistance to bursting. Only the tough original skin of the cast-iron, which is pratically immune to burning and corrosion, is exposed to the gases.

2. *Four to six times as much heat absorption surface as obtained from bare tubes:* The extended surface of the rings gives a better balance for heat conductivity from the slow-moving low-density hot gas in contact with the exterior, to the larger weight of fast-moving steam wiping the interior. By thus increasing the heat transfer per unit length of element the construction of a superheater to fulfil a given specification is simplified. This is of the greatest advantage in cases where superheaters are to be placed in relatively restricted and inaccessible locations inside boiler settings. The high rate of heat transfer with Foster Extended Surface permits higher degrees of superheat to be obtained within the space available within the boiler than can be secured with any other type of superheater.

3. *Reserve heat stored for sudden demands:* The mass of metal in the heating surface forms a reservoir for storing heat, where it is instantly available to assist in keeping the degree of superheat constant, and in the case of a priming boiler, to aid in flashing the moisture into steam.

4. *No flooding is necessary in starting and stand-by periods:* Foster Surface needs no water protection to prevent burning out when getting up steam or when little or no steam is passing.

CANADIAN REPRESENTATIVES:

THE GENERAL SUPPLY CO. OF CANADA, LIMITED

OTTAWA

MONCTON, MONTREAL, TORONTO, NORTH BAY, WINNIPEG, VANCOUVER.

Meeting the Test

THE valve lifters of a well-known truck are tapped in cold rolled steel with a 13/16-20 U.S.F. Pratt & Whitney Con-eccentrically Relieved Tap.

After careful testing, this style and make of tap was selected for its ability to stand up under high production and has proven satisfactory for over two years. The durability of these tools comes from the careful selection and heat treatment of the steel, while their cutting qualities are assured by their construction and the care taken in the manufacturing processes.

The con-eccentric feature insures the retention of original size through a number of regrindings. Instead of relieving the tooth directly back from the cutting edge, the land is made concentric for one-third of its width, the remaining two-thirds being eccentrically relieved.

You make no mistake in specifying P. & W. Taps for ordinary work or for exceptional jobs such as the one illustrated.

Taps, Dies, Reamers, Milling Cutters and many other tools are listed in our small tool catalogue. A copy awaits your request.

PRATT & WHITNEY CO. OF CANADA LIMITED

Works: Dundas, Ontario

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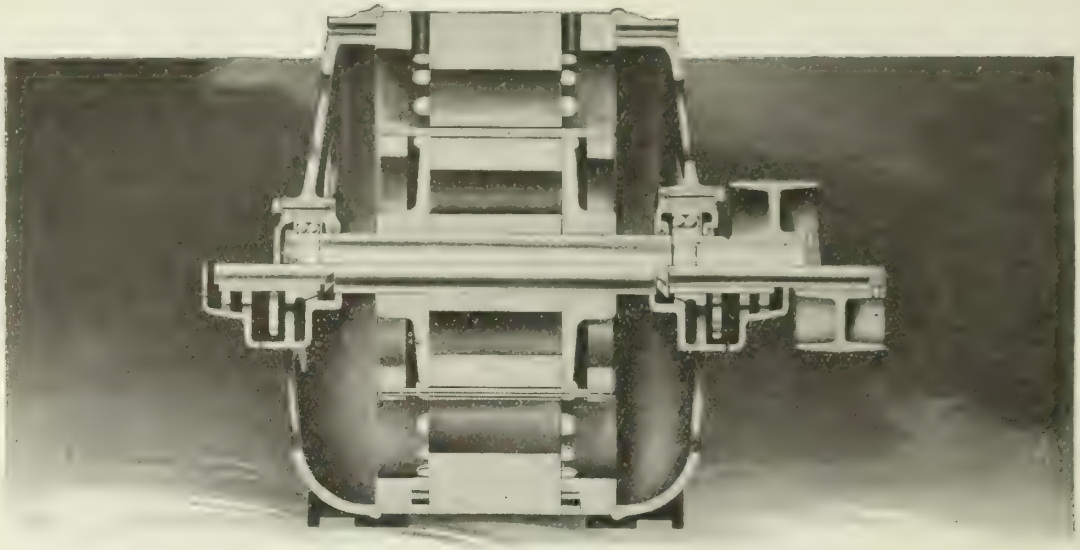
723 Drummond Bldg.	Roy Building	32 Front St. West
WAKERVILLE	WINNIPEG	VANCOUVER
1031 Sandwich St.	1205 McArthur Bldg.	B. C. Equipment Co.

PRATT & WHITNEY

Men of influence consult Journal advertising.

SKF



Self-Aligning Ball Bearings

Shorten your Motors -- Extend their Market

THE more compact a motor can be made, the greater the field of its application, for space restrictions —especially in the case of individual motor drive—frequently govern the make of motor selected.

When SKF marked self-aligning ball bearings are used, as compared with plain bearings, the over-all length of the motor can be decreased from 10 to 27 per cent. The natural outcome of this increased adaptability is a larger market for your motors without the necessity of quoting on special motors of uncertain performance in cases where space is restricted.

Motors equipped with self-aligning ball bearings are free from hot bearings and misalignment troubles and armatures cannot strike the field structures. No renewals or adjustments are required, and lubrication and maintenance costs are reduced 80 per cent. Bulletin No. 113 gives detailed information.

CANADIAN SKF COMPANY, LIMITED
TORONTO — MONTREAL

Normal View *Deflected View*

Write for the advertisers' literature mentioning The Journal.

Ears and Gears at the C.N.E.

CONDENSITE CELORON GEAR

Silent, Oil-proof, Water-proof.

IN Machinery Hall at the Canadian National Exhibition we gave an actual demonstration of Celoron Gears, different sizes and at difficult angles, running full speed in absolute silence and without friction. It was a wonderful testimony to the SILENT qualities of Condensite Celoron.

The WEARING qualities of Celoron Gears, however, can only be proved by actual daily use under the most difficult working conditions.

Hundreds of progressive engineers and executive heads throughout Canada have made this test and now always specify Condensite Celoron Silent Gears.

We want to show you that you can make better working conditions for YOUR employees as well as increase your production and cut down your operating costs by installing Celoron Gears. Send for literature on the subject or have our representative call on you.

Diamond-F

Diamond State Fibre Company of Canada, Ltd.

- TORONTO -

Domtar

THE NATIONAL BITUMEN

MONTREAL-TORONTO HIGHWAY, WEST OF KINGSTON.

"GOOD ROADS" for the greatest number of users is practically demonstrated by the extensive mileage of Domtar penetration macadam and surface treated waterbound roads in the various sections of the Ontario Provincial Highway system.

Descriptive literature and full particulars regarding cost, etc., on request.

Dominion Tar & Chemical Co., Limited

Sydney, N. S. Montreal, Que. Toronto, Ont. Sault Ste. Marie, Ont.

Every advertisement is a message to you.

McCRACKEN SEWER PIPE
Is Winning Canada's Favor

This is London's Opinion

"London, Ontario, March 5th, 1923.

John E. Russell Co., Limited.
Harbor Administration Bldg.
Toronto, Ontario.

Dear Sir,

McCracken Concrete Sewer Pipe has been used in large quantities by the city of London, under my direction, continuously since its introduction into Canada some years ago.

I have much pleasure in stating that we find it absolutely satisfactory in every way and have no hesitation in recommending its use for all sewerage and drainage purpose.

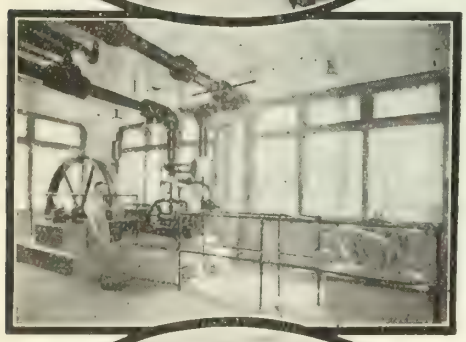
H. A. BRAZIER,
City Engineer, City of London."

This is typical of the letters we are continually receiving from engineers in every section of the Dominion expressing in enthusiastic terms their approval of McCracken Concrete Sewer Pipe. These testimonials are the strongest kind of evidence that McCracken Sewer Pipe makes good in the most trying service.

It is manufactured in accordance with standard specifications issued by the American Society for Testing Materials, and inspected by the Canadian Inspection and Testing Company Limited. And because of the absolutely uniform high quality of this pipe — every pipe measures up to the same high standard as every other pipe. In first cost and last cost McCracken is unsurpassed by any other sewer pipe.

McCRACKEN SEWER PIPE
"The Pipe That Endures

JNO. E. RUSSELL CO., LIMITED
GENERAL SALES AGENTS
Harbor Administration Building, Toronto.



There is no Real Substitute for Service

Substitutes for quality in mill white paints are many and varied—but no one has yet brought forth a real substitute for service and satisfaction.

Low initial cost—guarantees of service not backed up by demonstrated value—mere claims for merit, are worth nothing in determining value in so intangible a product as paint.

The plain proof of value—the safety factor that should guide you in the selection of mill white, comes down to consideration of just two things—the records of the paint in service—the reliability and reputation of the manufacturer back of the product.

In STA-WHITE—plain proof of value—demonstrated in every type of industrial building with service facts back of every claim made for it, is recognized—and hosts of industrial plants and institutions, architects and engineers, use it as the standard of quality in mill white paint.

STA-WHITE is the mill white paint that stays white. The unsurpassed finish and light reflecting qualities of STA-WHITE—its proven durability—have established it as a leader in the field of mill white paints.

DOMINION PAINT WORKS, LIMITED
WALKERVILLE, CANADA

Montreal Quebec
Toronto Calgary
Edmonton

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St. John Regina
Vancouver

STA-WHITE is one of the Degraco Line of dependable paints. Sold through branch offices with warehouse stocks in all principal cities.

DEGRACO PRODUCTS

Superior Graphite Paint
Sta-White
Degraco House Paint and Varnish
Degraco-Tone
Degraco Brick and Concrete Paint
Anti-Aqua
Degraco Gas Holder Paint
Degracolin
Degraco Enamels
Industrial Finishes

DEGRACO All Colors for All Purposes
PAINTS VARNISHES ENAMELS

Advertisements have an educational value. Read them carefully.

CANADIAN MM CO MEAD-MORRISON CANADIAN MM CO

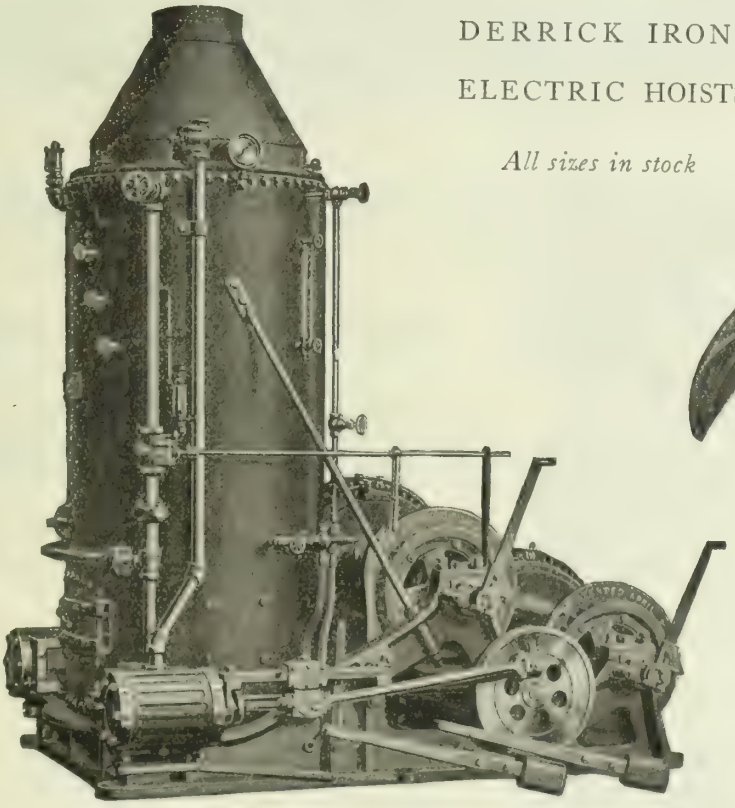
HOISTING ENGINES
GRAB BUCKETS

STEAM HOISTS

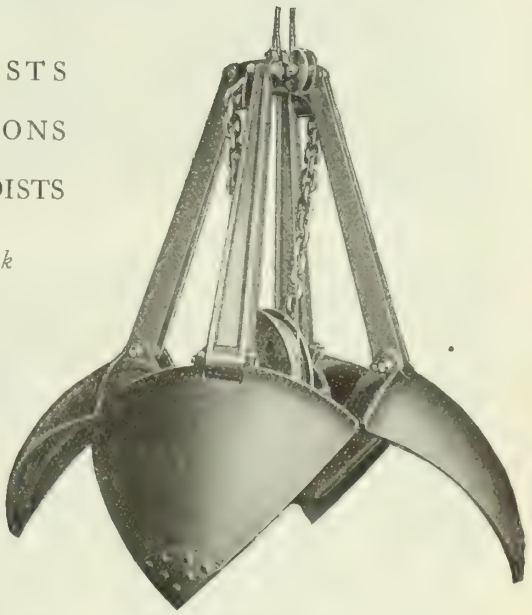
DERRICK IRONS

ELECTRIC HOISTS

All sizes in stock



Double Drum Steam Hoist



Orange Peel Grab

GRAB BUCKETS

All types and sizes in stock

Agents:

B. C. EQUIPMENT CO. - - - - Vancouver
FERGUSON SUPPLY CO. - - - - Calgary
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CANADIAN MEAD-MORRISON CO.
LIMITED
CANADA CEMENT BUILDING
WORKS: MONTREAL WELLAND ONT

What

The Taylor Stoker

"The Pioneer Underfeed Stoker —and still leading"

will do in your plant

Increase every day boiler and furnace operating efficiency.

Increase steam production by your present boilers.

Insure highest flexibility in meeting all changes in steam demand.

Reduce labor costs in operation.

Lower maintenance expense.

Effect decided savings in fuel.

Obtain high furnace output from low grade fuel without smoke trouble.

Proof is convincingly presented in our 45-page Facts-Book—"Are Mechanical Stokers a Good Investment?"—that will tell you in definite terms of horsepower tons of coal, and dollars saved in plants of every type and size by The Taylor Stoker. Let us send your copy without delay. Write for it now.

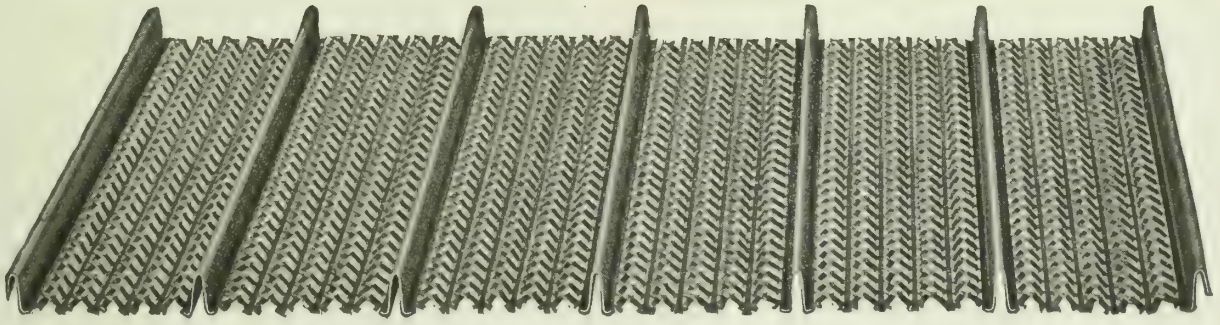
THE TAYLOR STOKER COMPANY, LTD.
TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

Advertisers appreciate the engineer's purchasing power.

TRUSSED CONCRETE STEEL CO OF CANADA LIMITED
TRUSCON
Building Products

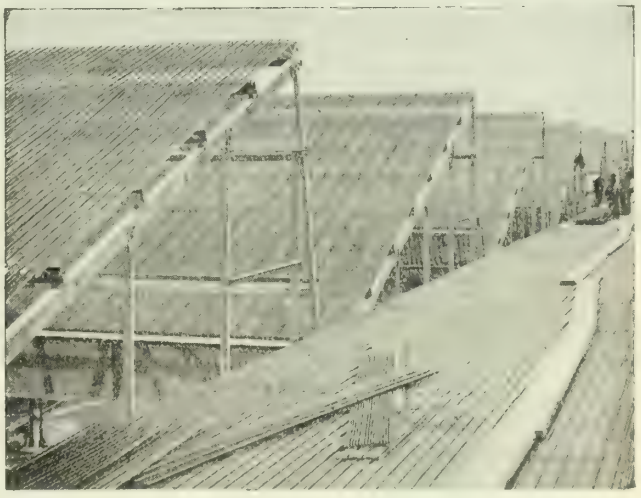
ROOFS, WALLS and PARTITIONS
can be constructed more economically with
Hyrib



Why Use Hyrib?

BECAUSE HYRIB

Eliminates all forms for concrete.
Saves channels and wiring.
Reinforces the concrete and plaster.
Insures fireproofness and permanence.
Permits wide spacing of supports.
Reduces weight of construction.
Increases available floor space.
Saves time, labor and material.



Hyrib Walls and Sidings

are much less expensive than other types of permanent construction, and more economical than old-style constructions which require constant maintenance on account of rust and decay.

A solid two-inch Hyrib concrete wall is as solid as a 12-inch brick wall. It conducts no more heat. It is as fireproof. It costs much less. It is more quickly erected and more easily adapted to special framing.

Our Hyrib Book is free to all who write for it.

Trussed Concrete Steel Co. of Canada Limited

WALKERVILLE, ONTARIO

Branches: TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER
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Grand Discharge, Lake St. John, P.Q., Showing Railway Piers.

HARNESSING THE WATERS OF LAKE ST. JOHN

The illustration shows concrete piers erected by the Wm. I. Bishop Company, Limited, for a railway bridge at Lake St. John, P.Q.

This bridge is an important link in the 12 mile standard gauge road destined to connect Grand Discharge with the C.N.R. line which runs from Quebec City to Lake St. John.

The Grand Discharge site being isolated from railways and distributing centres this railroad was required as one of the preparatory steps to the completion of a Development which will give to the Province of Quebec the tremendous power potentialities of Lake St. John.

Mr. W. I. Bishop is Consulting Engineer for the Quebec Development Company.

Specify
CANADA CEMENT
Uniformly Reliable

CANADA CEMENT
CONCRETE
FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our literary is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at Montreal Toronto Winnipeg Calgary

18,000,000 tons

of coal were imported in Canada last year

Vast Deposits of Canadian

FUELS ARE AVAILABLE IF THE PROPER METHODS OF BURNING WERE ADOPTED.

Lopulco Pulverized Fuel Systems

OFFER A SOLUTION TO THIS PROBLEM.

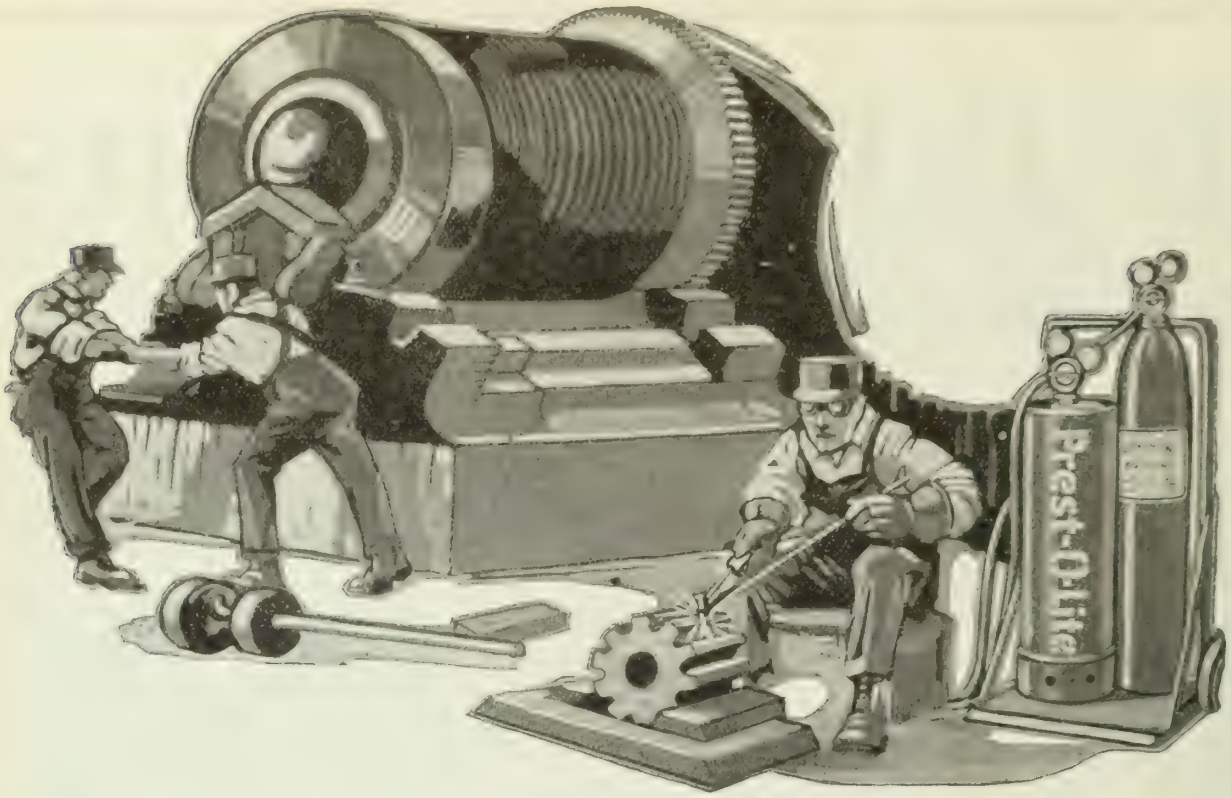
WRITE FOR "ADVANTAGES TO BE GAINED FROM PULVERIZING CANADIAN FUELS."

Combustion Engineering Corporation

LIMITED

MAIN OFFICE: TORONTO

VANCOUVER MONTREAL WINNIPEG



When Time is a Vital Factor

A BROKEN COG in a gear or a crack in the fly-wheel may tie up your plant. Breaks in machinery cause costly delays. Oxy-Acetylene welding and cutting is saving thousands of dollars yearly in effecting quick repairs.

That is when Dominion Service proves up. The purity of Dominion Oxygen and Prest-O-Lite Acetylene, assures the hottest flame and the utmost economy in fuel. The easily-handled cylinders permit the placing of the welding and cutting equipment within working distance of the job, which alone saves valuable time.

Dominion Service is equally good for the small welding and cutting shop, manufacturing plants, and big shipyards or railroads. If you use welding and cutting in your business, or contemplate the use of the oxy-acetylene process, either in production or for general repair work, it will pay you to know about Dominion Service.

Our representative will welcome the opportunity of telling you how Dominion Service will benefit your business.

Dominion OXYGEN

Operating the Welding and Cutting Gas Division of

Prest-O-Lite Company of Canada, Limited.

DOMINION OXYGEN COMPANY LIMITED.

Prest-O-Lite DISSOLVED ACETYLENE

General Offices:
80 Adelaide St. East, Toronto.

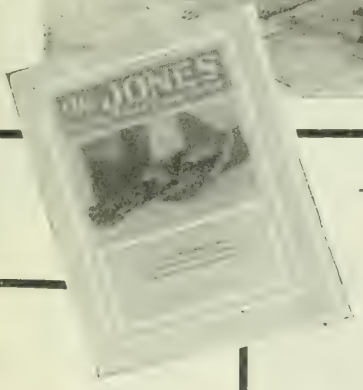
Distribution Points: Hamilton, Merritton, Montreal, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, and Winnipeg.

T2

Mentioning The Journal gives you additional consideration.

Its record recommends it

—the best investment for hundreds of Canadian plants



You will want this catalog—

It shows how the Standard "Side-Dump" Stoker is applied to different types of boilers. All of the features of design and construction are fully described and illustrated. Ask for your copy of this informative book.

CONSULTING engineers are today recommending stoker firing for plants that a few years ago would have been considered to small for mechanical firing.

Stoker firing is paying big dividends in these smaller plants not alone because coal and labor costs are higher, but also because stokers have been developed to exactly meet the requirements of smaller plants.

The "Jones Standard Side-Dump" Stoker is in every detail an ideal stoker for hundreds of existing plants.

First cost is moderate because of the stoker's exceptional simplicity—the very quality that makes the "Side-Dump" Stoker ideal for smaller plants.

Installation is simple—and therefore inexpensive. No excavation is necessary for ash pits because the simple side dump plates discharge the ash and refuse into shallow pits that are only a few inches below the floor level.

But although this stoker can be purchased and installed at relatively small cost it is nevertheless a real self-cleaning under-feed stoker possessing all the established advantages of the under-feed principle—economy of fuel, quick response to load demands, heavy overload capacity, and steady, trouble-free operation.

You will be surprised to find what a small investment is required to convert your plant into an economical stoker fired plant by installing the

"Jones Standard Side-Dump" STOKER

The Under-Feed Stoker Company of Canada, Limited
146 King Street, West TORONTO, Ont.

The UNDER-FEED STOKER COMPANY of CANADA LTD.

"Jones" Stokers
"Riley" Stokers
"Murphy" Furnaces

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E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:

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Remember The Journal when buying apparatus.

P · A · X

Private Automatic Exchange

SIMPLE

The Automatic Telephone

Built to work automatically surely, anytime, all the time, easily understood and liked by foremen and superintendents.

Has no human troubles. Inexpensive and once used, indispensable because any and complete information can be quickly secured from any part of the plant by simply turning the dial to the number wanted.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest home.

Northern Electric Company
LIMITED

MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
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"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
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Wires & Cables
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DISTRIBUTING
Construction Material
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Power Apparatus
Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

The advertiser is ready to give full information.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.

We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

When buying consult first Journal advertisers.

The Standard of Quality

Type H

Type H Transformers, through many years of satisfactory service, have earned an enviable reputation, resulting in their being regarded as the standard of quality. Large central stations, and operating companies specify Type H Transformers because of their long life, and excellent operating characteristics. Low depreciation rates, and uninterrupted service will eventually win on any system.

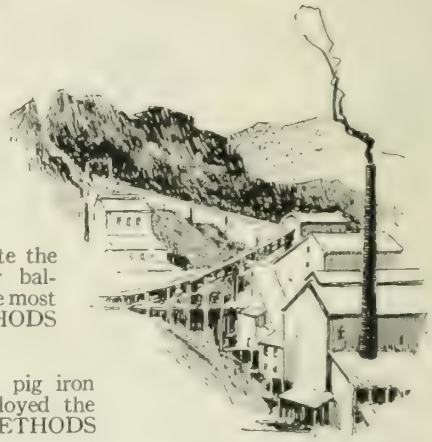
"Made in Canada" by

Canadian General Electric Co., Limited

HEAD OFFICE TORONTO

Branch Offices: Halifax, Sydney, St John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

"The Seven Ages" OF STRUCTURAL STEEL



The First — AT THE MINE

Magnetic Iron and Hematite are the principal ores mined for commercial iron and steel. The operations are characterized by SCIENTIFIC METHODS

The Second — ROASTING

The object of this operation is to separate the water, carbonic acid, sulphur and other balatilizable substances. Here also are used the most SCIENTIFIC METHODS

The Third — SMELTING

This is the production of metallic or pig iron from the ore. Here also are employed the most highly SCIENTIFIC METHODS

The Fourth — STEEL MANUFACTURE

Steel is metallic iron combined with carbon, usually from .5 to 1.5 per cent. The two large processes in general use are known as the Bessemer and the Open Hearth Methods. Both are HIGHLY SCIENTIFIC

The Fifth — ROLLING

The process of rolling into **structural shapes** requires steel of excellent quality which has been subjected to most CAREFUL INSPECTION

The Sixth — FABRICATION

The fabrication of structural steel is accompanied by accuracy and MECHANICAL PRECISION

The Seventh — ERECTION

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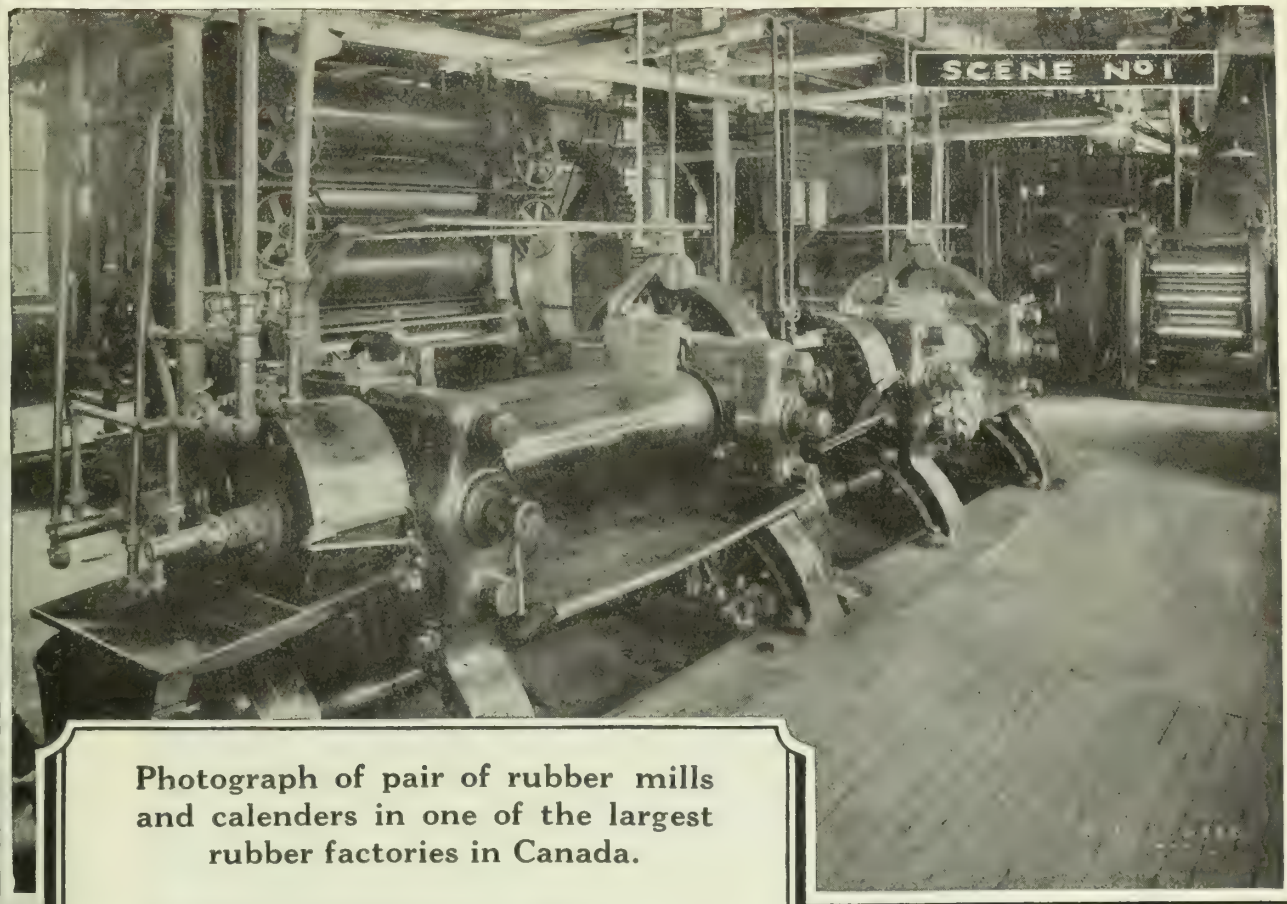

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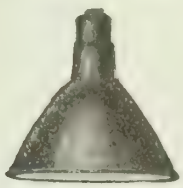

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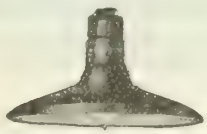

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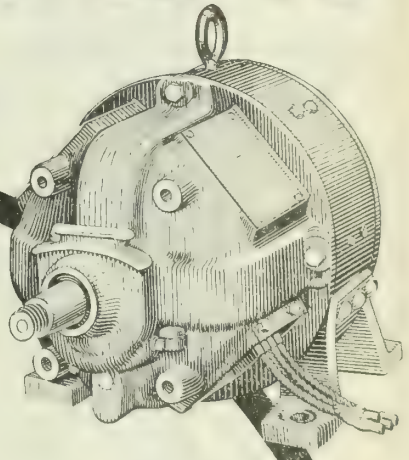

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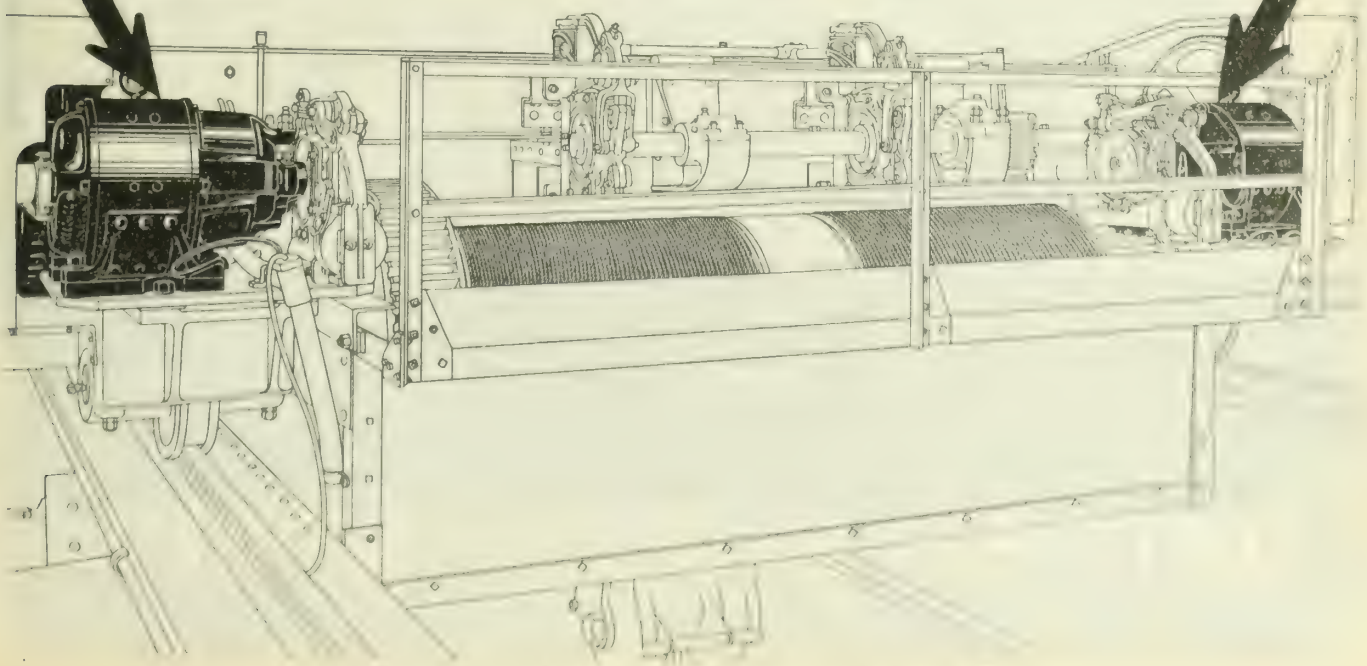

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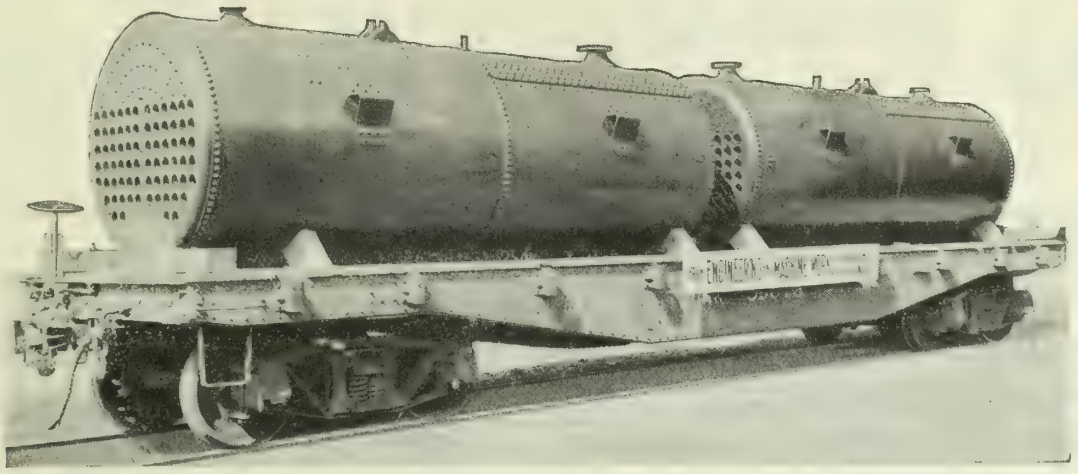

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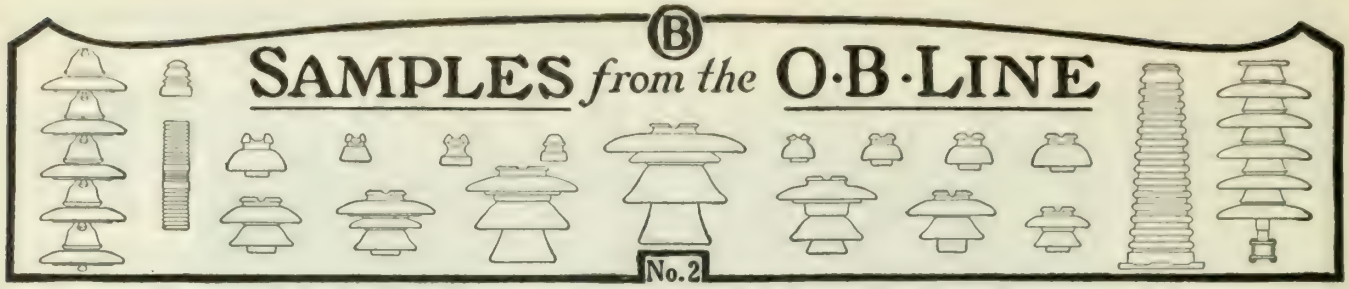

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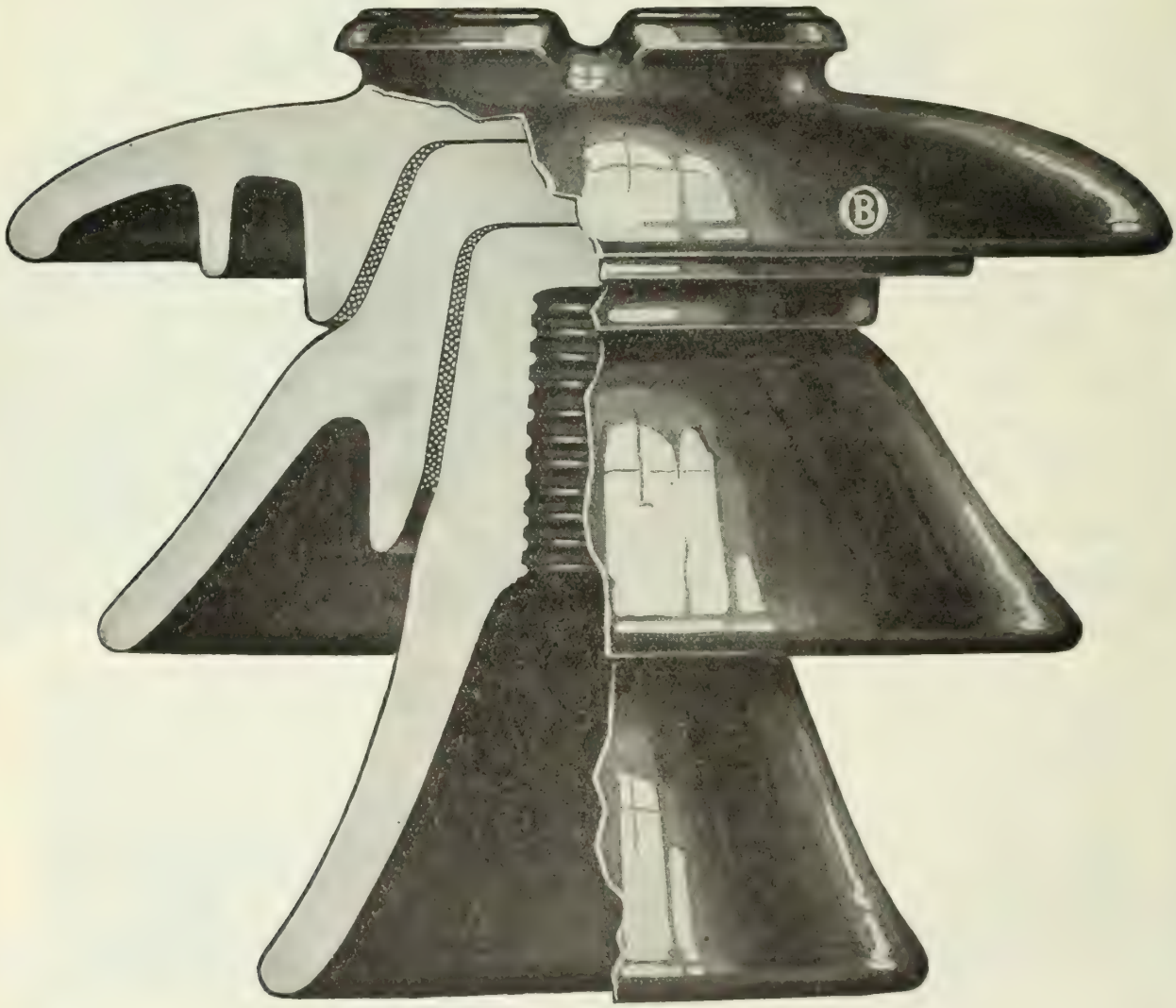

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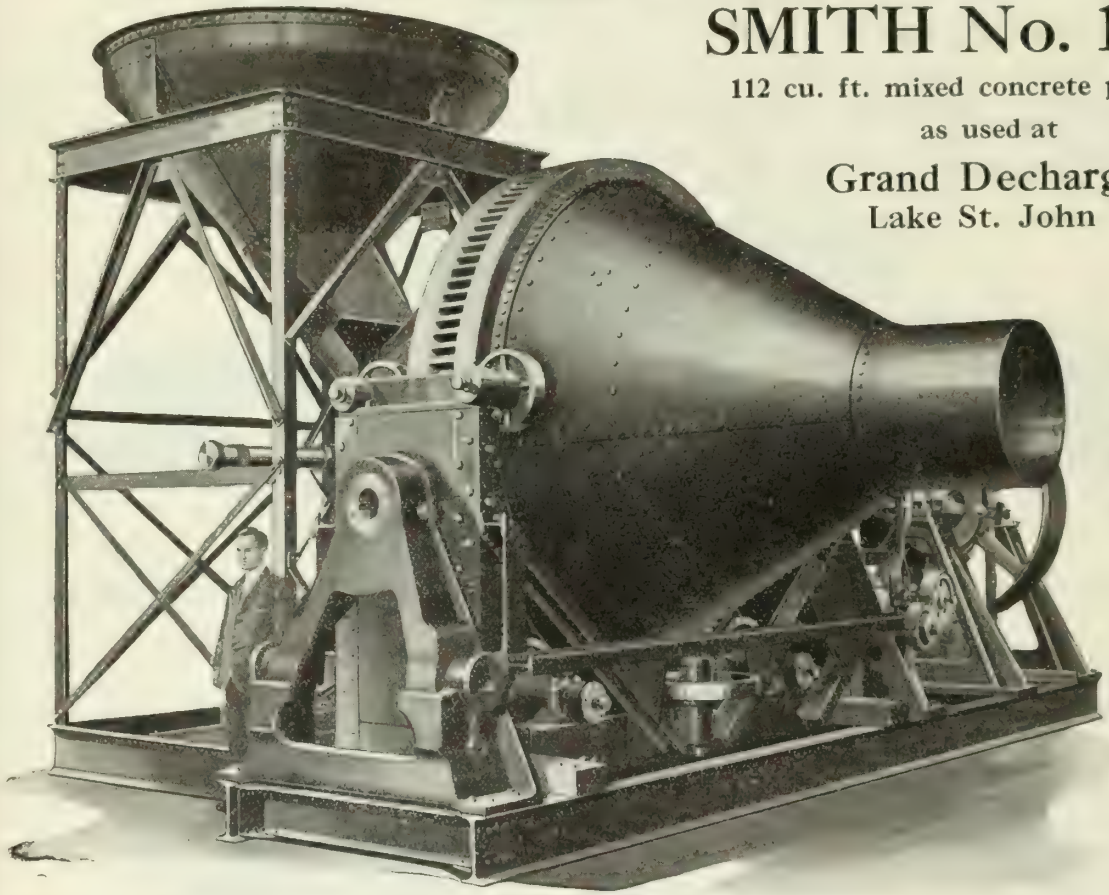

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OCTOBER 1923 Volume VI, No. 10

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The St. John Drydock.

Details of construction and Equipment of the St. John Drydock, designed for the largest vessels afloat.

E. G. Cameron, A.M.E.I.C.,
Chief engineer, St. John Drydock and Shipbuilding Company, Limited, St. John, N.B.

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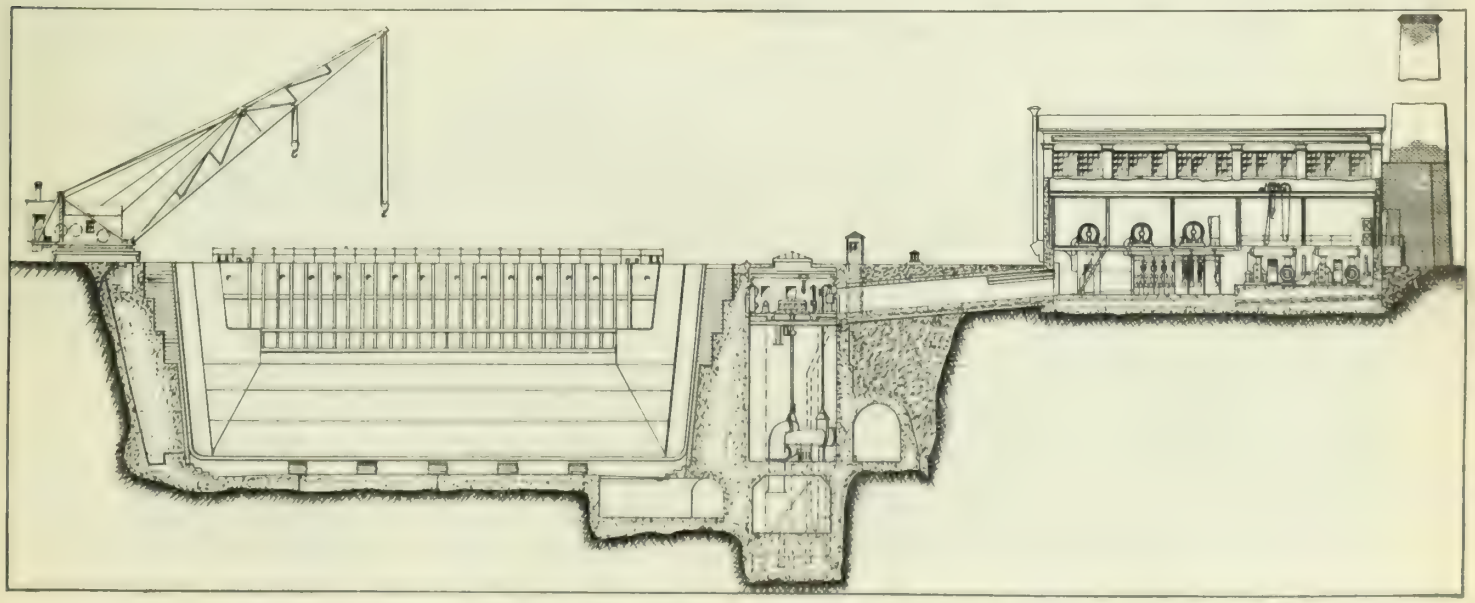
While the port of St. John, New Brunswick, has for a number of years enjoyed a position of importance among the Canadian trans-Atlantic shipping centres, it was not until recent years that any attention has been given to providing this port with the all-essential facilities for the overhaul and repair of the many vessels making St. John their port of call. Possibly a reason can be given for this apparent oversight in that St. John, being situated on the Bay of Fundy, has enjoyed these facilities as provided by nature, by reason of the extreme tidal range of twenty-eight feet. In fact, the Bay of Fundy can rightly be called nature's greatest drydock and where nature has actually made it possible to take a vessel of any draft up to twenty-eight feet and so place it, at extreme high tide, that when the tide recedes, it is left standing at low tide, entirely out of the water, it is only natural and to be expected that man would be slow in providing artificial means for accomplishing this same object. Such has been the experience of St. John.



Section Through Dock. Pumping Station and Power House

Natural Drydocking Facilities of Bay of Fundy

In this connection, the writer has been advised on most reliable authority that during the recent Great War, when German submarines were carrying on their offensive against allied shipping along the northern Atlantic coast, advantage was taken of the drydocking facilities offered by the Bay of Fundy to scrape and clean hulls of these submarines and effect urgent hull repairs, while resting easily on the sand flats of the Nova Scotia shore of the Bay of Fundy, during low tide, in some secluded inlet beyond the view of the scattered settlements of this coast.

Figure No. 1. Plan of St. John Harbour

At different well chosen points along this coast were found the unmistakable impression of submarine hulls, mute evidence of the fact that, even in far-off Germany, the natural advantages of the Bay of Fundy, in this respect, were already known.

These advantages have at the same time, always been accompanied by their disadvantages, such as the very limited time available at each low tide for conducting these operations, and with the rapid increase in the size of vessels during the last twenty years, the drydocking facilities, provided by nature at St. John, have become more and more inadequate, until now St. John may be considered as possessing no facilities whatever for the handling of, below water line, hull repairs, except on the smaller schooners and coasting vessels. At the same time, with the steady increase in shipping to and from St. John during this same period, the need of such drydocking accommodation has become more and more an urgent requirement of this port.

A natural or artificial chamber, with direct connection to the sea, into which a vessel can be floated,— the chamber entrance then closed to the sea and the water removed so as to leave the vessel entirely in the dry and accessible at all points, for as long a period of time a may be desired, — such a structure constitutes a drydock and one of the most essential requirements of the port of St. John.

Historical Sketch

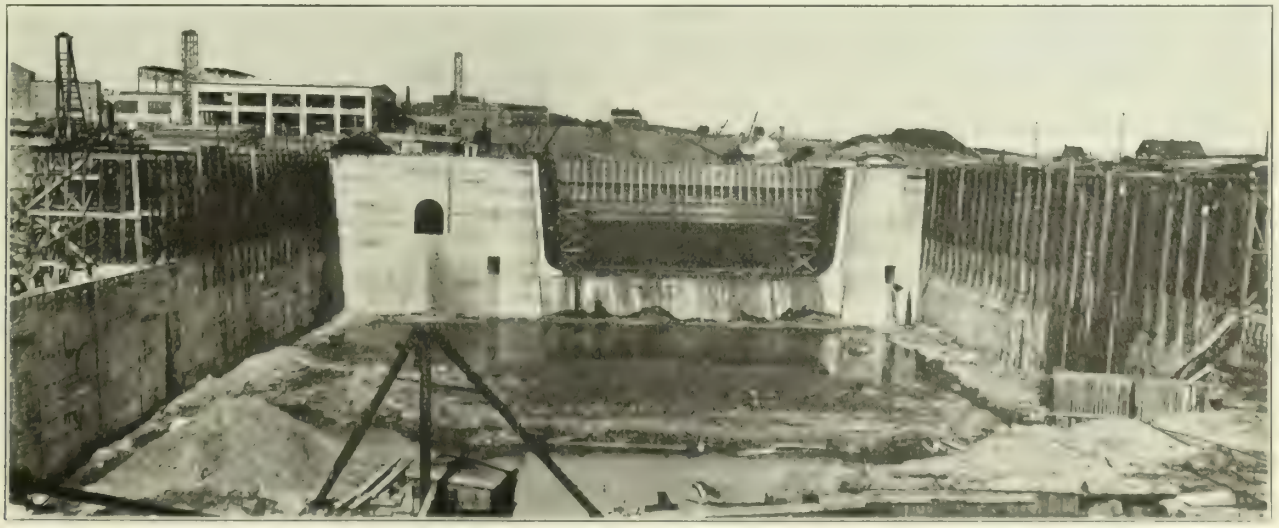
The federal government of Canada, has, by an act of parliament, known as "The Drydock Subsidies Act of 1910-17", endeavoured for a number of years, to interest capitalists in investing in drydock and ship repair plants by undertaking to pay, as a subsidy to the investors, four and one-half per cent per annum for a period of thirty-five years on the cost of the dock and repair yard constructed, on condition that the total cost of the

Pitt excavation looking towards Head of Dock from Entrance.

drydock and yard shall not exceed five and one-half million dollars for a dock of the first class, whose general dimensions shall not be less than, — length on blocks 1,150 feet; breadth at entrance 125 feet and depth of water over entrance sill at high tide 38 feet, and capable of accommodating with ease and safety, the largest naval or commercial vessel afloat of the time the dock construction is undertaken. From this brief outline of the act, it will be seen that the government undertakes to guarantee the interest on bond issues made by the company building the dock in order to finance the project and, by undertaking to pay this interest for a period of thirty-five years, allows the construction to be finished and the dock to be operated until the undertaking can be developed into a self-supporting business. At the same time, the government reserves the right to step in at any time, if operations are not being properly conducted, and take over the dock and yard and operate these itself, without prejudice to the government. However, before entering into any agreement as provided for by the "Subsidies Act", the parties are required to submit plans and specifications of the work, as it will be undertaken, for the government's approval.

Though this act has been in existence for twelve years or more, there has been little response from Canadian capital, and so St. John, as an important shipping port, suffered accordingly. The Honourable Sir William Pugsley, until recently Lieut. Governor of New Brunswick and prior to holding this post, Federal Minister of Public Works, fully realizing the deficiencies of the port of St. John in this respect, and always mindful of the need of fully developing Canada's Atlantic ports, succeeded in 1911, in interesting Old Country capitalists, under the leadership of Mr. Norton Griffiths, in undertaking the construction of a first class drydock and repair yard at St. John. Actual construction operations were started in the year 1912, and in 1914, at the outbreak of the world war, extensive operations were under way on the excavation and preparation of the drydock site.

Like many other large projects, this soon felt the pinch of war times, with the resultant shortage and high price of both labour and material, so that after struggling along through the first two years of the war, further operations became impossible, construction operations ceased and the Norton Griffiths Company were relieved of further obligations in connection with the drydock undertaking. Not until the end of the war, could any interest be aroused in this undertaking which lay dormant until the fall of 1918, when the St. John Dry Dock and Shipbuilding Company, representing Canadian capital entirely took up the task where the Norton Griffiths Company left off, assumed the obligations of the original



Outer Entrance of Dock showing Floating Caisson in Place.

undertaking, and since has carried on the work continuously up to the present moment, when the project may be reasonably considered as in its final stage of completion.

The writer's connection with this project dates only from the time it was taken over by the St. John Drydock and Shipbuilding Company, and so he is not fully conversant with the preliminary studies made, but from plans and records remaining from the days of the Norton Griffiths Company, one is able to judge that a great deal of thought was given to the question of the most suitable site for the drydock.

An examination of the plan of the harbour of St. John, (figure No. 1), readily discloses the fact that the main harbour, at the time the St. John drydock project was first under consideration, was already fully occupied on its western side by the deep water berths and on its eastern side by the older, yet equally necessary, small and shallower docks originating from the days of the small costal trading schooners. This situation in the main harbour necessitated looking elsewhere for a suitable dock site, and as the broad expanse of Courtenay bay, directly east of the main part of the city, offered no such condition of congestion as existed in the main harbour, its use as a site was determined on. The fact that it was exposed to gales from the south and southeast and that it was only a mud flat at low tide, necessitated its protection by means of a breakwater and the dredging of an entrance channel and basin from the main channel to the dock site, as supplementary operations to the building of the dock itself.

These latter improvements were not included as part of the cost of the drydock itself but, while it was required that they be undertaken and the work involved be performed by the company building the dock, they were covered by additional unit price contracts. The original breakwater length, determined on, was 5,200 feet and this was completed during the Norton Griffiths régime. This length did not afford all the desired protection, so a 2,500-foot extension has been made since work was resumed in 1918 and the required protection is now afforded Courtenay bay.

A bluff, rocky shore, midway along the easterly side of Courtenay bay, naturally suggested itself as a suitable dock location, but evidently from plans and estimates on record, a number of alternative sites and schemes were given full consideration along the side of the bay, before the final site, adjacent to the root of the protecting breakwater, was adopted. The formation of a tidal basin, using the breakwater as its easterly outline was even studied, but evidently this had to be abandoned because of the prohibitive cost.

Characteristics of Site Selected

The site finally decided on was a slight projection of the otherwise regular easterly outline of Courtnay bay. Here the solid rock surface, a few feet above high tide level at the shore line, which was selected as the outer end of the dock, raised an additional fifty feet in length of the dock itself, requiring rock excavation varying in depth from fifty to one hundred feet. Generally, this rock was of a carboniferous shale formation, but greatly distorted by an obtrusion of volcanic rock running parallel to the length of the dock and slightly north of the centre line. The effect of this obtrusion of traprock was to tip the shale strata to an inclination of only about twenty degrees from the vertical. Drilling operations, necessarily were severelly affected by this condition and considerable over-break, from rock slides on the north side of the dock pit, was practically unavoidable.

The remarkable and yet redeeming feature of this rock formation, which was not discovered until the pit excavation was well advanced, was that it was practically impervious to water. With the original formation so greatly distorted and the seaward end of all seams exposed directly to the waters of the bay, and in addition, the presence of an obtruding shaft of rock of another character with its accompanying distinct lines of cleavage, all indicated the probability of at least considerable, if not excessive, leakage from the sea.

As the excavation progressed, these anticipated difficulties failed to materialize and it was found that practically the only water to be dealt with in unwatering operations originated as fresh water from ground and run-off sources. In fact, at one stage in the excavation operations, the seaward end of the dock pit stood excavated to its final grade, at a point not more than sixty feet distant from where high tide lapped the outer face of this rock, fifty feet above excavated pit grade, yet no seepage whatever was evidenced in the end face of the pit adjacent to the bay.

General Dimensions

The general dimensions of the drydock, as established by the terms of the Drydock Subsidies Act are being only slightly exceeded in actual construction. The overall length will be 1,150 feet. The clear width at the entrance 125 feet, with 42 feet of water over the entrance sill at extreme high tide. A comparison of these dimensions with those of other modern drydocks discloses the fact that the St. John drydock is actually the largest dock in the world. Bearing in mind that the largest vessel afloat to-day, the White Star liner "Majestic", is only 956 feet long and that naval authorities are generally in agreement in the conclusion that vessel dimensions have now reached their economic maximum, it would appear that entirely unnecessary length is provided in the St. John drydock. However, as this dock is being provided with an intermediate sill which will permit the whole dock to be divided into two entirely separate docking chambers, the inner 500 feet in length and the outer 650 feet in length, it will be appreciated that this length is justifiable in that it so provides for the accommodation, at one and the same time, of at least two moderate sized vessels, and still can be utilized when the occasion arises, as a single docking chamber with sufficient capacity to accommodate the largest vessel afloat to-day.

Concrete is being used throughout in the dock construction with the slight exception that granite is used to form the outline of the stops in the outer entrance and inner sill for the reception of the floating caisson, where concentrated pressures and wear will be excessive. Due consideration has been given to the question of the action of salt water on concrete, but, owing to the fact that the drydock will only be filled intermittently and most of the time will be entirely dry, no unusual provision has been made to minimize this action except by exercising every care in the mixing, placing and working of the concrete, with the addition of extra cement in those parts of the dock structure that will be more or less constantly immersed in the salt water. Results obtained in concrete, as well as construction methods employed to effect these results, will be dealt with more fully later.

As the writer, at the outset of this undertaking, realized that those responsible for the design would later carry the added burden of the successful and economical construction of the drydock, he has had every effort directed toward the development of the simplest and yet most effective detail possible. Simple rugged construc-

tion combined with full provision for meeting and accommodating the varied demands of the docking and repair operations, with least interference and confusion, has been the key note of this design. Intricate form work has been eliminated without detracting from the appearance of the work; ample wall, floor and tunnel sections have been used, particularly where the use of steel reinforcement has been necessary, to protect the latter from contact with salt water, — all without an appearance of extravagance in this regard; and last, yet of chief importance, every effort has been made to provide full accommodation for such all essentials as pumping equipment, drainage, power, light, air, and water throughout the dock in such a way that these will always be directly available when and where required, without in any way restricting or interfering with the most necessary feature of an unobstructed working area in and around the drydock and the vessel therein, for the successful and continuous movement of cranes and materials, as well as the ready handling of ships lines.

Wall and Floor Thicknesses reduced due to Rock Conditions

With the dock pit excavated to half its full depth, but at no point to its originally intended width, before the development of final detail of the dock was undertaken, an excellent opportunity was thus afforded to study the rock characteristics and determine actual wall and floor requirements necessitated thereby. No doubt, influenced by the original superficial appearance of the rock, those who originally designed the dock for the Norton Griffiths Company, anticipated very heavy overbreak, combined with very porous rock conditions, and so provided for the use of practically a full gravity wall section for the docking chamber. Similarly, to overcome anticipated hydrostatic up-thrust under the dock floor, this was originally intended to have a minimum thickness of seven feet, poured directly in contact with the solid rock and under-drained. Entrance and inner sill, wall and floor thicknesses were proportionately heavier.

Finding actually a uniformly, almost impervious vertical rock face on the pit sides, in many cases half of the drill holes showing thereon, and little or no indication of seepage in their faces, while at the same time vertical holes drilled in the bottom to and below final pit grade gave no evidence whatever of having tapped any water bearing seams or fissures, it was immediately determined that both original dock wall and floor thicknesses would be reduced, thereby effecting, not only a material saving in rock excavation, but also a like saving in concrete.

In place of a gravity section of wall, a facing wall was determined on of sufficient cross-section to be self supporting, both in compression at its base and against overturning in its own section, with no allowance made for the assistance that reasonably would be obtained

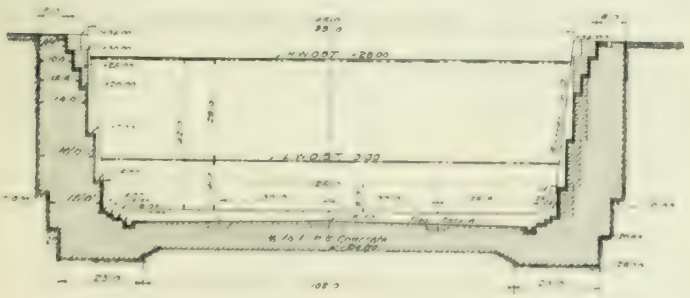
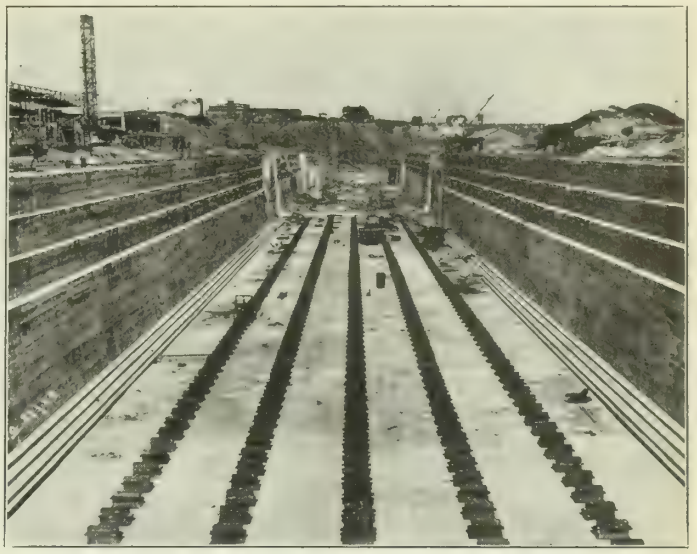


Figure No. 2. Dock Section originally proposed.



Drydock from Caisson showing Altar arrangements.

from the bond between the rock and concrete. Anticipating, however, that materially different conditions might develop when the dock was eventually placed in operation and alternately filled with water and emptied, a complete system of back drainage was provided for, to cover the full height and extent of each wall; six-inch land tile being laid enclosed in broken stone, following each and every indication of seams in the rock face, and all brought to a common outlet, — the combined drainage and sewerage system main extending around the whole outline of the dock in the base of the side walls. Wherever the facing section of wall could not be used and the concrete of the dock wall carried up in contact with the rock for approximately its full height, due to excessive overbreak as was experienced in the north wall of the dock, a full gravity wall section was determined on, using a width of one half the wall height and stepping in on the back as the height decreased.

A minimum floor thickness of three feet was established, but owing to the fact that the rock was practically standing on edge and on account of the pocketing effect of blasting vertical drill holes in rock so situated, it was decided to keep all the floor from direct contact with the underlying solid rock, by pouring this floor concrete on a layer of loose rock; this open layer of loose rock to be

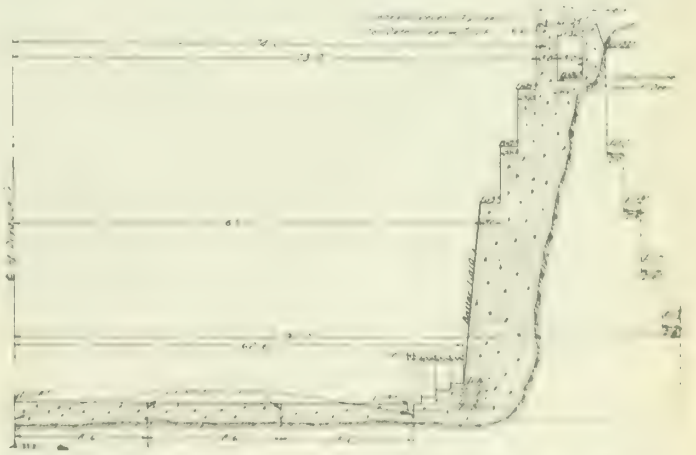


Figure No. 3. South Wall of Dock Final Section Gravity Wall Shown dotted.

fully drained with longitudinal and cross tile drains, laid before pouring the floor concrete and covered first with a mound of loose stone and then a thin protective coat of concrete. By adopting this method of construction, it was felt that complete and adequate under-drainage would result, while if an effort were made to clean the foundation, all to the solid rock, numerous pockets originating from drill holes would be left where no direct bond with the solid rock would be obtained, but completely surrounding such pockets and entirely sealing them, there would be the bond between solid rock and floor slab concrete, and as these pockets would not in any way connect with the under—drain system, a condition of accumulating hydrostatic pressure would be created under these parts of the floor slab, with its resultant ultimate rupture or displacement.

Cross-section of Dock designed for Modern Type of Vessels

The cross-section of the docking chamber, at the same time, was an all important factor in the determination of the actual dock wall section. With the vast change in vessels cross—section, from the older sailing vessel, with its sharply defined keel and high sheer, to the modern flat bottomed vessel, has come a like change in drydock chamber section. The older vessels, possessing in themselves no ability to remain upright and on an even keel when removed from their natural element, required the extensive use of shores or props to support them when docked. This shoring necessitated a continuous flight of altars or steps in the face of the docking chamber walls for the reception of the ends of these shores. To-day the need of lateral support is minimized by the wide bearing taken by the flat bottom of the modern vessel on the dock floor and the altar, as a result, has become an intermediate working level between dock coping and bottom, instead of a shoring support. To make these usable by workmen, has brought about a demand for wider altars, but even in the more modern drydocks this increased width has not yet been amply provided. In order to meet this requirement, and at the same time keep the width of docking chamber to a desired minimum at coping level, so that cranes of an excessively long working radius are not necessary, one solution only has been found, that of reducing the number of these altars to a minimum. A study of this question with reference to the St. John drydock resulted in three altars only being provided, — two of these two feet six inches wide and the third and lowest three feet wide. An even greater width than this is desirable from the writer's point of view for the desired safety of workmen where the other conditions make this increased altar width permissable, and while the extra altar width, provided in this dock over altar widths as used in contemporaries such as the Champlain dock at Lauzon, Quebec, and the Commonwealth dock at South Boston, seems slight, the extra assurance of safety felt by one actually traversing these altars is greatly out of proportion to the increase in width. Figures Nos. 2 and 3, show a comparison of the originally intended wall section with that finally adopted and being used, as well as other details of the working chamber now being dealt with.

Distribution Tunnel for Water, Compressed Air and Steam Lines

The modern drydock is an extensive open air workshop, in which innumerable intensive operations have to be carried on, all at the same time, yet with the least possible amount of confusion and interference, and practically all these operations require the use of equipment mechanically operated. Furthermore, because of the rapidity with which docking charges mount up with each additional hour that a large vessel lays in the drydock, and because of the loss sustained by the vessel owners while the vessel is out of service, every provision must be made for conducting these operations as rapidly and continuously as possible.

With the above requirements in mind it was determined that a readily accessible, yet entirely unobstructive distribution system must be provided throughout the perimeter of the dock — a system that would provide at any and every point in the docking chamber such essentials as electricity for light and power, compressed air, water and even live steam. After due consideration had been given to systems employed on other modern docks, such as those at Lauzon and South Boston, it was determined to make a rectangular tunnel the basis of this distribution system; this being located directly below the top of the wall and completely circuiting the whole perimeter of the dock, and of sufficient cross-section to permit the passage of workmen, even with pipe lines installed on the tunnel sides.

Originally it was intended to make this tunnel accommodate on its sides not only all water, air and steam lines but the cables carrying the electric energy to the various points about the dock, as well. However, on further consideration of this, it was finally determined that a much cheaper and much more satisfactory lay-out of these cables would be obtained by providing a series of fibre conduits in the concrete directly in rear of the tunnel with pull boxes at 50-foot intervals opening into the tunnel from the conduit line. Had the original idea been maintained, the same extent of metal conduit — instead of fibre conduit — would have been required, with their requisite supporting brackets; all off-takes from the feeder cables would have had to be made in the tunnel itself with each cable bend occupying otherwise valuable space; and the possibility of damage to these feeders would be considerable, owing to their exposed location in a confined space where many other operations would be necessary. In addition there would be the constant risk of workmen coming in direct contact with these high-tension feeders and the consequent injury or loss of life. With the revised installation, in addition to the large saving in cost of fibre conduit over metal conduit, all connections to main feeders will be made in the pull boxes entirely clear of the tunnel, so no tunnel space will be taken up by cables, nor will any of these be in any way exposed, with the result that both the cables will be protected from any possible damage, and no injury can result to workmen in the tunnel, who, with this arrangement, cannot in any way come in contact with the cable.

The tunnel originates in the pumping station, located in the outer end of the north wall of the dock, and from this point extends completely around the dock to a point in the south wall opposite the outer end of the pumping station. Between the pumping station and the power house, a similar tunnel is provided, so that a complete underground gallery is provided from the dock power house, located on the north or left side of the dock entrance, to practically the extreme outer end of the south or right wall of the dock. By means of this tunnel, the requirements of electrical energy for light and power, compressed air for operating air tools, and water for fire protection, washing down the dock floor and to meet a docked vessel's needs, are so provided at all points around the dock and in an entirely unobstructive manner.

The Electrical Distribution System

The electrical energy requirements for the drydock are varied and extensive. Because of its adaptability and positive result in energy supplied, all the dock operating equipment is provided for direct motor operation, using in every case 550-v., 3-phase, 60-cycle alternating current. The unwatering, drainage and sump pumps of the pumping station present the largest demand at one point and so a separate feeder circuit is provided to take care of this load of 2,465 h.p. The sluice gate valves on the filling and emptying culverts present a demand of only 75 h.p., but at five different and widely separated points in the perimeter of the dock. Similarly, the ten capstans, each operated by a 45-h.p., motor, require the supply of electric energy at ten different points around the extent of the drydock. At either end of each caisson stop is required a tap to provide energy for the operation of the 15-h.p., motor driven caisson unwatering pumps. In addition, the complete lighting of the dock with flood lights requires no less than 48 outlets in the dock chamber walls. By effecting a number of combinations of these demands, the whole distribution of power and lighting energy is obtained by the use of only six feeder circuits and these combinations are so arranged that, even in the event of an interruption occurring in one of these circuits, there is still another circuit available, supplying a similar combination of equipment demands, which can be called into use to replace other units of equipment rendered useless by this short circuit. For instance, alternate capstans on either side of the dock are combined in the same circuit with one of the caisson taps. Should one of these circuits suffer an interruption, a second circuit is available by which capstans immediately alongside can be operated and this circuit at the same time connects to another plug receptacle for the caisson connection. With such a balanced distribution arrangement, feeder cables are also kept to minimum sizes and the maximum protection is offered against service interruptions. All feeder cables are rubber covered, lead sheathed, to give this installation the maximum degree of permanence.

Lighting Equipment for the Dock

For dock lighting, flood lights will be used entirely, and these will be separately arranged, one group for lighting the dock chamber and the other to light the top of each dock wall with the working area in rear. Located at intervals of 50 feet along the face of each wall, 2 feet above high tide level, are recesses approximately 2 feet square by 15 inches deep. In each of these will be located a wide angle flood light mounted on swinging base, so that the direction of the light can be altered either in a horizontal or vertical direction. Mounted on the back wall of each of these recesses is a three outlet plug box of absolutely watertight and weatherproof construction. Two of the three outlets will be on the lighting circuits, giving a plug connection to the flood light in the recess and a second plug connection for an extension cord to provide for taking lights to the bottom of the dock and underneath a vessel on the blocks. The third and larger connection, with a capacity of 50 amperes, is provided for operating electrically driven drills or small portable motor driven welding units.

Similar wide angle flood lights, but of greater capacity, will be located at the inner and outer ends of each dock wall, elevated to a height of about 30 feet above wall level on removable towers so that the light can be directed most effectively over the full extent of the dock wall or the working area in rear. It will be readily appreciated that this system of lighting will give the maximum distribution of light over the whole dock area, possessing at the same time the most essential and desirable feature of being able to concentrate this light at any particular point where docking or repair operations are localized. At the same time, the whole lighting system is so situated that it is, whether in use or not, entirely out of the way of any operations, such as passing ships lines along the dock or swinging any materials or equipment into or from the docking chamber. While provision has been made with recesses for the use of wall flood lights at intervals of 50 feet along each wall, actual night tests made of this system of lighting indicate that lights placed at 100-foot intervals will give more than ample working light at any point in the docking chamber, and because of the reflected light from each wall, no dark spots or shadows whatever will exist. All electric circuits for the dock are controlled by a "Square D" switchboard located in the pumping station, so that dock operators will have full control of these circuits on the switchboard there.

Dock Telephone System for Intercommunication

An intercommunicating telephone system will be accommodated in one of the distribution conduits, with outlets for attaching portable telephones at control points such as the pumping station, the different valve recesses and the floating caisson, so that the dock master can communicate directly with any of his assistants or operators from any point about the dock. This is provided as a distinct improvement over the present method generally used for communicating — namely the use of a megaphone which at best gives only indifferent results depending largely on prevailing weather conditions. This system will be entirely separate and independent of the intercommunicating system between the office and shops, and is provided entirely for operations affecting the dock only.

Compressed Air and Water Mains

The air compressors are located in the power house and the air mains will follow the same course as the electric circuits from this point through the end of the pumping station and thence around the dock in the distribution tunnel, the main being bracketed on the tunnel walls. At 100 feet intervals along the tunnel, outlets are provided from the tunnel to rectangular recesses in the face of the chamber wall. These outlets will accommodate branches from the main, to which manifolds will be attached, located in the wall recesses, each with several hose connections and taps. All main shut-off valves and drains will be located in the tunnel itself, but readily accessible through the manholes in the tunnel roof to the wall coping. Air lines can thus be run to any part of a vessel in the dock without laying on the top of the wall, on the altars, or across crane or railway tracks, and at the same time all vulnerable parts of the compressed air system are entirely out of the way and protected from all possible damage.

Water, at city pressure will be similarly distributed, with all mains and control valves in the wall tunnel. For fire protection purposes, hydrant connections will be provided on the water main in the tunnel, directly alongside manholes in tunnel roof, with regular wall type hose brackets carrying connected lengths of hose on the tunnel wall beside each hydrant. With this arrangement, the hose will be entirely out of the way and protected from the weather, when not required, but when needed can quickly be drawn up out of the man holes and stretched

to any required point along the dock walls. From the same water main other pipes are carried down and in the concrete of the walls, to outlets in the face of the wall a few feet above dock floor level. Each of these outlets is fitted with standard hose connection, the shut-off valve being located in the tunnel. These down pipes provide the water for flushing down the dock floor or scrubbing a ship's sides and bottom.

The above distribution system, as applied to electricity, air and water, has many advantages over systems in which conduits are carried underground in rear of the dock walls and pipes for air and water are either entirely incorporated in the chamber walls or carried in an exposed position along the face of the dock wall, which is the practice adopted in other modern docks of similar capacity to the St. John drydock. All circuits and mains are thus entirely protected and out of the way, yet accessible at every point for inspection, maintenance or repair, and the cost does not exceed that of the other types of installation mentioned above.

Complete Sewerage System for Drydock

The sewerage system provided in this drydock is rather an innovation. Heretofor, even in the most modern docks, immediately a vessel is received in the dock and the water removed, all the ship's toilets, bilge water discharges, steam drains, etc., are made inoperative for the protection of the workmen engaged around or under the vessel on the dock floor, and to prevent the accumulation of offensive waste discharges which, under such conditions would be made on the dock floor from the continued operations of these outlets. Putting these conveniences out of operation has very materially handicapped the vessel itself and also has been the source of a great loss of time with workmen, employed in the interior of a vessel.

When the White Star liner "Majestic" was docked in October 1922, in the Commonwealth drydock at Boston, owing to all toilet and waste discharges, etc., of the ship being closed while in the dock, the majority of the ship's crew of some 1,100 persons had to be removed from their quarters on the vessel and accommodated at hotels in the city — not only a large item of expense but a very great inconvenience and loss of time to the many members of the crew whose services were still urgently required on the vessel for repair and overhaul work incidental to the docking operation.

To eliminate such inconvenience and expense, the St. John drydock is provided with a complete sewerage system so that a vessel may be received in dock and have all necessary work done without any interruption whatever to the operation of its usual waste discharges.

This sewerage system consists of a continuous terra cotta tile incorporated in the base of the dock chamber walls, originating in the south or left wall at the outer entrance, in a 6-inch diameter tile, and extending in this location with a gradual increase in diameter completely around the outer and inner docking chambers to the drainage pump sump of the pumping station. At 50-foot intervals throughout this sewer main, 4-inch outlets extend to the face of chamber wall, ending there in a standard 4-inch brass hose connection, this being located in a shallow circular recess so that the end of the connection is still inside the line of the face of the dock wall and protected from damage, but the recess permits of making proper connection to the outlet end with the flexible hose extending from this wall connection to the waste outlet on the vessel's side.

Special Provision for Connections to Vessels

Owing to the fact that the location of these vessel outlets will vary practically with every ship received in the dock, and that a number of these discharges may be operating at one time, the wall connections are closely spaced in each wall as already described. As a certain percentage of solids may have to be handled by this system, the sewerage main is given a continuous fall from its origin to the left of the outer entrance, to its outlet into the drainage pump sump, and at the same time provision is made for the constant supply of sea water from outside the dock entrance to the small or origin end of the sewer main — this sea water connection being made with a 2-inch pipe through the base of the outer entrance wall from the basin in front of the dock, to the origin of the sewer. This constant supply of water with the grade provided in the sewer main will reasonably deliver to the drainage pump sump all solids discharged into the main by any laterals connected to the vessel. When not so connected to the vessel, all wall connections will be closed with brass screw caps. The back wall drainage system, already described, discharges also into this sewer main, the water so originating from back wall drainage being also figured on to flush the sewer main. As indicated on figure No. 5 each lateral leaves the main from the top, extends vertically for a distance of about six inches and then is led to the face of the wall with a 90° elbow. This reasonably eliminates the possibility of any discharge being met with when removing the cap from a lateral.

No definite detail has yet been developed of the receptacles to be used on the ship end of the flexible hoses, owing to the wide variation in the size and location of vessels' waste discharges. It is proposed, however, to use a funnel connection with one side flat, to fit closely against the ship's side, with a wide flare on the side away from the vessel to catch discharges leaving the vessel under head. This funnel connection will be securely fastened to the hose and will be suspended in position with lines down from the ship's deck. Some exception has been taken to this method of connection from the vessel to the main on the grounds that the hose will offer obstruction to other operations being carried on alongside the ship and also that this system is subject to damage from timbers, plates or angles falling when being lowered into the dock chamber by the attending cranes. The flexibility of the connecting hoses allows them to be readily drawn clear of any other operation they may be temporarily obstructing, and while it is true that falling timbers or plates would damage these connections, the demoralizing effect on the sewerage system would be insignificant as compared with its effect on the workmen in the dock were operations being so carelessly conducted that such occurrences as dropping plates or timbers would be anything but a most extraordinary affair.

As the sewer main approaches its outlet into the drainage sump of the pumping station the falling grade of the main brings the latter below the level of the altar steps at the base of the chamber walls. Where this condition exists the lateral connections are extended vertically to the altar tread above where the usual recesses are provided with the hose connection. To provide toilet accommodation for workmen engaged on the floor of the dock it is proposed to provide portable shelters connections to the wall outlets. Figure No. 6 gives a typical application of this system to a vessel in the drydock.

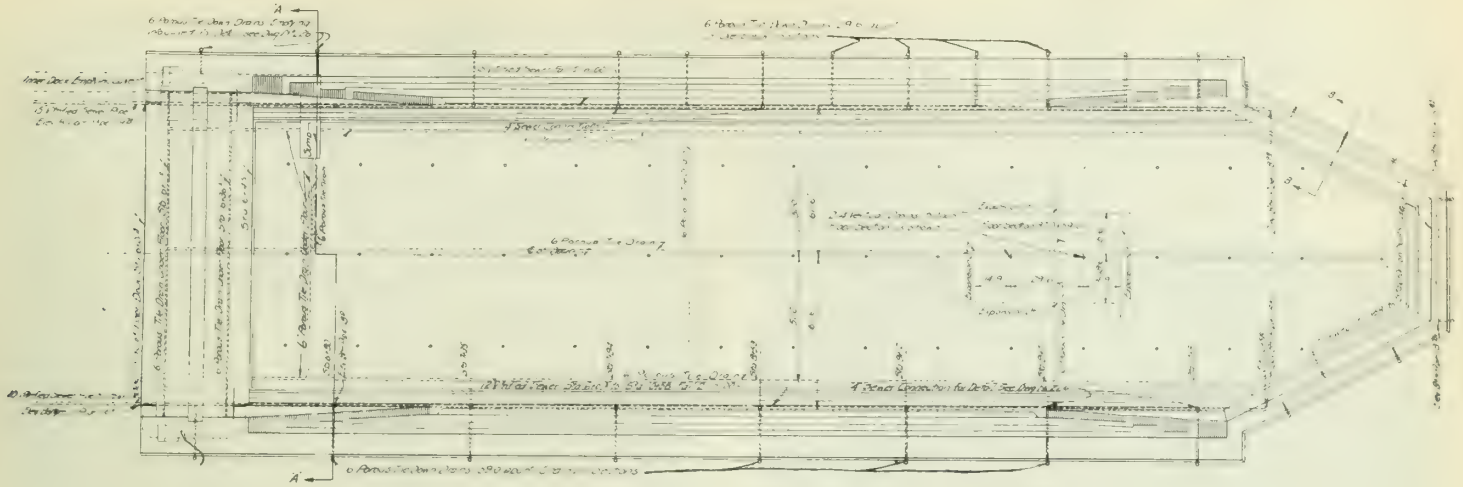


Figure No. 4. Plan of Inner Dock, Drainage and Sewage System.

While the idea of the above sewerage system did not originate from any system used by other modern drydocks, but instead, its use in the St. John drydock will be the first application of this scheme, it is interesting to learn that only very recently the U. S. Naval Department, appointed a board of engineers to study and report on the best system for drydock sewerage accommodation and disposal. This board evidently gave considerable time and study to this question and finally submitted two systems for consideration — one system using compressed air sewerage ejectors, and the other using the same idea as being installed in this dock. The Naval Department rejected the ejector idea as being too expensive and intricate and accepted the second recommendation, which is being installed in the naval drydock No. 4 at New York for test. (*Public Works of the Navy.*)

Pumping Station and Equipment

One essential feature of a modern drydock is the provision of pumping equipment of ample capacity, with which the dock can be emptied of water in as short a time as possible after a vessel has been received therein and the entrance closed. Invariably the utmost dispatch is required in completing any work which has necessitated the vessel being docked, and the required workmen will be posted about the dock when the vessel arrives. It is most essential, therefore, from an economical view point, that the dock be emptied of water quickly, in order that these men can begin operations with the least delay. As a dock of this size represents a water capacity of approximately 43 million Imperial gallons, this task is a reasonably heavy one and immediately suggests the need of using large capacity pumps, and at the same time, the equal necessity of so locating these that friction losses in intake and discharge pipes or tunnels is kept down to a minimum, without their location offering an obstruction to the free access to the dock with cranes, etc., for repair operations.

The marked increase in the size of drydocks in recent years has resulted in an equally distinct change in dock pumping equipment. The steam driven plunger pump was superceded by the horizontal steam or electrically operated centrifugal pump, and this in turn has given way to the vertical pump of the same type. The very large volume of water to be handled by a plunger pump necessitated a pump of such size that its construction was out of the question and the remedy came with the development of the centrifugal pump of large size. The horizontal centrifugal pump met the demand in capacity but introduced the necessity of locating it, with its prime mover, at or near the same level as the floor of the drydock, in order that it would always be primed and capable of handling the dock water as long as any remained in the dock. Such an installation, — and the Champlain Drydock at Lauzon, Quebec, is an excellent example of this, — required a very extensive sunken pump room with engines or electric motors located therein, all at dock floor level, fifty feet or more below ground surface. Such a location for electrical equipment was far from desirable because of moisture conditions, and the additional excavation involved represented a large item. These objectionable features have been most successfully overcome by the development of the direct connected vertical centrifugal pump, located at or about dock floor level, and driven by a vertical motor, located at any desired height above the pump, readily accessible, and free from all injurious moisture conditions.

Figure No. 5. Sections of Inner Dock, showing Drainage and Sewage System.

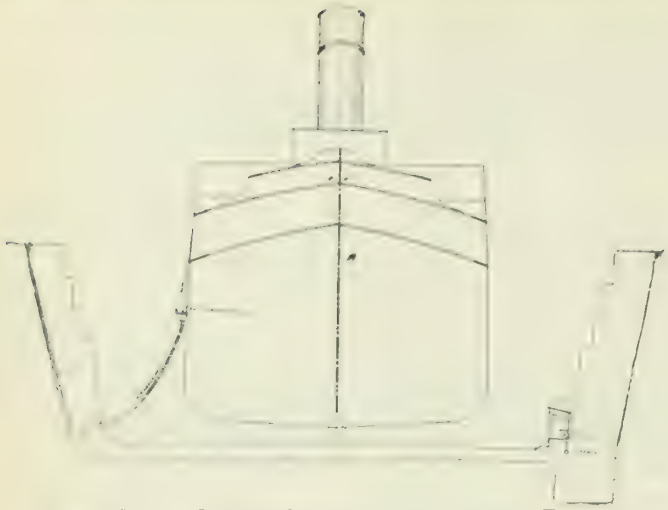


Figure No. 6. Sewage Connection to vessel in Drydock.

Special Precautions in locating Pumping Station

In every case the need of a protective shelter has remained and, with the introduction of the vertical pump and motor, has come the necessity of providing this at a higher level. By locating the motors at dock coping level, an obstruction has been introduced in the desired clear area around the drydock, by the elevated motor building. With the St. John drydock pumping installation, the best and desirable features have been maintained and the objectionable characteristics, mentioned above, eliminated.

The specification submitted by the company, and approved by the government, provided for the use of three main pumps with sufficient combined capacity to empty the drydock in not more than four hours, with water in dock at extreme high tide level, 47 feet above dock floor level, when pumping starts. Two auxiliary drainage pumps, capable of handling all leakage into the dock when empty, and a small sump pump for unwatering drainage pump sump were likewise required.

Having determined on the use of this vertical type motor driven pump, the next problem was to obtain an unobstructive station location, as close as possible to the dock, yet with the least possible additional excavation over that required for the dock itself. To accomplish this, the pumping station was located in the dock wall, directly inside the entrance, with the complete pumping equipment all accommodated in a chamber, the roof of which is at dock coping level. By this location, additional rock excavation for the pumping station was only that required below dock pit grade for the main sump or suction chamber, — a matter of approximately 5,000 cubic yards, — and the whole of this equipment is completely housed and accommodated without the use of any building extending above the level of the dock wall.

The Pumping Station

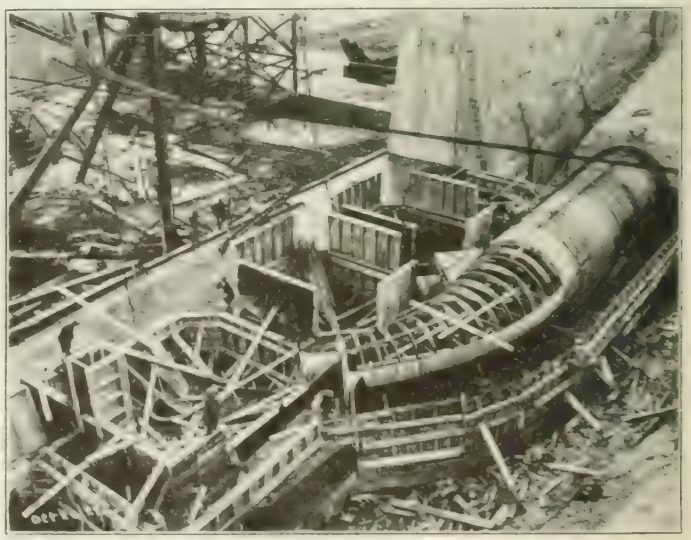
The station occupies an eighty-foot section of the north wall of the drydock — widened out sufficiently to give required wall sections between dock and station chamber, and again in rear of the 22-foot wide space representing the pumping station itself. Below the three main pumping units, the suction chamber, 22 feet wide by 14 feet high, with roof at approximately dock floor level, is continuous, and has the two separate and independent 8-foot by 10-foot unwatering tunnels, from the outer and inner docking chambers, entering this suction chamber at its inner end. Each of these tunnels is controlled by a sluice gate valve located at this point of junction with the main suction chamber, thus allowing for their independent control and the pumping out of either the outer or inner chamber independently of one another. The motor driven valve operating machinery is thus located in the inner end of the pumping station and so concentrates the control of the pumping operation entirely at the one point in the station itself.

The roof of the suction chamber, which is as well the floor of the main pump wells, is of very heavy reinforced construction and is designed as a beam to take loads either from above or below. The total downward load will be that of the pumps themselves with the addition of the floor slab and the division walls between pumps. The level of the top of the suction chamber is as high as the water will reach in the pumping station, so that under the condition of the dock being full of water and emptying culvert valves open, this suction chamber roof will be subjected to the hydrostatic upthrust originating from the head of water in the dock above this roof level, which, with extreme high tide will be a matter of 47 feet, and this resultant upward pressure will be approximately five times greater than the downward pressure from the weight of pumps, floor and division walls. This slab is reinforced accordingly, and it will be noted that this reinforcement is all at least six inches from the face of the concrete to isolate it from the salt water in the suction chamber.

The cellular construction of the pumping station from main pump floor to motor room floor was adopted to give the reduced dock wall section, for the extent of the pumping station, the necessary additional support when under the pressure originating from the docking chamber being full of water, as well as giving the rear wall necessary support against back fill pressures.

Drainage and Sump Pump Compartment

To accommodate the drainage and sump pumps, whose function is to handle all water which cannot be economically taken care of by the main pumps, a separate compartment is provided at the outer end of the station. Here the pump floor level is three feet below the floor of the main suction chamber and below this pump floor as well is a suction chamber divided at its centre by a wall parallel to the length of the station. Into the rear



Pumping Station completed to Main Pump Floor Level.

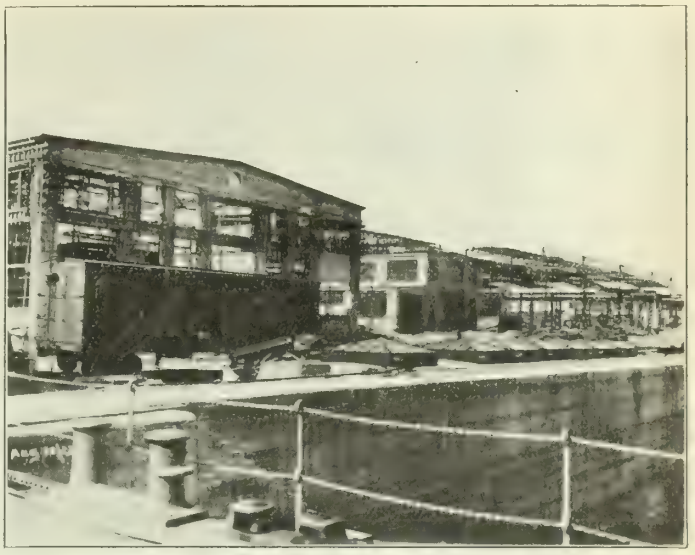
compartment of the suction chamber is brought back drainage of the north wall of the dock and into the front compartment is brought the dock sewerage discharge. One drainage pump is located over the rear half of this sump, the other drainage pump and the smaller sump pump being located over the outer or front half. Each drainage pump, on its suction side, is connected horizontally, by means of a "Y", to the main suction chamber and vertically to the smaller suction chamber directly below, — the sump pump having a vertical suction connection to the sump below only.

With this arrangement either drainage pump may be used to handle water from the main suction chamber, — such water originating from leakage past the caisson, rain fall, or washdown water, — or dispose of any water coming to the small sump from back drainage or sewerage. The sump pump can also take care of sewerage or back drainage up to its capacity and is available as well to completely dry the drainage pump sump should inspection or cleaning be required here. The division of the drainage sump is made to allow the use of one drainage pump as a circulating pump for the power house condenser; the pump used for this purpose being isolated from that half of the drainage sump receiving the dock sewerage. A 12-inch valve is introduced in this division wall, permitting the connection of the two halves of the sump, when desired. The 12-inch down pipe in the back wall of the drainage pump compartment connects the discharge tunnel of the pumping station to the back half of the drainage pump sump. This connection provides for the pumping out of the discharge tunnel at any time for inspection or repairs after its outer end has been closed from the sea by stop logs. This connection will also supply, from the discharge tunnel, any make—up water required by the circulating pump when dock drainage in itself is not sufficient for this requirement. By this arrangement it is expected a saving will be effected, in that the one pump will perform its primary duty of disposing of drainage water from the dock, and at the same time, with no additional power required, will supply this discharge as cooling water to the condenser in the power house.

A series of iron stairways in the drainage pump compartment provides a ready means of access from the motor room to both main and drainage pump floor levels.

The Motor Room

Above the cellular pump compartments, but still twelve feet below dock coping level, is the motor room floor level. Here are located all the motors, and their switchboard equipment, which operate main, drainage and sump pumps, — as well as the motors operating the emptying tunnel sluice gate valves and the gate valves on the main pump discharges. The motor room is twenty-two feet wide and extends as one room for the full length of the pumping station, eighty feet, its roof being the coping of the dock wall. In order to provide proper

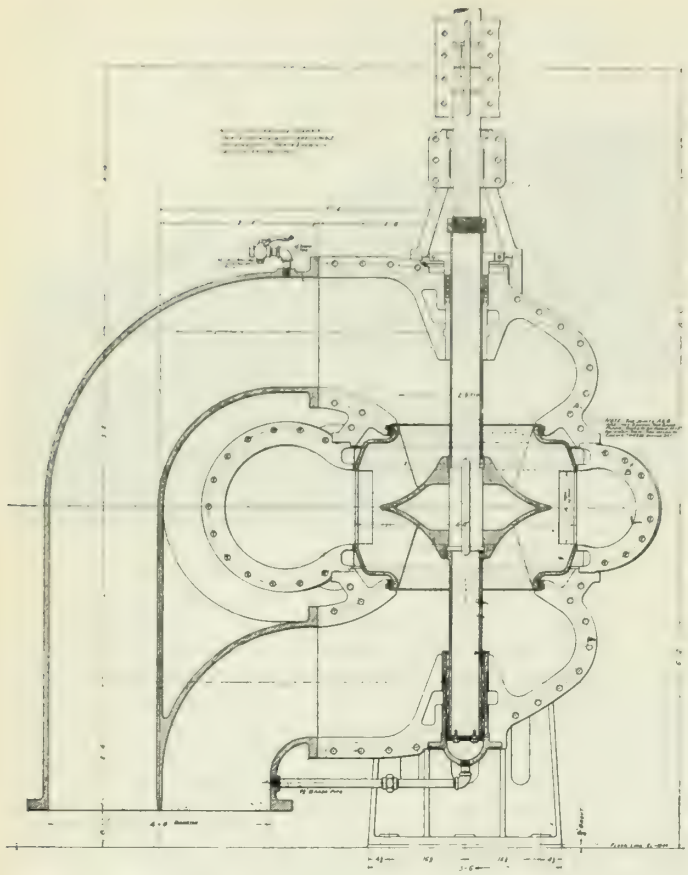


Pumping Station, exterior view, showing removable Skylights.

lighting as well as immediate access to the machines in this motor room, seven nine-foot square openings are inserted in this roof slab, — each covered by a metal framed, glass inserted skylight, so built as to fit over and completely close each opening to the weather, but, at the same time, these skylights are removable and by reason of their being located directly over the contained machines, direct access may be had to all the pumping station equipment with a crane operating on dock coping level. These skylights project only two feet above the top of the dock wall and so can hardly be looked on as in any way offering an obstruction to the operating of dock cranes or the handling of vessel lines along this portion of the dock.

The discharge tunnel from the pumping station is located with its floor level at main pump floor level, for the extent of the station and directly back of the station itself, and extends from opposite the three main pumping units to its discharge portal in the north return wall of the dock entrance. The level of the discharge portal floor is made three feet above low tide level, in order to permit access to the tunnel from outside at low tide for purposes of inspection or repair. In section the discharge tunnel is twelve feet wide by fourteen feet high with arched roof. The cross-section thus provided permits of handling the immense volume of water, necessary in emptying the dock, within the time limit, with a very low velocity, which, in both emptying tunnels to the pumping station and in the discharge tunnel, is estimated will not exceed three feet per second. Friction losses thus become negligible, while the possibility of erosive action on the concrete of these tunnels is reasonably eliminated.

Figure No. 7. Pumping Station, Sections through Motor Floor.



General assembly of 48"—42" Volute Type Vertically Set Pump.

The Pumps

While the development of the above detail of the pumping station was done under the writer's direction, it was considered inadvisable to extend this development to include the design of the pumping equipment itself. Instead, it was considered that this would be much more satisfactorily accomplished by submitting to accredited pump manufacturers, a statement of the duty required with the general type of installation necessary to suit the station layout and allow these manufacturers to submit proposals using their standard equipment with a guarantee as to performance under the conditions specified. By adopting this method of procedure it was felt that a much lower price would be obtained by reason of the manufacturer being able to bid on his standard equipment on which all development work was already done rather than ask for bids on specially designed equipment which would involve new development costs, and equipment, again, whose performance the manufacturer would hesitate to guarantee. Adopting the former mode of procedure resulted in twelve very complete and excellent proposals being received, and the problem thus presented to the writer of selecting the best was a difficult one indeed. From the viewpoint of cost there was a very wide variation and immediately several proposals were eliminated. Least operating power requirements again narrowed the field down to two propositions. A final decision between these remaining two proposals was arrived at by eliminating those features of each which were more or less equal, such as cost, power required, and details of equipment, and in this final comparison the equipment chosen was not only found in every way suited for the immediate purpose it was proposed, but formed a harmonious link in the whole drydock equipment installation.

This pumping equipment was supplied by the Goldie and McCulloch Company, and consists of three 48-inch-42-inch Rees Roturbo patent pressure chamber, double suction, volute, centrifugal pumps, direct connected to 750-h.p., Westinghouse vertical, self starting, synchronous motors; for the emptying of the dock, and each of these large pumps is provided, on its discharge end, with a 42-inch single door type non-return valve and a 42-inch motor operated gate valve; for temporarily or completely isolating the pumps from the discharge tunnel as desired.

To handle dock drainage, two 15-inch — 12-inch pumps, of the same type as the main pumps, are provided, each driven by a Westinghouse 100-h.p. vertical induction motor with automatic starter and float control switch and a 15-inch—4-inch Rees pump driven by a 15-h.p. motor constitutes the sump pump required. This latter is fitted with a bronze sewage type impeller as it is anticipated that its chief function will be the handling of the discharge from the dock sewerage system. The two drainage pumps are likewise fitted with bronze impellers to provide for the probability of their being constantly in service handling salt water; but as the main pumps will operate only very intermittently and then only for short four-hour periods, the use of bronze impellers was considered an unnecessary precaution and cast iron impellers are therefore being used.

The Rees Roturbo pump, because of its very flat power curve characteristic, particularly suits the St. John drydock situation, in keeping the power demand, with relation to pump capacity, down to a minimum. The dock is being provided with its own power plant for the development of required electrical energy, as no large block of power for very intermittent use is available from any local plant except at unreasonably high rates, and it is most essential that the dock power plant be moderate in size and so not occupy excessive space in the dock vicinity and unduly limit the clear working area so essential around the drydock. The use of synchronous motors for the operation of the main pumps may at first thought seem inadvisable owing to the very low starting torque of this type of motor. However, by adopting the simple expedient of starting these motors under no load conditions, by keeping the gate valve on the pump discharge closed until the motor has reached synchronous speed, this objection is successfully overcome and the net result is a much improved power factor condition in the power plant due to the presence of these large synchronous motors instead of induction motors with their corresponding low power factor condition, — the practice, universally adopted, so far, in pumping installations of this nature.

Automatic Control of Pumps

To allow for automatic operation of the dock drainage and sump pumps, in keeping with the constantly varying quantity of water from drainage, sewerage discharge, and leakage past the caisson, there is provided a float control system governing the automatic starters and float switches of the 100-h.p. and 15-h.p. motors. Space does not permit of a detailed description but it may be briefly described as consisting of a permanently waterlogged ball contained in a closed vertical cylinder, but connected by a wire over a system of pulleys to a lever arm in the motor starting box. The vertical cylinder, containing the float ball, is directly connected to the main and drainage suction chambers, so that the water level in

the cylinder corresponds with the water level in the suction chambers, and as this rises and falls the ball follows and through the connecting wire transmits this movement to the lever arm on the starter — closing the float switch and starting the motor when the water has reached a predetermined level, and again, when the pump has lowered the water to its minimum level the float switch is opened and the motor stops. The float cylinder is independently connected to the main and drainage suction chambers so that this float control system can be utilized for either, as desired.

While the pumping plant installation, as above described, is now completed, actual performance tests remain to be made when the dock power plant is completed and power is available, sufficient to operate this equipment. That the manufacturers' guarantee, of emptying the dock under conditions of maximum high tide in four hours, will be fully realized is indicated by performance curves already obtained from these pumps now in operation. In fact, this performance curve indicates that, under actual conditions that will prevail at the time tests are made, owing to the decreasing back head that will result from the tide falling outside the drydock during the pumping period, this will have the effect of reducing the actual pumping time to approximately three and one-half hours. Even better performance than this can reasonably be anticipated in the actual docking of vessels during periods of low high-tide when the volume of water to be removed from the dock will be considerably less due to the lower level reached by the tide and the displacement of the vessel itself. Actual performance, however, is, as yet, a matter of conjecture.

Floating Caisson provided to close Docking Chambers

The caisson, provided for closing off the docking chambers from the outside water when the dock is to be emptied, is of the floating type generally used in large modern drydocks and that provided the St. John drydock follows very closely both in design and operation similar floating caissons with which such drydocks as the Champlain drydock at Lauzon and the Commonwealth drydock at Boston are equipped. In fact, as the caisson of the Commonwealth drydock in every way proved so entirely satisfactory, its design and construction were duplicated in the caisson of the St. John drydock, changes in dimensions only being made to suit the different cross-section of the latter drydock entrance and intermediate sills.

The subject of floating caisson design has already been so thoroughly and well presented to *The Institute* by Leslie R. Thomson, M.E.I.C., in his paper "The Rolling and Floating Caisson of the Levis Drydock", (Vol. XXX

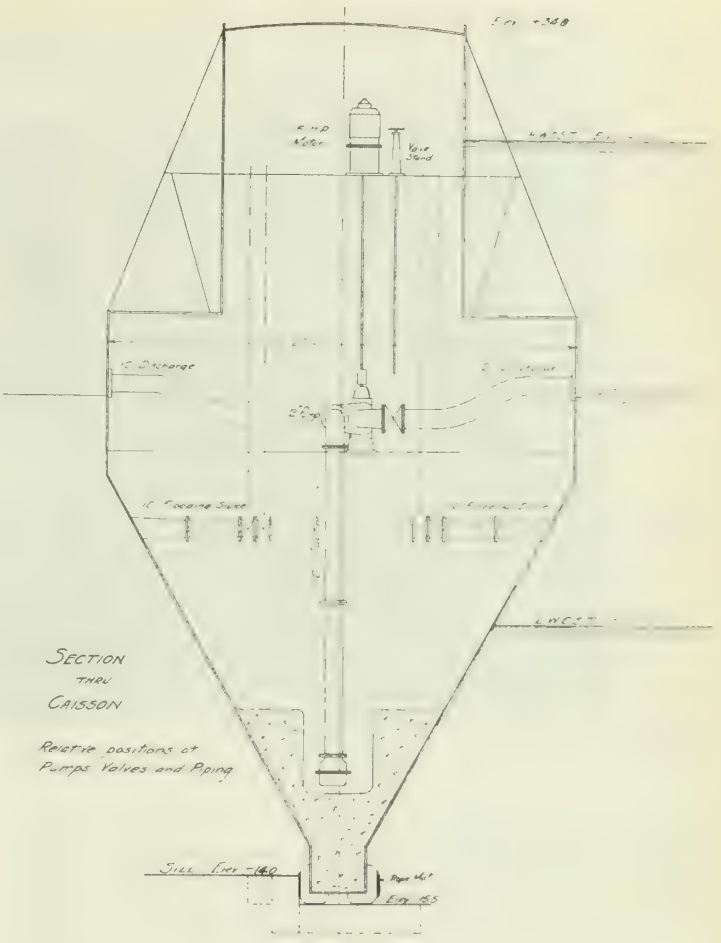
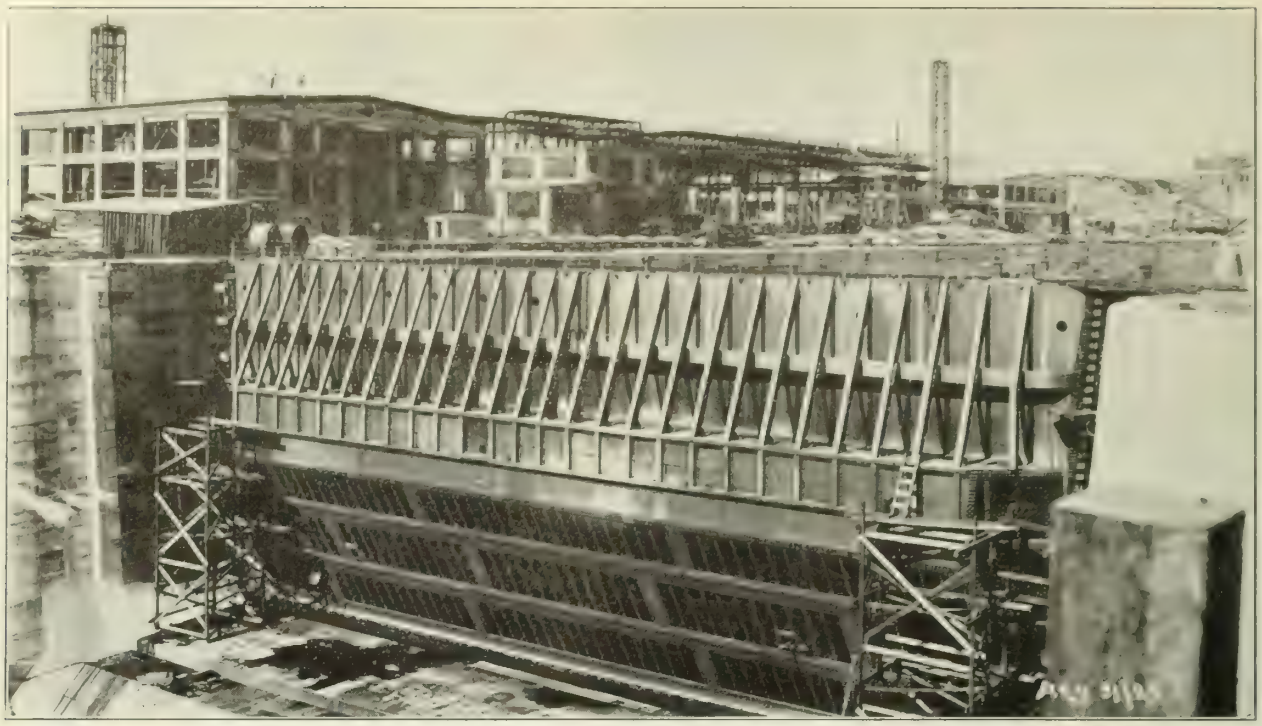


Figure No. 9. Section of Caisson.

Transactions C.S.C.E. 1916), that the writer feels that nothing can be added in this connection; but a brief outline of the operation of the caisson may be of interest.

From the accompanying figures Nos. 8 and 9 it will be seen that the caisson is simply a vessel of rather unusual lines and cross-section. Both ends are identical in outline and terminate in a distinct, projecting stem and this same projection carries as a keel across the bottom between uprights. Faced on either side with oak, this projecting stem and keel, when the caisson is in place across the dock entrance, make a complete and continuous contact with the projecting granite stop in the outer or intermediate entrance walls and floor — the pressure of water on one side of the caisson only, with the drydock empty, creating the desired water seal between oak and

Figure No. 8. Plan of Caisson showing Pumps, Valves and Piping.



Repair Shops from outer Entrance of Drydock.

granite. Below deck No. 2, which is itself water tight, the caisson is divided into five separate chambers, — two in either end of similar dimensions, and a large middle compartment. This middle section has two openings, one on either side connecting to the outside but controlled by double gate valves. Similar connection is provided to the end compartments from the centre division, also under gate valve control. All gate valves have extension spindles with operating headstocks on deck No. 2.

Operation of Caisson

When afloat with a light draft of approximately 28 feet these compartments are dry, except for such water as may be carried in the end trimming compartments to maintain the caisson on an even keel longitudinally. When the drydock is to be closed, the caisson in its above condition is floated into position across the entrance where its keel will be, — at high tide-fourteen feet or so above the entrance sill and the stem clear of the wall stops. The valves on the side connections are then opened, admitting water to the centre compartment, until the caisson sinks to a position of rest on the sill, its stem and keel in contact throughout with the face of the granite stop. To remove it again from this position in opening the dock, this water ballast is pumped overboard by the 12-inch vertical motor driven pumps located below deck No. 2, bringing the caisson again back to its light draft condition when it can be floated out of the dock entrance. The twin valve control is provided on the scuttling connections to the sea to insure these being always capable of being closed off, should one valve become plugged or jammed in its open position. The only unusual feature of the St. John caisson is in its being provided with a standard gauge track across its top, thus providing rail connection from one side to the other of the drydock by this route. The one caisson now completed and in place across the outer dock entrance, was fabricated and erected by the Dominion Bridge Company, Montreal, and the fine appearance of this caisson is the best evidence of the very excellent character of the shop and field work done thereon.

The Repair Plant

An all-important adjunct to the modern drydock is a complete and readily accessible repair plant and this is provided the St. John drydock as indicated on figure No. 10 and consists of, in addition to the power house, a machine shop, a boiler, blacksmith and fabricating shop, as well as a carpenter shop and stores building with second story accommodation for a mould loft. These buildings are all of reinforced concrete construction and are located immediately alongside the dock and parallel to its length, yet with ample working area between buildings and the side of the dock. An underground tunnel connects all buildings with the power house so that electrical energy, steam for heating and power, compressed air and water will be supplied to each and all with nothing in the nature of wires or pipes above ground to interfere with, or be interfered with by, the movement of materials between the buildings and the dock. These buildings are equipped throughout with all necessary machines of sufficient size to handle any class of repair work that may originate from any vessels which the drydock itself can accommodate.

Equipment of Power House

The power house installation consists of a battery of four 500-h.p., Robb water tube boilers, equipped for firing with crude oil fuel. The boiler settings, at the same time, have been so arranged that, if necessary at any future time, mechanical stokers can be installed. The immediate oil supply is accommodated in a reinforced concrete tank, under the boiler room floor, in front of the boilers, and has a capacity of approximately 50,000 gallons. Should mechanical stokers be installed later on, this tank is so located and arranged that it can be used for an ash pit, having ample room to accommodate an ash conveyor, if desired.

Two non-condensing DeLaval steam turbines and one Wait mixed flow condensing turbine, each direct connected to 1,100-h.p., Allis Chalmers 550-volt, 60-cycle, alternating current generator, constitute the power plant. The Wait turbine will operate, when in service alone, on high pressure steam direct from boilers, but when one or more of the non-condensing units is operating, the Wait turbine will operate low pressure on the exhaust from the other units in service. The steam demand of the Wait machine being less than that of the DeLaval turbine, leaves this surplus of exhaust steam available for heating purposes. The main switchboard, controlling the whole of the electrical system of the dock and yard, is located in the power house and has incorporated in it panels to provide for the supplying to any outside system of any surplus energy available from this plant, in excess of the demand of the dock and shops themselves.

Two two-stage belt driven air compressors, each driven by a 300-h.p. synchronous motor, are installed in the turbo generator end of the power house. These will provide the air requirements of the drydock and repair shops, which will, under normal conditions of operation, not exceed the capacity of one of these units, the second thus acting as a standby.

The fact that this power station is required by the federal government, as part of the drydock and yard equipment, under the existing agreement, is not reason enough in itself for this power development being made. The connected motor horse power in the repair shops represents approximately 2,200 h.p., and that for the operation of the drydock equipment totals approximately 3,000 h.p. While the constant shop load will be considerably less than the indicated connected horse power, and the load from the operation of the drydock equipment in docking operations, while heavy, will only be intermittent, the power situation in St. John does not permit of either the local developments reserving a block of power sufficient to meet this intermittent demand, except at a constant load rate which would make the power cost excessive. Furthermore, the dock and yard require maximum protection against service interruption, in order that any docking and repair operations undertaken, may be put through to completion as rapidly as possible. In addition there is the most essential consideration of heating the shops. Therefore from the view point of cost, combined with the need of uninterrupted service and ample heating provision in the cold weather, it would appear that this independent power plant is entirely justified. That this plant may yet prove a benefit to the community at large is quite within the range of possibility.

Reference has been made, in detailing the drydock equipment, to the provision being made for cranes about the dock. For the quick and economical handling of materials and equipment to and from vessels under repair, such crane facilities are absolutely necessary. The St. John drydock is being equipped with a travelling locomotive type crane with a lifting capacity of twenty tons at eighty-foot radius and this machine, with the track layout, indicated on figure No. 10, will reasonably serve not only all parts of the dock but the repair yard itself. In addition a fixed derrick of seventy-five tons capacity at sixty five-foot radius is being provided on the wharf at the entrance to the drydock, so that heavy lifts such as arise with the placing or removal of ships' boilers, warships' guns, etc., can be made while the vessel is afloat when hull repairs are not required.

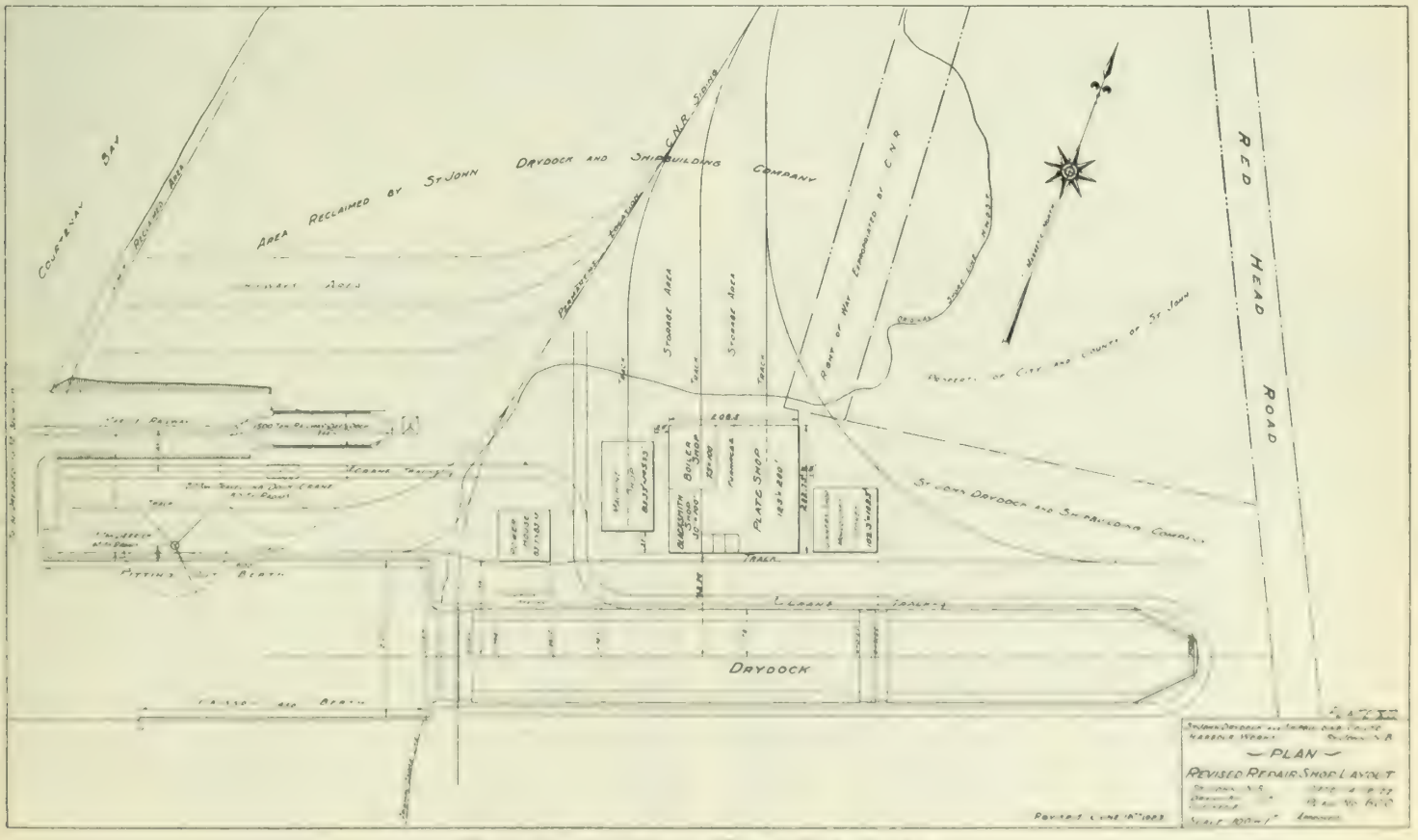


Figure No. 10. Plant of Repair Shop Layout.

Slipway provided for Small Vessels

In order to accommodate small vessels, which if received in the drydock for repairs, would be subject to docking and lay day charges quite out of proportion to their size, a slipway is provided alongside the dock entrance, which will accommodate any vessel up to two hundred and fifty feet in length with a dead weight not in excess of eighteen hundred tons. This slipway consists of a carriage or cradle, fitted with keel and bilge blocks, travelling on a wide gauge inclined track, extending down to below low tide. The vessel to be docked is floated, at high tide, to a position in contact with the cradle lowered to the bottom of the incline. The keel and bilge blocks are then adjusted to fit the vessel's bottom and then carriage and vessel are slowly hauled up the grade, by a large winding engine located at the head of the slipway. The cradle thus receives the full vessel weight and then is drawn to the top of the incline, when the vessel is then in a position entirely above high tide level and accessible at all points for continuous repair or overhaul operations. This slipway is provided, in excess of the repair yard equipment required for the main dock, by the terms of the Drydock Subsidies Act, but by its addition to the other yard facilities, it is anticipated that every call for vessel repair work, no matter how large or how small, can be properly accommodated, thus fulfilling more completely the intended object of this project.

Construction Methods Employed

Details of construction methods employed in the execution of this undertaking will be of interest. The excavation of the drydock pit was carried out with steam shovels entirely, a large proportion of the rock being utilized in the rubble mound breakwater, the balance going into the reclamation of areas adjacent to the entrance of the drydock.

The selection of the simplest and therefore the most economical method of handling the hundred thousand yards of concrete required in the construction of the drydock itself proved more of a problem, and the decision —of the writer—in this matter was based on the following local conditions.

Methods employed in handling Concrete

For aggregate, crushed stone, beach gravel and sand were available. Rock from the excavation could be crushed, but as this rock varied in character from an excellent grade of volcanic trap to very soft shale, hand picking before, or washing after crushing would have to be resorted to in order to exclude the objectionable shale content, and because of the high percentage of shale present the cost of crushed stone appeared unduly high. Less than half a mile south of the dock site and on the bay shore was located an attractive deposit of beach gravel which proved sufficient in quantity for the dock needs and reasonably well graded to the proportions of two of stone to one of sand. This beach was readily accessible by rail from the dock site.

As the general level of the ground around the dock pit was the same or slightly above the level of the top of the dock walls, such a situation naturally suggested that gravity methods should be used to their fullest extent in the disposition of the concrete. Then again as the concrete cross-section of the dock was practically uniform for its full extent of twelve hundred feet, a flexible mixing plant, rather than a central fixed type, was used in order that the mixed concrete could be put in place in the forms by the quickest and most direct method possible. This feature likewise suggested the advantage of storing the aggregate directly alongside its ultimate destination as concrete; rather than concentrating this storage at one point and so experiencing the added cost of rehandling a considerable quantity of this aggregate, which would be necessitated by central storage.

Influenced by the above considerations, the moveable concreting plant illustrated in figure No. 11 was adopted.

Mixing Units

This plant consists of two mixing units, each identical with the other in detail. Each unit consists of a 1¼-yard Smith mixer mounted on a travelling carriage, having a single aggregate storage bin overhead with a measuring hopper between the storage bin and the mixer. The cement charging platform is located over the mixer and in front of the storage bin and an inclined belt conveyor up one side delivers the bags of cement, placed on it from the cement car door, to the charging platform above. Alongside the mixer car and standing on the same two standard gauge tracks is a travelling clam shell derrick. This machine fills the storage bin of the mixer from the continuous storage pile of gravel alongside, but in rear of the through track for the cars of cement, directly behind the mixer carriage. These two units both stand on the same pair of standard gauge tracks paralleling the length of the dock and so located that the front of the mixer stands just at the edge of the dock pit. Directly opposite each of these units, standing on a travelling carriage on the dock floor, is an elevating tower. A continuous line of 12-inch concrete chutes extends on a 3 on 1 slope from the receiving hopper in front of the mixer to a similar hopper at the tower base. This connecting chute has inserted in it two line gates, one directly over the wall adjacent to the mixer and the other midway between mixer and tower. To the first gate is connected the chutes leading into the near wall of the dock, and these chutes are suspended from a cable running parallel to the length of the dock. To the other line gate is attached a section of counter weighted chute with swivel head chute extension. Each tower is equipped with a quick shift boom rig which carries the chutes for the north or far wall of the dock.

All parts of this layout being readily moveable has allowed of making a continuous storage of gravel for the full length of the dock, along which the plant could move, receiving the concrete materials opposite the point where the mixed concrete could be discharged directly into place in the forms. Two hoist runners, one fireman and eight labourers constitute the full crew required for the operation of one mixing unit and the actual results in output, cost, and character of concrete obtained, fully justify the plant selection made.

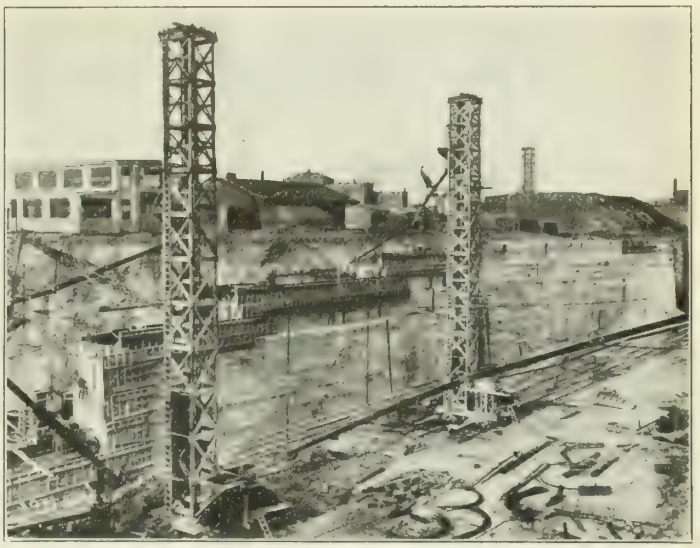
A concrete mixture of one part cement, two and one-half parts sand with five parts stone was adopted for the concrete of the dock, except in the outer entrance and pumping station divisions, where a one-two-four mix was used for added protection against sea water action. As considerable variation in the grading of the beach gravel was experienced in the stone content, the proper proportion of cement to sand was maintained by daily screen tests and particular attention was given to the matter of keeping down the quantity of water used to a minimum in keeping with good concrete consistency. Considerable difficulty was first experienced in this latter detail, but when the workmen found that the only concrete that

would flow down the 3 on 1 slope of the chutes from the mixer to the tower, without splashing over or jamming, was that having just the proper quantity of water — they relieved the inspecting staff of seeing that the man charging to mixer with water kept this detail of the mixture right.

Test of Concrete

From each day's run of concrete, test cylinders six inches in diameter by twelve inches long have been taken, and these after curing in moist sand for twenty-eight days or more were tested in compression in a local hydraulic press. Results have varied from 1,000 pounds to 3,000 pounds per square inch, low results being invariably due to improper ramming of the concrete in the mould resulting in voids or the presence of an oversize stone in the test piece. Some few results exceeded 3,500 pounds, but the average of test results indicates that the original intention of obtaining 2,000 pound concrete has been satisfactorily accomplished. The writer attributes this to the extreme cleanness of the gravel, the uniform care taken in mixing, both very materially assisted by the consistent regulation of the water used.

In closing, the writer desires to express his fullest appreciation of the valuable assistance given him by F. P. Vaughan, M.E.I.C., on the electrical details of the dock equipment, to A. F. Crawford, of the Goldie McCulloch Company, for the many excellent suggestions in connection with the pumping station and power house detail, and to Alex. Gray, M.E.I.C. for his kindly co-operation in his capacity of inspecting engineer for the federal



Concrete Placing Towers and Chutes.

government. To the engineers directly associated with the writer on this undertaking and particularly V. S. Chesnut, A.M.E.I.C., the writer's first assistant, is due to a very large measure any credit that reflects itself from the results obtained. Most loyal co-operation combined with careful study and development of details and ideas justifies each and every member of the writer's engineering staff assuming to himself due credit for the successful accomplishment of this undertaking.

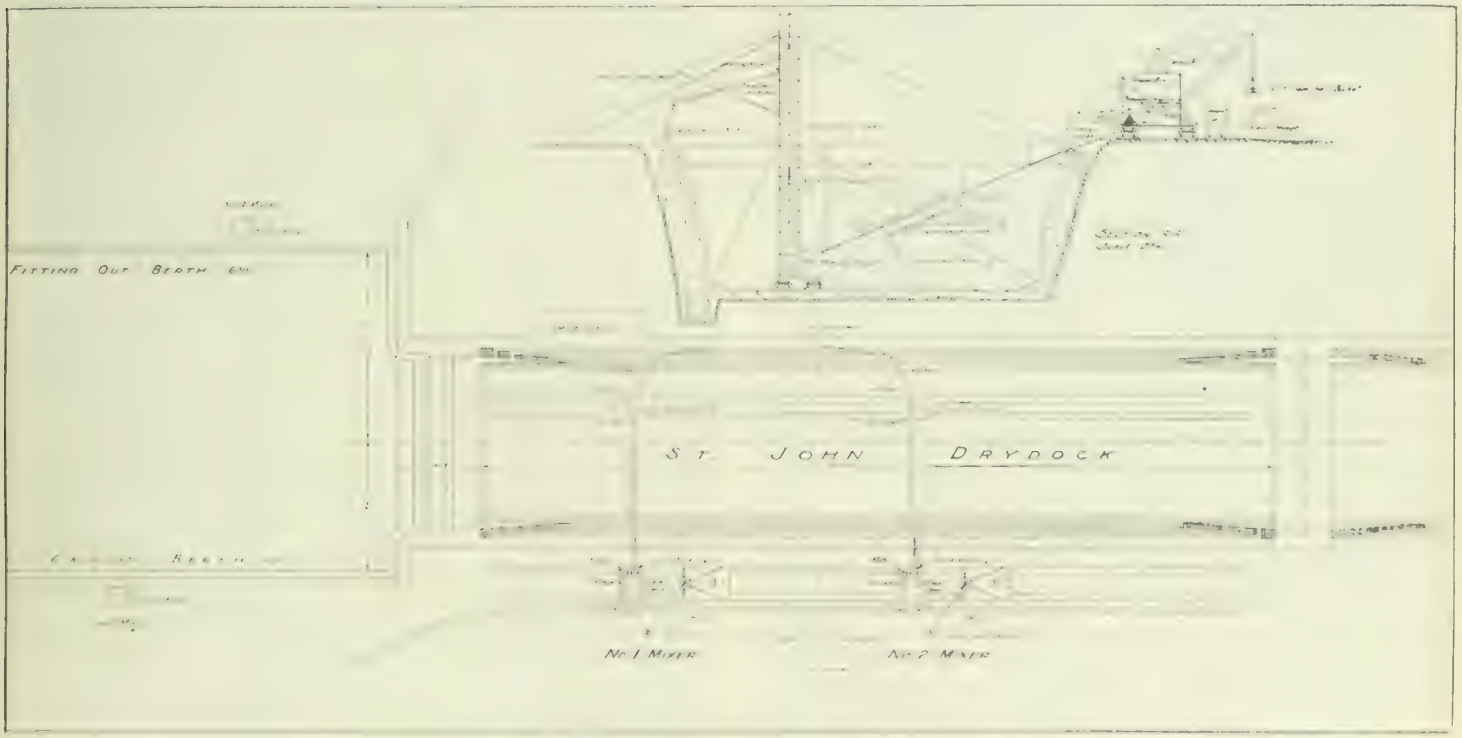


Figure No. 11. Plan of Drydock and Berth with Construction Plant Layout.

Loud Speakers and Public Address Systems

H. J. Vennes, A.M.E.I.C.
Transmission Engineer, Northern Electric Company Limited.

Paper read before the Maritime General Professional Meeting, The Engineering Institute of Canada, September 26th, 1923.

The large amount of development work done during the last few years in connection with the communication art has made available a number of facilities of public interest and which for specific purposes serve in a very useful and even important capacity. One of these developments is that of public address systems. Public address systems are designed to meet the demand for equipment which will enable a speaker to address an audience of much greater size than is possible without any artificial means of increasing the volume of his voice. , There are a large number of prominent men and women who have messages of great importance to the public, but until very recently the size of an audience a speaker could reach at any one time has been limited by the carrying power of the speaker's voice and also by the size and acoustic properties of auditoriums or other gathering places.

In a well designed auditorium the range of a speaker's voice unaided by artificial means is slightly greater than that of out-of-doors areas, but the number of people who can be accommodated within hearing distance seldom exceeds five thousand. In many auditoriums of much smaller capacity the acoustic properties are so defective that not more than two or three hundred people can clearly understand the words of the speaker.

Inasmuch as public speaking plays a very important part in our every day commercial and social activities, it is evident that any facility which enables a larger number of people to partake in these activities is of great importance to the general public.

Loud speaking telephone receivers have been in use for a number of years. They have been used to a considerable extent on battleships for providing a means for centralized fire control. A loud speaker is located near each of the guns. The gunners receive orders direct from the commanding officer, thus making it possible to give simultaneous orders to any number of gunners. Loud speakers have also been used in railway stations for announcing the departure and arrival of trains. Until quite recently, however, the service provided by loud speaking telephones has not been very satisfactory due to the lack of faithful reproduction of the speaker's voice.

Before making any mention of the actual commercial use of public address systems it might be well to consider the function which such a system must perform. The ultimate objective is of course to intensify and direct a speaker's voice so it may be heard distinctly by the entire audience. The equipment necessary for attaining this result may conveniently be divided into three parts.

1. An instrument which will pick up a small amount of energy from the speaker's voice and convert it into electrical energy with characteristics, corresponding to those of the voice. This instrument is known as the microphone or transmitter.

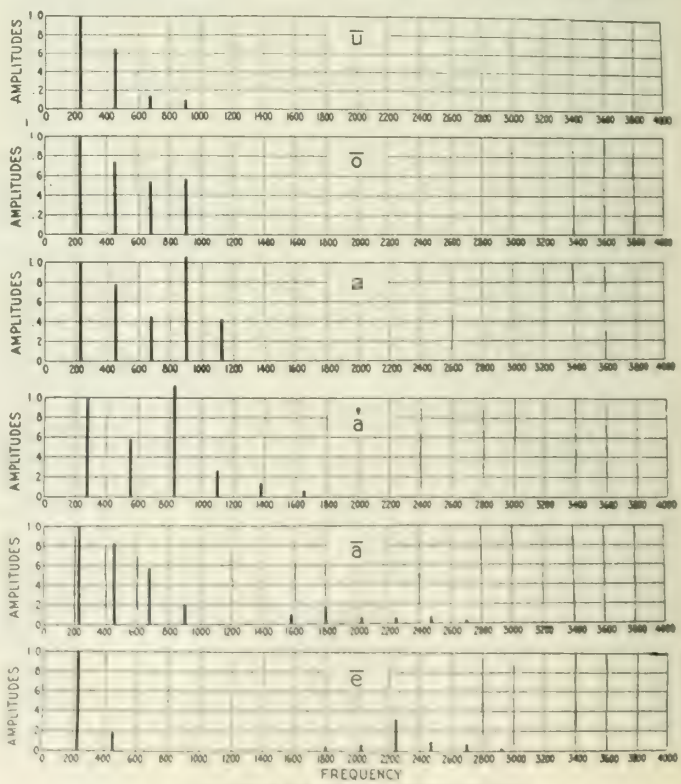
2. An amplifier capable of enormously increasing the small amount of energy picked up by the microphone.

3. Loud speaking receivers and projectors for converting the amplified electrical energy into sound and directing it in such a way that the entire audience can hear what the speaker has to say.

The Microphone

Before dealing with the microphone itself let us consider for a moment the nature of the driving force actuating the microphone. This driving force is the speaker's voice. The microphone must be capable of converting this sound energy into electrical energy having corresponding characteristics. This is the most important function of the entire system. The amplified sound emitted by the horns must be an exact reproduction of all the characteristics in the speaker's voice, otherwise it will be unnatural and unpleasant to listen to and even unintelligible. The human voice is produced by the vibration of the vocal chords and is modulated by changing the shape and size of the mouth and throat cavities and also by the position of the tongue, teeth and lips. The sound thus emitted is made up of vibrations covering a rather large range of frequencies. The frequency of the vibrations depends on the particular vowel, consonent or syllable spoken.

Figure No. 1 shows the spectrum of the voice for five different vowel sounds and it will be noted each one has vibrations in several parts of the frequency range. In two cases it will be noted that the amplitude of one of the higher harmonics is greater than that of the fundamental itself. In the case of ā and ē there is a region up to almost 3,000 cycles where there are vibrations of



ANALYSIS OF VOWEL SOUNDS (SUNG)
Figure No. 1.

quite noticeable amplitude. There are also other components whose frequencies lie above those shown on this diagram but the amplitudes are too small to show on the same scale with the others.

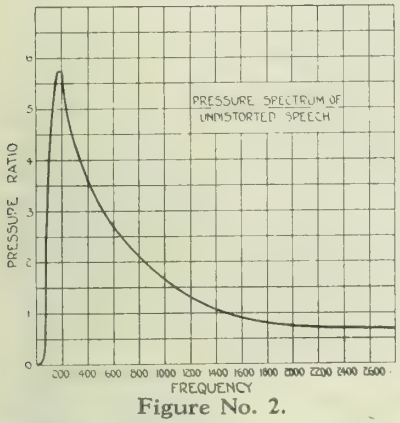


Figure No. 2.

Figure No. 2 shows a continuous spectrum of undistorted speech. It will be noticed from this figure that the maximum energy of the voice lies in the neighbourhood of 200 vibrations per second. From this maximum the energy tapers off quite rapidly until a frequency of about 2,000 vibrations per second is reached. From that point on there is only a very gradual decrease in the amount of energy present, even up as high as 5,000 vibrations per second.

Figures Nos. 1 and 2 however, tell the story only as far as the amplitude of the voice is concerned. They do not tell us which of these various frequency components are of the greatest importance in obtaining intelligent speech. It would appear that if all components up to about 2,000 cycles were transmitted a very good quality of articulation should be obtained. This is, however, not the case.

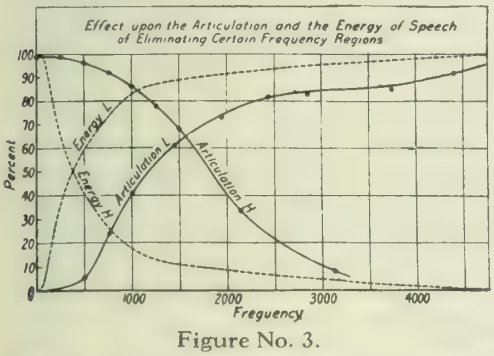


Figure No. 3.

Figure No. 3 shows the results of some very comprehensive tests made for the purpose of determining what part of the voice spectrum is of greatest importance from an articulation standpoint. These data was obtained by the use of a high quality telephone circuit. This telephone circuit is very nearly perfect from a transmission standpoint and the voice is just as intelligible as if two persons were talking to each other at a distance of seven or eight feet. A large number of syllables of different vowel and consonant combinations were transmitted over this circuit. That is to say a person at one end of the circuit pronounced the syllables and several observers at the other end recorded what they heard. The percentage of correctly recorded syllables was taken as the articulation value of the circuit. In order to determine the relative importance of the different regions of the voice range from an articulation and intelligibility standpoint two types of electric wave filters were used, — namely high pass and low pass filters. A high pass filter permits currents of frequencies above a given critical value to be transmitted and suppresses all frequencies below this critical value. A low pass filter is the converse of a high pass filter, — that is, it will permit currents of frequencies below a given critical value to pass but will not pass currents whose frequencies are above this critical value or cut-off point.

Articulation *H* in figure No. 3, gives the percent articulation obtained when the high pass filter was used and its cut-off point varied along the frequency range given by the abscissa. Articulation *L* gives the percentage

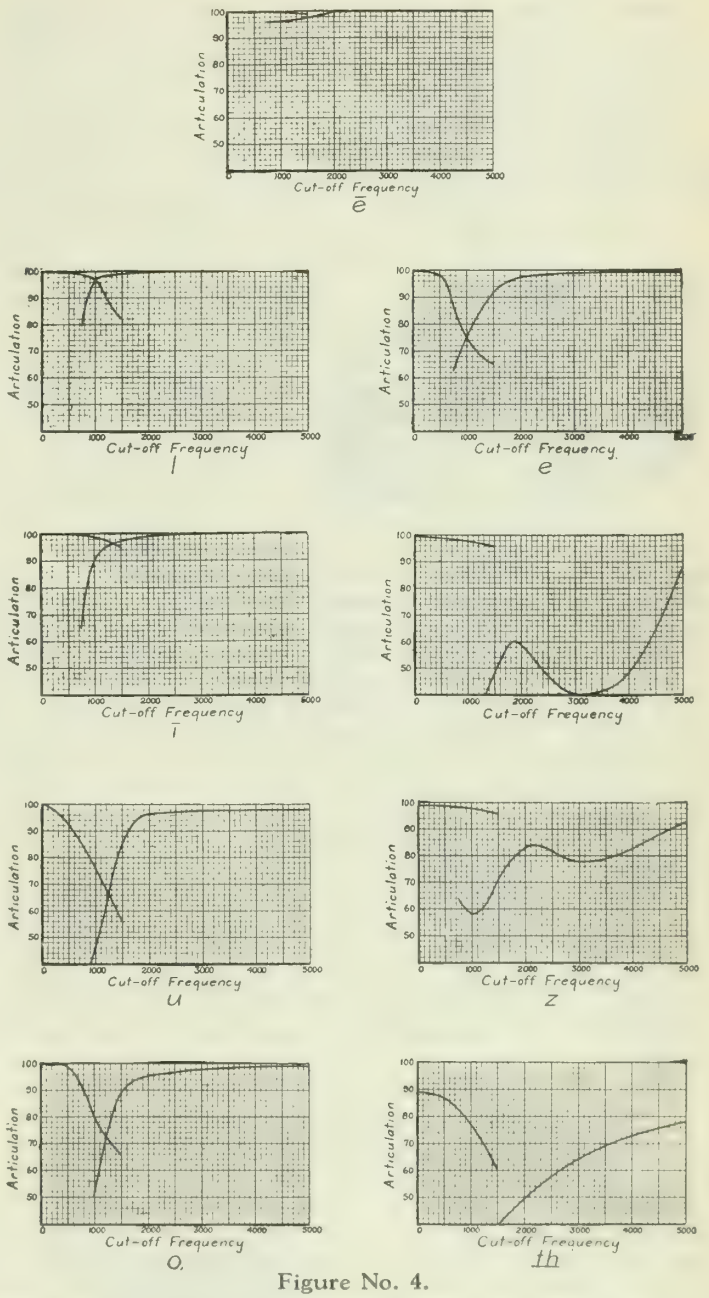


Figure No. 4.

articulation when the low pass filter was used and its cut-off points varied along the same frequency range. The dots show the actual value of cut-off points used. The curves marked energy *H* and energy *L* are the corresponding percentages of the voice energy which would pass through these filters.

The data represented by figure No. 3 shows very definitely that the frequency components of the voice which lie in the range of maximum energy are of very little importance from an articulation or intelligibility standpoint. It is of interest to note that the same percent of articulation is obtained when only the component frequencies lying above 1,500 cycles are transmitted as when only those lying below this point are transmitted. In either case the articulation is about 65 per cent. It is of further interest to note that only about 10 per cent of the total voice energy is used when the component frequencies above 1,500 cycles are transmitted, but that about 90 per cent of the total voice energy is used when the portion below the 1,500 cycle point is transmitted. The lower range, however, is important in that these frequency components make the voice sound full and

natural. If they are eliminated the voice will sound nasal and very unpleasant. The result of similar tests made on individual vowel and consonant sounds are shown in figure No. 4.

With the above data available we have a basis on which to design a microphone as well as the other component parts of a public address system.

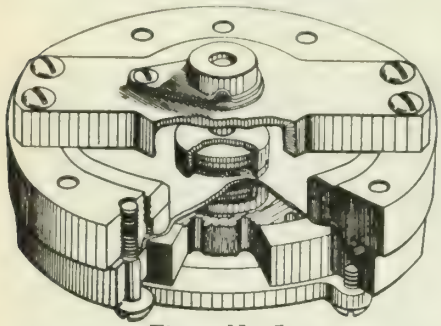


Figure No. 5.

Figure No. 5 shows a cross-sectional views of a microphone which has been developed for this purpose. It consists essentially of a very thin metallic diaphragm and a carbon button on either side. The diaphragm is securely clamped by the two large outer rings and is stretched to a very high tension by means of two stretching rings held in place by the outer clamping rings. A thin diaphragm stretched to a high tension is used to obtain a transmitter which will have as nearly as possible the same efficiency for all frequencies throughout the entire voice range. The two carbon buttons are connected to the amplifier in the so called "push pull" method, thereby considerably reducing the possibility of distorting the voice waves. As a further precaution against resonant effects a damping plate is provided at the back of the diaphragm. This damping plate, as will be noticed in the diagram, is placed very close to the diaphragm and has a number of small holes to permit a reasonable amount of movement of the air at the back of the diaphragm. This provides a small cushion of air against which the diaphragm vibrates and tends thereby to make it respond uniformly to all frequencies of vibration set up by the voice.

Amplifiers

The transmitter or microphone described above has been designed for uniform efficiency over the entire voice range. As a result there has been considerable sacrifice of transmission efficiency. That is to say although it responds uniformly to all frequencies of vibration within the voice range, it is a rather inefficient generator of electrical energy. When talking into this transmitter in the same manner as into an ordinary telephone transmitter it develops only about one five-hundredth as much energy in the associated circuit. When speaking at a distance of six or seven feet it generates only about one millionth as much energy as when talking directly into a telephone transmitter. This tremendous loss in efficiency must be compensated for in some way if sufficient power is to be delivered to the loud speaking receivers so that a speaker may be heard by a large number of people. Here again the vacuum tube comes to the rescue and by means of several stages of amplification the weak voice currents generated by the microphone can be intensified to any suitable value.

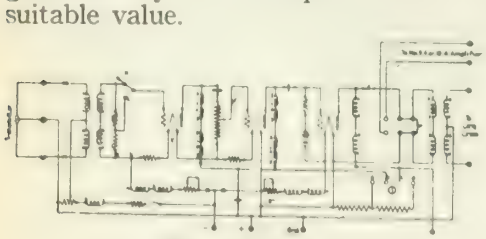


Figure No. 6.

Figure No. 6 shows a schematic circuit diagram of an amplifier used in connection with a high quality microphone in a public address system. This amplifier has three stages of amplification. Between the input transformer and the first vacuum tube and between the first and second vacuum tubes, facilities are provided for controlling the amount of amplification. The maximum energy amplification of this amplifier is about one hundred million. The minimum energy amplification is about one hundred. There are twenty-four intermediate steps of amplification available. This amplifier must be capable not only of giving a large energy amplification to currents of some particular frequency but must be capable of giving this same amount of amplification to currents of all frequencies within the voice range. Otherwise the quality of transmission, that is, articulation and intelligibility, which is required for a system of this kind will not be realized. Precautions must also be taken to avoid singing or whistling in an amplifier of this kind, since the energy in the output circuit is so tremendously increased over that in the input circuit.

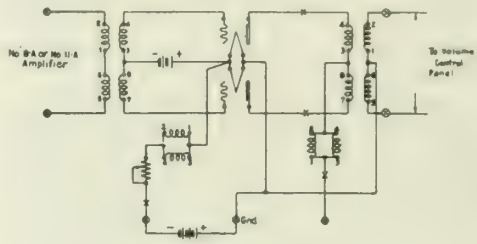


Figure No. 7

Figure No. 7 shows a schematic circuit diagram of a power amplifier used in addition to the one shown in figure No. 5. This amplifier is intended to deliver sufficient power to the loud speaking receivers so that the voice may easily be heard even in the very largest auditorium. This amplifier increases the energy delivered by the preliminary amplifier about twenty-five times.

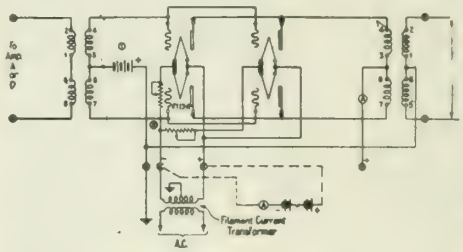


Figure No. 8.

Figure No. 8 shows the circuit diagram of a power amplifier which is used when the maximum amount of volume is required. This amplifier is used only when a speaker is addressing a large out-door gathering. It is capable of increasing the energy from the preliminary amplifier approximately 300 times.

Loud Speaking Receivers and Horns

Having discussed the microphones and amplifiers used in a public address system, we will consider for a moment the projectors or loud speaking receivers and horns. The microphone converts the sound waves into electrical energy with corresponding characteristic. The amplifiers increase this energy tremendously. The loud speaking receivers convert the amplified electrical energy into sound waves so that the human ear will receive them in the same form as they leave the speaker. Here again we must have a device which is capable of converting a comparatively large amount of electrical energy into sound and which at the same time introduces a minimum amount of distortion.

Figure No. 9 shows a schematic diagram of a loud speaking receiver. The essential parts of this receiver are the magnets, armature, and diaphragm. The armature is pivoted in a central position between the permanent magnets. The field strength surrounding the free ends of the armature is controlled by a coil through

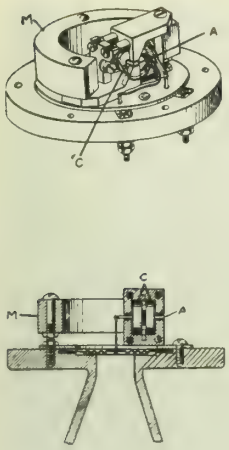


Figure No. 9.

which the output current from the amplifier flows. The fluctuations in this current, as produced by the speaker's voice, cause a corresponding vibration of the armature. By means of the connecting link shown between the armature and the diaphragm the latter is caused to vibrate in accordance with the speakers' voice and to produce sound waves of the same characteristics but of much greater amplitude. The magnet and armature of this receiver operate in a "push pull" manner, thereby permitting maximum amplitude of vibration with a minimum distortion in the wave shape. As a further means for preserving the quality of speech the diaphragm is made from a specially prepared fibre and has a number of concentric corrugations so that it will be subjected to a minimum amount of stress when vibrating.

The type of horn used in connection with this receiver depends somewhat on the size of audience to be addressed. For an auditorium the best results have been obtained with horns about 38 inches long and a diameter at the large end of about 22 inches. These horns are made from wood fibre and shaped to give maximum efficiency consistent with the best quality of sound. When large out-of-door audiences are to be addressed a somewhat larger horn has been used. These measure as much as ten feet in length and 2½ feet by 1½ feet at the large end, the cross-section being of a rectangular shape. When the speaker is in the center, with the audience on all sides, it is necessary to have at least six of the smaller horns, or twelve of the larger ones. In some cases it may be necessary to use the smaller horns for projecting the sound to that portion of the audience just outside of the speaker's direct range and the larger horns for the more distant audience. Some of the most recent tests have indicated that the smaller horns may be of sufficient size for even a very large out-of-door audience.

Complete Public Address System

The essential parts of a public address system have been discussed above, but in addition to these are a number of auxiliary pieces of apparatus required for making a complete working system. There must be provided suitable power equipment, the necessary testing and switching circuits and monitoring facilities so that those in charge of the system have full control over the operation of all the different units entering into the whole layout. A system of this kind has a very important mission to fill when a speaker is addressing a large audience and consequently every precaution must be taken to insure the perfect working order of all parts of the system. A great deal of care and judgment must be exercised when the equipment is installed and it must be carefully tested before the actual performance. The projectors must be directed so as to distribute the speaker's voice uniformly over the entire audience. The volume of sound must be adjusted for each projector so as not to be too loud and at the same time to be loud enough so that the speaker may be easily understood. This requires a great deal of experience as the range of intensities to which the ear responds most easily is not very great compared with the amount of amplification available in a system of this kind. In figure No. 10 is plotted the auditory sensation areas for the normal ear, and also the maximum and minimum audibility limits over the entire range of audible frequencies are shown. The shaded portion in the center indicates the region most used in ordinary conversation. From these data it is evident that the volume of speech delivered by the horns must be quite accurately adjusted. There must also be made allowance for the difference in sound absorption with and without an audience. A considerably greater volume is required when an auditorium is filled with people than when no audience is present.

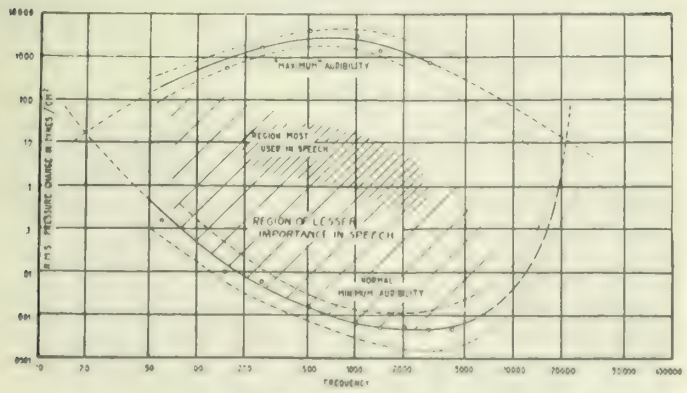


Figure No. 10.

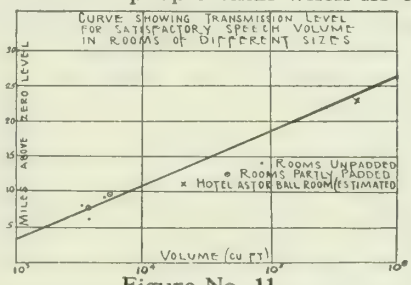


Figure No. 11.

Figure No. 11 shows some data obtained in respect to the amount of volume required for rooms of different size. The ordinates show the transmission level or power which must be delivered to the loud speaking receivers. Zero level corresponds to about one hundredth of a watt and every ten miles above zero level multiplies this value about ten times. That is, ten miles above zero mean one tenth of a watt, twenty miles mean one watt, thirty miles mean 10 watts and so on. The volume of the room is plotted as the abscissa. Consideration must also be given to the acoustic properties of a hall or auditorium. Very often there are echoes and reverberations which have to be corrected before a public address system can be used successfully.

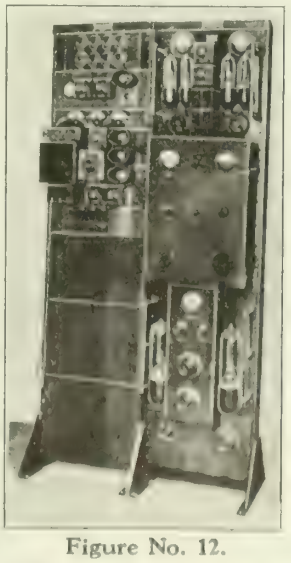


Figure No. 12.

Figure No. 12 shows the amplifiers, control and meter panels for a public address system suitable for large out-of-door audiences. The large power amplifier is shown at the upper right hand corner. Directly below this amplifier is the power panel which controls the plate and filament current for the power amplifier. At the right hand bottom is shown a vacuum tube rectifier. By means of this rectifier it is possible to use commercial alternating current for supplying the power for this system. The preliminary amplifier shown at the middle left is the only unit that requires a storage battery.

Figure No. 13 shows schematic layouts of the equipment required for a complete installation pro-

vided with facilities so that a speaker can simultaneously address a local audience and one at a distant

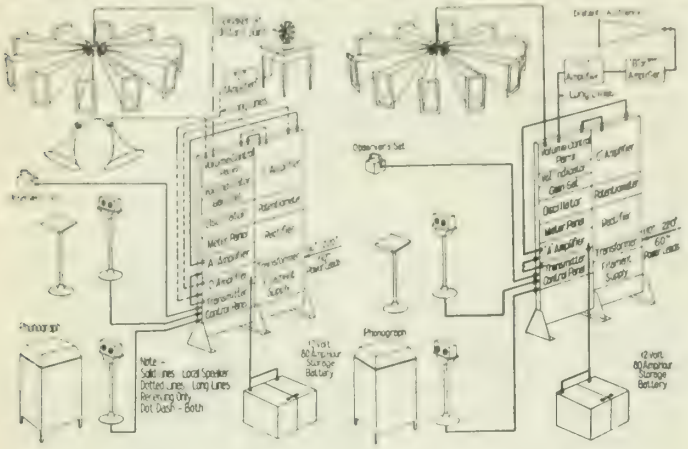


Figure No. 13.

Figure No. 14.

point. Figure No. 14 shows the arrangement where a speaker at one point can address an audience at a distant point.

Practical Application

Public address systems of the type described above have been put to a number of practical uses. One of the first installations was made at Chicago, in 1920, at a political convention when the presidential nomination was made. A similar installation was made at San Francisco during the same year.

One of the outstanding applications of a public address system for an out-of-doors gathering was its use in connection with the late President Harding's inauguration on March 4th, 1921, when an audience of 125,000 persons partook in the inauguration ceremonies. Figure No. 15 shows a map of the grounds directly in front of the Capitol building at Washington. The irregular line incloses the area over which the audience was spread and within which the president's address could be distinctly heard. The small inclosed area directly in front of the Capitol steps shows the limit beyond which the direct voice could not be heard satisfactorily. This diagram gives a very good idea of how a speaker's voice can be made to reach a much greater number of people than without any artificial means.

Figure No. 16 shows a schematic of the Armistice Day ceremonies at the Arlington Amphitheatre on November 11th, 1921, when the late President Harding delivered his oration over the body of the unknown American soldier. On that occasion his words were made audible to an audience of about 100,000 gathered in and about the cemetery. At the same time, the oration, music and other speeches were transmitted to New York and San Francisco over the long distance telephone lines, and, by means of auxiliary public address systems, an audience of about 35,000 people in and around the Madison Square Gardens at New York, and about 20,000 people in and about the Civic Auditorium in San Francisco, heard the ceremonies. On that occasion the audiences at the three places joined in singing the National anthem during the ceremony. The figure shows a schematic of the equipment involved at each point as well as the intermediate telephone lines and transcontinental repeater stations.

These illustrations give a representative idea of the use to which a public address system can be put. It is entirely practical to operate any number of these systems simultaneously at different places in the country and by means of the long distance telephone lines a single speaker can at any one time address an unlimited number of people. With the reliable and efficient operation of the telephone lines, such as we have to-day, there is every

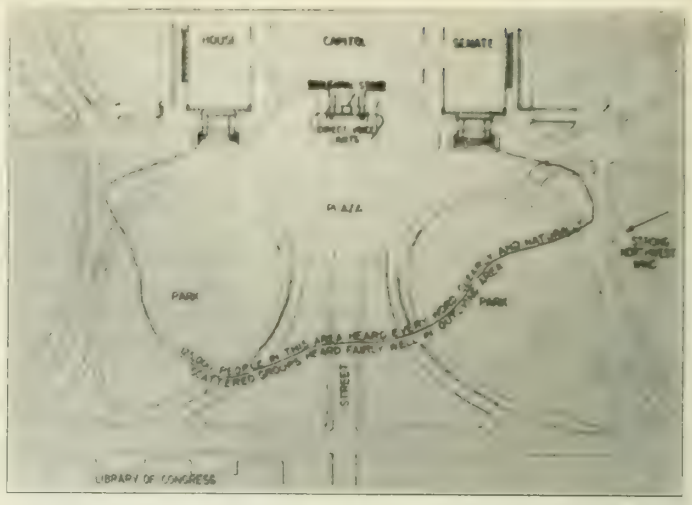


Figure No. 15.

reason to believe that this method of making public addresses will be used a great deal. It often happens that persons who hold important public positions are prevented from reaching those for whom they have real messages, due to the time required for travelling. However, with the advent of the facilities described above, it is possible for a governor or other official to sit at his desk and address audiences in any part of the country and thus save days and even weeks of travelling.

The development of the radio telephone and the attendant public interest in broadcasting has created a demand for equipment which will transmit vocal and instrumental music with the highest degree of faithfulness. The rapid advancements in radio broadcasting is in a large measure due to the development of high quality microphones and associated amplifiers. The pleasing qualities of vocal or instrumental music cannot be preserved in transmission unless the apparatus is of the same efficiency for all the vibrations set up by the voice or instrument. The ordinary telephone transmitter is entirely unsuited for this work since it is much more efficient for frequencies in the neighbourhood of 800 or 900 cycles than frequencies either above or below this range.

In addition to the need for high quality transmitting equipment in the broadcasting studio, there is a rapidly growing demand for loud speaking equipment for use in connection with the ordinary radio receiving set. It is just as important that the quality of the voice or music be preserved at the receiving end as at the transmitting end. Musical selections which are artistically rendered and faithfully transmitted, very often have their quality destroyed in the receiving set or loud speaking equipment. The loud speaking receivers used in connection with public address systems are also suitable for use with radio receiving sets and will give very faithful reproduction of sound provided there is no distortion in either the transmitting or receiving circuits.

Figure No. 16.

Locomotive Freight Tonnage Ratings

A general outline of the methods followed by railroad officials in utilizing existing data to establish their tonnage tables.

W. U. Appleton,
General Superintendent, Atlantic Region, Canadian National Railways.

Paper read before the Maritime General Professional Meeting, The Engineering Institute of Canada, September 27th, 1923.

The importance of establishing correct tonnage ratings on every subdivision of a railway cannot be over estimated. It is plainly apparent to everyone that it is uneconomical to set a tonnage rating too low, but it may not have occurred to some that two or three cars over the correct rating for a subdivision may prove almost as expensive to haul as another train. For example an overloaded engine may stall and be compelled to double over a couple of grades and eventually cut and run for coal before its train can be brought into the terminal. The cost of running this train will be much higher and out of all proportion to the extra load hauled, and if the extra expense due to delaying other trains which may be running on the same division is considered, it is hard to tell where the expense due to delay and disorganization of traffic will cease.

There is just one correct tonnage rating for each section of the road; if the rating is set either above or below the correct figure, the result is a loss of efficiency and it is therefore the aim of railway officials to establish ratings which are correct.

The organization of some of the larger railway systems includes a bureau of statistics, from which certain information is issued periodically concerning all the different districts on the system. One of the chief objects of issuing these statements is to stimulate competition between districts, get every man on his toes and thus improve the efficiency of the system as a whole. One of the factors of which the statistician has to keep close record is the ratio of the actual tonnage hauled to the potential tonnage and it will readily be realized that the value of this ratio will be entirely lost if the tonnage rating, — i.e., the potential tonnage, — is incorrect on some of the districts.

This is more or less of a side issue and it is mentioned here chiefly to show how far-reaching may be the effect of a faulty tonnage rating.

Contrary to popular opinion the establishment of locomotive tonnage ratings is far from being an exact mathematical science but neither is it one of those jobs where we "figure a little and then guess a whole lot". There are so many extraneous factors which exert a certain amount of influence on the correct potential or possible tonnage, such as length of subdivision, speed at which trains must be operated, density of traffic, location of passing tracks, water tanks, coaling plants, etc., that the purely mathematical end of the work must be discounted to a certain extent. Some of these conditions may also vary from time to time and permit a variation in the tonnage rating, but notwithstanding all this, particular stress should be laid on the fact that with any particular set of conditions *there is just one correct tonnage rating for a specified class of locomotive over a specified subdivision* and further *it is possible to determine accurately the correct rating.*

Factors which Govern the Correct Tonnage Rating

Primarily there are just two main factors which govern the correct tonnage rating for any subdivision. First, the drawbar pull exerted by the locomotive, and second, the resistance of the train, — two equal and opposite forces acting upon the drawbar of the engine.

Each of these main factors may be influenced by a host of minor factors and a careful analysis of all conditions is necessary before a tonnage rating is definitely established.

Tractive Effort

The tractive effort used in computing a tonnage rating is not necessarily the maximum starting tractive effort of the locomotive, but the tractive effort which can be sustained over the ruling grades at the speed which is called for by operating conditions. On a subdivision with short steep grades where a considerable part of the grade can be covered on momentum it is good practice in most cases to figure on topping the grade at a moderate speed with the engine developing its full tractive effort, but on a subdivision with constant grades many miles long such as are encountered on the former National Transcontinental Railway, it is necessary to figure on the tractive effort which can be sustained indefinitely at whatever speed is required by the operating conditions of that particular subdivision.

This sustained tractive effort is naturally lower the higher the speed required and it may be even further limited on grades which are twenty or thirty miles long by the steaming capacity of the boiler or by the coal shovelling capacity of a fireman. There is a limit to human endurance and it is quite necessary to take cognizance of this, although the human endurance factor is being eliminated as rapidly as possible by the application of mechanical stokers to our heaviest classes of power. Poor location of coaling stations and water tanks may also in some few instances lower the tractive effort which can be obtained from the locomotive, for it is futile to draw so heavily on the power plant that the coal or water supply is exhausted before there is an opportunity of replenishing it.

The chart shown in figure No. 1 shows the highest tractive effort which can be obtained from various classes of Canadian National locomotives at different speeds. The locomotives mentioned on this chart are designated by type, diameter of cylinder, stroke of piston, diameter of driving wheel and boiler pressure; thus, the top curve will be for a Santa Fe type locomotive with a 26-inch diameter cylinder, 32-inch piston stroke, 57-inch diameter driving wheel and 200 pounds per square inch boiler pressure. The tractive effort indicated by these curves is theoretical and can only be approximated at the higher speeds under the very best of conditions. The starting tractive effort can always be relied on provided the locomotive is in good shape but in order to meet the

average conditions encountered on the Atlantic Region it is necessary to figure on developing only about 85 per cent of the theoretical tractive effort at the higher speeds.

Definition of Tractive Effort and Drawbar Pull

It would be well at this point to distinguish clearly between the terms "tractive effort" and "drawbar pull". Tractive effort is the horizontal force exerted on the rails by the tires of the driving wheels, whereas the drawbar pull is the force exerted at the drawbar at the rear of the tender. As it must take a certain amount of effort to move the engine and tender, it is quite clear therefore that the drawbar pull can never equal the tractive effort, unless the engine is running down grade.

An increase in drawbar pull is particular noticeable sometimes when a locomotive has just passed the crown of a heavy grade and is travelling down hill with the greater part of the train still coming up the grade; under such circumstances it is possible for the drawbar pull to equal or even exceed the tractive effort exerted by the

reduce the tractive effort in this particular instance to 35,700 pounds. Then by referring to figure No. 2, it can be seen that the approximate resistance of the same engine and tender on a 0.6 per cent grade will be 4,700 pounds and this leaves a drawbar pull of 31,000 pounds available for hauling tonnage. This has been proved by repeated tests to be the maximum drawbar pull which can be sustained indefinitely by this class of locomotive on this grade under the conditions which are to be met in this particular locality.

If this class of engine were being rated for a subdivision with short heavy grades such as are found at many points along the former Intercolonial Railway it would be possible to figure on the maximum tractive effort, which can be developed up to a speed of over 8 miles per hour (see figure No. 1). Supposing the grade were 1.3 per cent, the tractive effort available at low speed is 49,700 pounds, the approximate resistance of the engine and tender on this grade is 7,000 pounds,

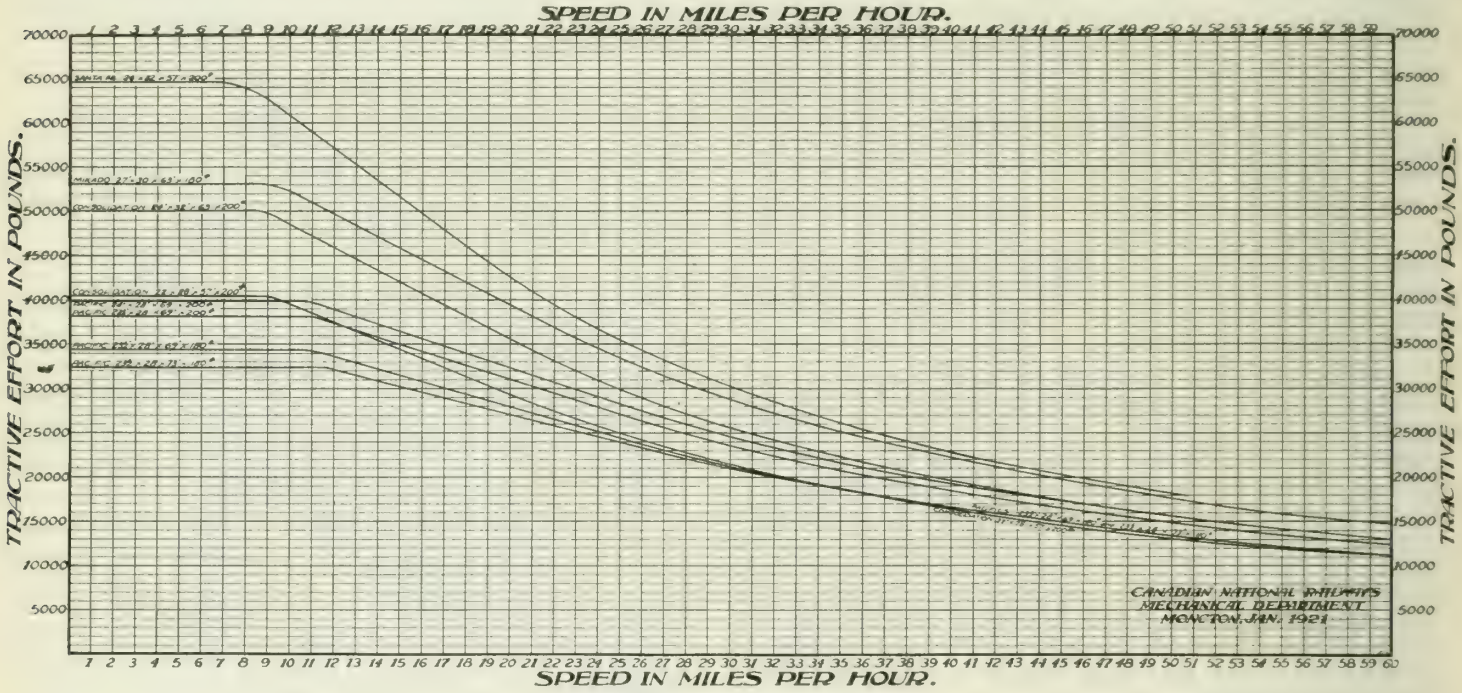


Figure No. 1.—Curves of Tractive Efforts of Locomotives at different Speeds.

locomotive. This point has, however, only been mentioned as a matter of interest and has no particular importance.

The chart shown in figure No. 2 shows the approximate resistance of the engine and tender on different grades for the same classes of locomotives as are shown in figure No. 1.

Computation of Drawbar Pull

Supposing, by way of example, we wish to ascertain the drawbar pull which can be sustained at a speed of 15 miles per hour by the Consolidation 24″ × 32″ × 63″ × 200 pounds on a 0.6 per cent compensated grade:— Referring first to figure No. 1, the tractive effort for this particular locomotive at 15 m.p.h., is shown as 42,000 pounds. This can only be obtained, however, under ideal conditions and it is necessary to make the proper reduction to suit all the conditions encountered on the district concerned. It was mentioned above that on the Atlantic Region only 85 per cent of the theoretical tractive effort could be relied on at the higher speeds and this will

(see figure No. 2), and this will leave a drawbar pull of 42,700 pounds for hauling tonnage.

Influence of Quality of Fuel on Tractive Effort

The reasons for the greater drop in tractive effort with increased speed than that indicated by the curves shown in figure No. 1, are various, but the most important reason is directly traceable to the grade of fuel which is used in the maritime provinces. To thoroughly analyze this point would take considerable time and the following short explanation will have to suffice.

The fuel in a locomotive firebox is burned by means of an induced draught and this draught is created by the jet of exhaust steam from the cylinders impinging upon the sides of the smokestack. Some grades of fuel require a fiercer draught than others. A low grade of fuel which tends to clinker badly needs a very heavy draught to assist combustion and bring out its best steaming qualities. Some of the coal used on this region is fairly good and some is anything but the best, and a locomotive naturally has to be draughted to burn the worst grade of coal in the

pile. This means that the orifice of the exhaust pipe tip has to be reduced to give a higher velocity jet and heavier draught than would be required with the best coal and, with any given cut-off of the valves, a reduction in exhaust opening must result in a reduction of speed. It is not intended to convey the impression that the efficiency of the locomotive is reduced to anything like the extent of 15 per cent by this means, the efficiency is slightly affected of course, but it must be borne in mind that reducing the speed also reduces the steam consumption and it is almost entirely a question of lower speed with a given tractive effort, or conversely, lower tractive effort with a given speed. The effect of reducing the exhaust opening is not discernable at very low speeds.

Resistance of the Train

The resistance of a train is due to grade, curvature, and friction.

The resistance due to curvature is, of course, a frictional resistance, but as it is due to a track condition it is computed with the grade and not confused with the frictional resistance of the moving parts of the train. The resistance due to grade is the only mathematically accurate factor which is used in tonnage computations, it amounts to 20 pounds per ton (2,000 pounds) hauled per one per cent grade and cannot be more or less.

The resistance due to curvature is generally added to the grade resistance in cases where the grades are not compensated for curvature, and the usual practice is to add 0.04 per cent to the grade percentage for each degree of curvature and figure on the equivalent grade. For example the resistance due to grade and curvature per ton hauled on a 1.0 per cent grade with a 2° 30′ curve would be taken as $20 \times 1.1 = 22$ pounds.

On some sections of our road the ruling grades are all compensated for curvature, that is to say, the gradient is sufficiently reduced wherever curves are encountered to make the combined resistance for grade and curve equivalent to the ruling grade resistance on straight track. In cases of this kind it is not necessary to consider track curvature when computing tonnage.

The frictional resistance of a train is produced by a variety of conditions which may be briefly summed up as follows: — 1. Journal friction. 2. Rolling friction of the wheels on the rail. — This includes concussion on rail joints, flange friction, etc. 3. Atmospheric resistance.

It is practically impossible to determine just what resistance originates from either of these sources and no useful purpose could be served by analyzing the subject to that extent, but by years of careful test and experiment the total frictional resistance for various weights of cars under favourable conditions has been determined.

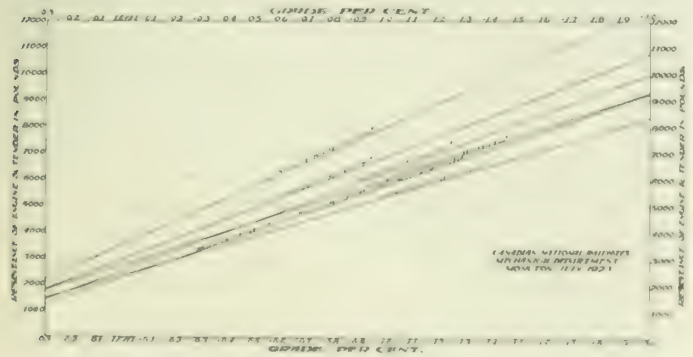


Figure No. 2.—Approximate resistance of Engine and Tender for different Grades

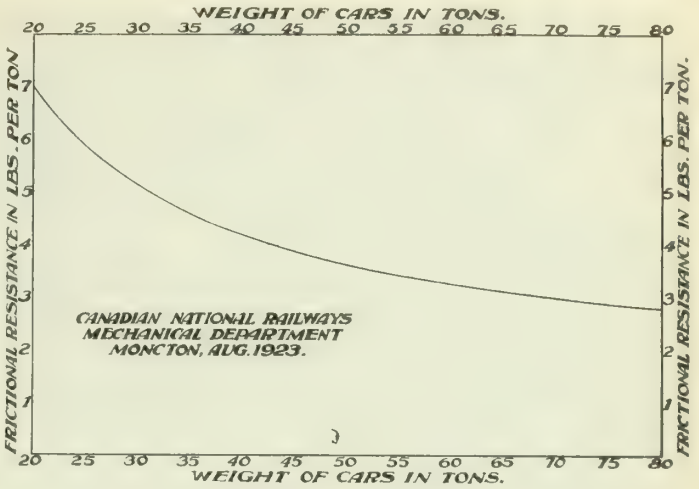


Figure No. 3.—Resistance of Freight Cars on Level Track at Moderate Speeds.

Figure No. 3 is a chart showing the frictional resistance per ton of various weights of cars, and figure No. 4 shows the combined grade and frictional resistance per ton for various weights of car on different grades. These charts are plotted for freight cars at moderate speeds, i.e., 20 miles per hour or less.

The frictional resistance of the locomotive per ton is considerably higher than that of the cars as machinery friction runs rather high, especially on a locomotive with four or five pairs of driving wheels, but this has all been taken care of in the chart shown in figure No. 2.

Computation of Tonnage Ratings

If the characteristics of the road and the operating conditions are known for any subdivision it is a simple matter to determine the tonnage which should be hauled by means of the charts shown in figures Nos. 1, 2 and 4.

Suppose that we wish to set a tonnage rating for the $24'' \times 32'' \times 63'' \times 200$ pounds Consolidation locomotive on a subdivision with a 0.6 per cent compensated ruling grade 20 miles long, and that the operating conditions necessitate a speed of 15 miles per hour being maintained over this grade: — Referring first to figure No. 1, the tractive effort at this speed is found to be 42,000 pounds, taking 85 per cent of this, — 35,700 pounds, — as the maximum tractive effort which can be relied on at this speed under local conditions and then subtracting 4,700 pounds for the resistance of the engine and tender (see figure No. 2), the available drawbar pull for hauling tonnage will be 31,000 pounds. Now referring to figure No. 4, the resistance per gross ton for 50-ton cars on a 0.6 per cent grade is 15.64 pounds; therefore the tonnage rating for cars with an average weight of 50 tons should be $31{,}000 \div 15.64 = 1{,}980$ tons.

In the case of a subdivision on which the tonnage is limited by a comparatively short heavy ruling grade and the operating conditions permit the crown of the grade to be covered at low speed, the computation of tonnage is even simpler. Supposing that the grade is 1.2 per cent with a curve of 2° 30′ uncompensated, the equivalent grade will then be 1.3 per cent. From the chart shown in figure No. 1, the tractive effort available with the same class of engine at low speed is 49,700 pounds, the resistance of the engine and tender on a 1.3 per cent grade is 7,000 pounds (see figure No. 2) which leaves a drawbar pull of 42,700 pounds available for hauling tonnage. From figure No. 4 the resistance per gross ton for 50-ton cars is 29.64 pounds, therefore the tonnage rating for cars with an average weight of 50 tons should be $42{,}700 \div 29.64 = 1{,}440$ tons.

Equivalent Tonnage

It will be perfectly clear even to the most inexperienced that a train consisting of 50 cars averaging 20 tons gross will require considerably more power to haul it than a train of 20 cars averaging 50 tons gross, owing to the greater frictional resistance of the longer train, so it is quite evident that it would be useless to set tonnage ratings in gross tons without taking into consideration the length of the train.

In former years this was taken care of on the government railways by setting all tonnage ratings in equivalent tons, and in figuring the equivalent tonnage of a train, a string of cars of light average weight would get the benefit of an allowance which compensated for the increased wheelage and higher frictional resistance per gross ton. The method which was followed was to subtract one half the total contents of the train from the total tare and to add 10 per cent, 20 per cent, or 30 per cent of the remainder, according to the nature of the subdivision, to the gross tonnage of the train. The gross tonnage plus this amount added for train resistance was known as the equivalent tonnage of the train.

On subdivisions with very easy grades the trains are naturally much longer than on subdivisions with heavy grades and a greater allowance is necessary for train resistance. For this reason 30 per cent of the difference between half the contents and the tare was added to the gross tonnage for ruling grades up to 0.4 per cent, 20 per cent for grades over 0.4 per cent and up to 1.0 per cent, and 10 per cent for grades over 1.0 per cent.

With the average fully loaded freight car the contents will be about double the tare weight and in the case of a train consisting of cars all loaded to capacity it is plainly apparent that there will be no allowance for train resistance as half the total contents will be equal to or perhaps greater than the total tare. Equivalent tonnage was therefore a haulage equivalent based on a train of fully loaded cars.

This method of figuring tonnage involved considerable work when making up trains and, what is worse, there were great opportunities for error and for the last few years the Canadian National Railways have published their tonnage tables in such a way as to entirely eliminate the necessity of considering equivalent tonnage.

The tonnage rating for the Springhill subdivision is shown below and this is typical of the tonnage tables which are included in every issue of the Canadian National Railway timetables.

It will be noticed that full tonnage is hauled only when the average weight of cars is fifty tons or over and that reductions are shown for lighter average weights. The grades are heavy on this subdivision and the ratings for 40-, 30- and 20-ton cars are therefore 97½ per cent, 95 per cent and 90 per cent respectively of the full rating. If the ruling grades were 0.4 per cent or under, much heavier tonnage would be hauled and the reductions for the lighter average cars would be 92½ per cent, 85 per cent and 70 per cent of the full rating and for grades over 0.4 per cent up to 1 per cent, 95 per cent, 90 per cent and 80 per cent for the 40-, 30- and 20-ton car average respectively.

With this style of table the gross tonnage of the train which should be hauled by any locomotive can be picked out at a glance when the average weight of the cars is known. The locomotives shown, — in this particular case 65 per cent, 53 per cent, 50 per cent and 30 per cent, — include all the classes in regular freight service on the subdivision in question, there is no 100 per cent engine on the system and this line is only included to facilitate calculating the tonnage for an engine which does not happen to be shown in the table. For example if a 41 per cent engine were working on the Springhill subdivision its tonnage rating would be taken at 41/100 of the tonnage shown for the 100 per cent engine. The locomotive percentages are based on their maximum tractive effort, 1 per cent being equivalent to 1,000 pounds tractive effort, thus the 65 per cent engine will be our Santa Fe with a maximum tractive effort of 65,000 pounds.

The practice of including tonnage ratings in the timetables instead of publishing them in book form has a great deal to recommend it, and one of the chief advantages is

Maritime District — **Locomotive Tonnage Ratings**

To arrive at the proper load for an egnine, tonnage ratings must be modified by the authorized allowance for car resistance, weather conditions, and air pump and train line capacity.

Note. — The Tonnage ratings in the Tables below make due allowance for Car Resistance.

When the average weight of all loads and empties in the train is **20** Tons Use **90%** Rating	When the average weight of all loads and empties in the train is **30** Tons Use **95%** Rating	When the average weight of all loads and empties in the train is **40** Tons Use **97½%** Rating	For a train consisting of cars having an average weight of fifty tons or over **50** Tons Use **100%** Rating			For a train consisting of cars having an average weight of fifty tons or over **50** Tons Use **100%** Rating	When the average weight of all loads and empties in the train is **40** Tons Use **97½%** Rating	When the average weight of all loads and empties in the train is **30** Tons Use **95%** Rating	When the average weight of all loads and empties in the train is **20** Tons Use **90%** Rating
Westbound — (Read down)				Springhill Sub-division		Eastbound — (Read up)			
2455	2590	2660	2730		100% engine	2950	2875	2800	2650
1595	1685	1730	1775	Truro	65% "	1915	1865	1820	1720
1305	1375	1415	1450	to	53% "	1565	1525	1485	1410
1230	1295	1330	1365	Springhill Jct.	50% "	1475	1435	1400	1325
740	780	800	820		30% "	885	860	840	795
2555	2700	2770	2840		100% engine	2950	2875	2800	2650
1660	1750	1800	1845	Springhill Jct.	65% "	1915	1865	1820	1720
1355	1430	1465	1505	to	53% "	1565	1525	1485	1410
1275	1350	1385	1420	Moncton	50% "	1475	1435	1400	1325
765	805	825	850		30% "	885	860	840	795

that time tables are constantly being reissued and any changes necessary in tonnage ratings due to changing conditions, transferring of power, etc., can be kept up to date without the necessity of putting out new books or issuing supplementary bulletins.

Tonnage Tests

From the foregoing it should be clear that provided all the conditions are known, it is possible to set a tonnage rating for any subdivision which will come within very close limits of the correct loading for the locomotives operating on that subdivision. This being the case, the inference may be drawn that conducting tonnage tests is neither necessary or desirable. This impression is erroneous, however, and there are many reasons why it is important to test tonnage ratings on all main lines and also on any branch lines where full tonnage is hauled.

To begin with, conditions are not always exactly as they are represented; the grades and curves may not be exactly as shown on the track profile; we know that long dumps will sag and that the track will get slightly out of alignment at curves, especially on a single track road where comparatively fast running is tolerated in the opposite direction down the ruling grades. It may be found on testing a short heavy grade that momentum may be utilized to a greater or lesser extent than that calculated.

Conceding then the advisability of making tonnage tests, why is a dynamometer necessary? In the first place it is essential to be sure that the locomotive used on the test train is in a condition to develop the tractive effort for which it is rated under the test conditions and that the engine crew are operating the engine to best advantage. The value of tonnage tests as a means of educating enginedriver's and firemen should never be disregarded, as such tests provide an excellent opportunity to demonstrate on the spot the superior results to be obtained by correct operation of the locomotives.

The dynamometer which is used on locomotive tests is very simple in principle, it consists of a cylinder rigidly bolted to the underframes of a car, the cylinder is completely filled with oil and the piston rod connected in tandem with the drawgear of the car. When a pull is exerted on the coupler this pull is transmitted by the drawgear to the piston of the dynamometer and sets up a pressure in the oil at one end of the cylinder. This pressure has a definite relation to the pull exerted according to the effective area of the piston and if the oil is piped from the end of the cylinder to a pressure gauge located in the observation room, the pull on the coupler can be read directly from the gauge.

About seven years ago tonnage tests were conducted on practically all the main lines of the Atlantic Region, the dynamometer car which was used at that time being

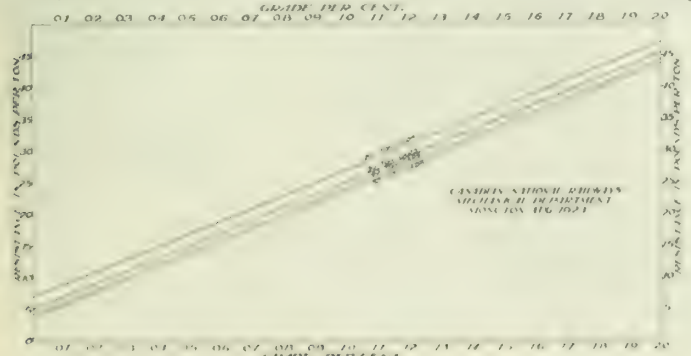


Figure No. 4.—Total resistance of Freight Cars on different Grades at Moderate Speeds.

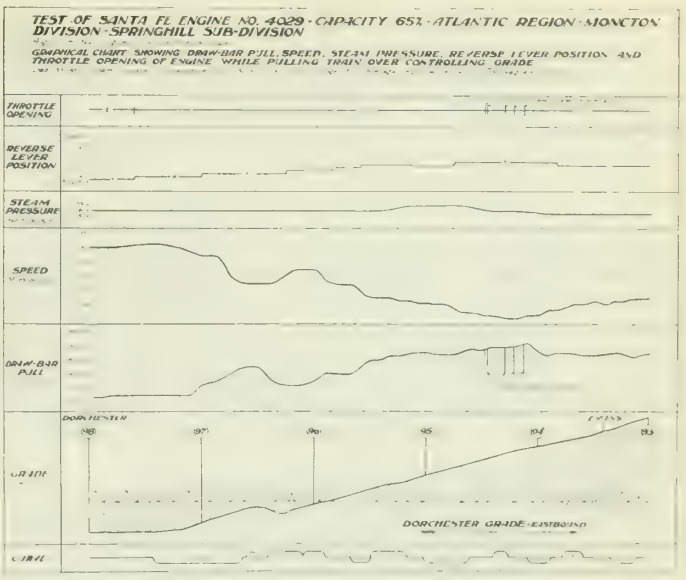


Figure No. 5.—Test of Santa Fe Engine.

loaned to the railway by the Westinghouse Air Brake Company. This car is probably the most elaborately complete piece of locomotive tonnage testing equipment in existence; it automatically records on a chart in full view of the observers not only the drawbar pull, but the speed at which the engine is travelling, the position of the reverse lever, the amount of throttle opening, the steam pressure in the boiler and even each shovel full of coal which is thrown on the fire. The air brake train line pressure is recorded and the period and the amount of the reduction for each application of the brakes is shown so that a complete record is kept of the enginedriver's operating methods throughout the entire run.

At the present time the Canadian National Railways have a dynamometer car in service on each of the three regions and, although these cars have not the elaborate equipment of the Westinghouse car, they will perform exactly the same functions; the chief difference being that whereas on the Westinghouse car the drawbar pull, speed, etc., were recorded automatically, on the railway cars these factors have to be noted by observers at certain intervals of time or distance and the chart plotted after the completion of the test. This entails more work on the part of the individuals making the test and has also the disadvantage that a really complete impression of the efficiency of operation cannot be formed at any particular instant during the test. There are advantages, however, which far outweigh these disadvantages. First consider the initial cost of the equipment; the cost of the apparatus on car No. 84, the Atlantic Region dynamometer, was a very small fraction of the cost of the equipment of the Westinghouse car. Then take into consideration the fact that car No. 84 is used as an ordinary business car far oftener than for locomotive testing. If this car were similarly equipped to the Westinghouse car it would be practically useless as a business car, whereas the apparatus actually installed does not occupy one inch of floor space and the usefulness of the car in other capacities is not interfered with in any way. The only instruments which are visible in the observation room of the car are two pressure gauges which indicate the drawbar pull and the buff, the speed indicator, and the air brake recording gauge. The pressure gauge dials are graduated to show drawbar pull or buff from zero to 75,000 pounds, and the oil is piped in such a way that

by opening one cock and closing another both gauges will register drawbar pull or both register buff as required. This feature is very convenient in the event of there being any doubt as to the accuracy of the gauge showing the drawbar pull as the buff gauge may be cut in without any trouble and the readings of the two gauges checked one against the other.

When making a tonnage test with this car the observer keeps a record of the drawbar pull, speed, mileposts, time, etc., and the master mechanic or some other competent person rides in the engine cab and makes notes of all changes in steam pressure, reverse lever position, throttle opening, etc., so that at the end of the run all essential information is available and it is only necessary to plot a chart from which the railway officials concerned may get a complete impression of the performance.

When a tonnage test is to be made, the profile of the subdivision should first be examined and the ruling grades picked out, then the operating conditions should be studied and questions such as the speed required over the grades, whether the trains may have to stop near the foot of a grade or whether a run for the grade may be depended on should be settled. The theoretical tonnage should then be set to suit these conditions and the test train made up, every car being weighed at the terminal from which the test run is being made. The result of the test may show the tonnage correct or that a slight adjustment is desirable and in either case the official tonnage table may be made up and issued to the operating department.

The chart shown in figure No. 5 illustrates a test of a Santa Fe engine on the ruling grade, eastbound, between Moncton and Springhill Jct. The train consisted of 53 cars with a gross tonnage of 1,802 or an average weight per car of 34 tons. It will be noticed that the engine struck the foot of the grade at a speed of 30 miles per hour and made full use of its momentum. It would be difficult to improve on this enginedriver's method of operating his engine, the whole of the grade was taken on a full throttle and the reverse lever dropped down notch by notch as required. If the wheels had not momentarily slipped on five different occasions on a bad piece of rail the speed would not have dropped below seven miles per hour, which is the maximum speed at which this class of power can be expected to develop full tractive effort. (see figure No. 1.)

The tonnage rating in effect for this subdivision is shown earlier in the paper and it will be seen that the rating for a 65 per cent engine with 30-ton cars is 1,820 tons; the loading of the test train was within 1 per cent of this figure and was handled with a slight reserve of power to spare, therefore, the test sustains the rating as correct.

In the majority of cases a dynamometer test will prove the theoretical rating to be correct, but occasionally it shows that some adjustment is necessary and in some rare instances the test may have to be repeated. A test train which is very much over or under the correct loading does not give any reliable data on which to work and in order to establish a tonnage rating definitely the loading of test train must be very close to the correct tonnage.

Notes of the Meeting

H. R. Loggie was kept busy lettering the names of those who were at the banquet. How well his work was done was a matter of general comment.

The busiest man at the meeting was W. J. Johnston, secretary-treasurer of the St. John Branch, who proved without question that he was the right man in the right place.

The fourth professional meeting of *The Institute* in the maritime provinces was voted by all to be the best yet. The result of these meetings are added friendships, better fellowship, a more complete understanding of one another and many happy memories.

Congratulations are due the committee for the harmonious perfection with which all the detail arrangements were carried out. It was even asserted that they had pull with the weather man as conditions in that respect were all that could be desired. The general committee of the St. John Branch in charge of all arrangements both programme and entertainment consisted of F. G. Goodspeed, chairman, Alex. Gray, G. G. Murdock, W. R. Pearce, F. P. Vaughan, C. C. Kirby, G. G. Hare, S. R. Weston, and D. L. Hutchinson.

Professor F. R. Faulkner of Halifax made a hit with his poem at the luncheon tendered by the St. John Branch. Although he would not admit being the author it was new to those present and no doubt new to nearly all the members of *The Institute*. It is entitled:

"The Civil Engineer"

He's a chap in spotless khaki,
He's a chap in corduroys,
He's a chap with trousers damaged in the rear,
He's a man of fashion's stamp,
Also ragamuffin, tramp,
And he's known from 'York to 'Frisco as the Civil Engineer.

He's a man of peaceful habits,
He's a man of tranquil mind,
It's hardly right to say he knows a fear.
Though you frequently may find him
With a Leugar strapped behind him
To be used on provocation by the Civil Engineer.

He will blast away a hill-top
'Till he turns a stream or road
To the pockets of some Wall Street financier
And it cannot be denied
That a little on the side
Is acquired in the process by the Civil Engineer.

When the crawley creepy ore bed
Closes o'er you with a rush
And the timbers crumble up and disappear
He will do his level best
Days and days without a rest
To dig you out and brush you off — the Civil Engineer.

When the swamp fiend sends it fever heat
Throbbing through your veins
And the 'dabe walls look far away and queer
He's the one who'll wet your lips
And will cool your pillow slips,
With a touch 'most like a woman's — the Civil Engineer.

When the ruby wine is redest
And the fun at highest tide,
And the fellows bubbling over with good cheer
And they give that good old toast
To the one they love the most,
You'll find the man they mention is the Civil Engineer.

His morals may be shady,
His language somewhat rough,
He may have a vulgar hankering for his beer,
But that's just a sort of shell,
He will stick with you through hell,
For he's a pretty decent fellow — the Civil Engineer.

General Professional Meeting at St. John, N.B.

The Fourth Professional Meeting in the Maritime Provinces a great success. A large attendance, interesting papers and enjoyable visits.

Enthusiasm and the spirit of camaraderie was the keynote of the Maritime Professional meeting. From the very commencement visitors were impressed with the evidences of the carefully planned and excellent arrangements made by the local committee, as demonstrated at the registration desk when each individual was presented with a convention badge with his name neatly printed thereon by a draughtsman of unusual merit. Further evidence of careful planning and thoughtful attention to detail was shown from hour to hour as the meeting progressed until the concluding event, a dinner at the Riverside Golf and Country Club.

The sessions were held in the hall of the Board of Trade rooms, the meeting being officially opened by President Francis at 10 o'clock Wednesday morning, September 26th. In calling the meeting to order he expressed his gratification at the large attendance and emphasized as one of the great benefits resulting from such gatherings, the many friendships that were formed.

Lieutenant Governor W. F. Todd gave a hearty address of welcome during which he paid a tribute to the engineering profession and expressed the pleasure it gave him in welcoming the engineers to a professional meeting of *The Engineering Institute* in New Brunswick. He dwelt upon the economic conditions of Canada and pointed out the tremendous resources from farm products, more of which, he stated, should be shipped from Canadian ports. He dwelt upon the immense value of the Canadian fisheries and emphasized the value of our forest products. He believed that the raw material should be manufactured in Canada, providing work for a great number of people, making greater immigration possible and increasing the wealth of the country. He referred to the fact that engineers gave unbiased reports on proposed public works and emphasized the necessity for economy in undertakings. The well-known hospitality of St. John was mentioned which he trusted the engineers present would enjoy to the fullest extent.

Mayor G. Fred. Fisher in a civic address of welcome spoke of the importance of the engineering profession and its remarkable integrity and achievement. Upon the engineers he said, depended the opening up of the natural resources and Canada was fortunate in having men of such high calibre as were represented at the meeting.

Paper on St. John Drydock

In introducing E. G. Cameron, A.M.E.I.C., chief engineer of the St. John Drydock and Shipbuilding Company, the chairman stated that transportation plays a large part in the development of a country, and it was fitting that the first paper on the programme should be on the St. John drydock. Canada had always led in transportation, having the greatest canals, and now the meeting was about to hear a description of the most up-to-date drydock in the world.

Mr. Cameron's paper on the St. John drydock, giving detail of the construction and equipment of the drydock was not read by the author as it was available in advance proof form. In its place he gave a very interesting talk on the drydock, illustrated by numerous slides, which was an illuminating introduction to the visit to the drydock later.

His address was listened to with an attentive interest and appreciation by all present, due not only to the fact that Mr. Cameron was describing the greatest and most up-to-date drydock in the world, but also on account of the able manner in which the address was delivered. In concluding he reported his appreciation of valuable assistance rendered by F. P. Vaughan, M.E.I.C., Alex. Gray, M.E.I.C., V. S. Chesnut, A.M.E.I.C., and A. F. Crawford and of the loyal co-operation of the engineering staff. Mr. Cameron's paper is published in full in this issue of *The Journal.*

Visit to Drydock

At the conclusion of Mr. Cameron's address the party, to the number of over a hundred, boarded a tug belonging to the St. John Drydock and Shipbuilding Company, and were taken on a trip about the harbour and thence to Courtenay bay, where the drydock was inspected, all being impressed with the magnitude of the undertaking and the excellent manner in which the engineering and construction work had been done.

With Frank M. Ross, the able and affable general manager of the St. John Drydock and Shipbuilding Company, in the chair at the head table, the visitors were treated to a hot chicken lunch, the bounteousness and quality of which is seldom excelled at the most elaborate banquets, which was served in the upper story

Group photograph of members in attendance at General Professional Meeting at St. John, N.B. taken in the St. John Drydock, September 26th., 1923

HARRY F. BENNETT, A.M.E.I.C.
Chairman St. John Branch.

of the big concrete and steel building of the drydock. Mr. Ross welcomed his visitors in a pleasing speech and expressed the hope that many of them would be present at the official opening next month. President Francis responded with appreciation of the delegates of the excellent reception tendered them. H. F. Bennett, A.M.E.I.C., chairman of the St. John Branch, also said a few words in which he voiced the hope that before long the work of ship repairing would be augmented by the actual construction of steel ships and that St. John's former reputation as a shipbuilding port would be re-established.

C. E. W. Dodwell, Hon.M.E.I.C., of Halifax, one of the oldest members of *The Institute* present, said that he had recently paid a visit to England and inspected all the drydocks in the British Isles, but not one of them was as big as that which the visitors had just viewed.

K. M. Cameron, M.E.I.C., acting chief engineer of the federal public works department, called to mind the fact that the last speaker, Mr. Dodwell, had recently celebrated the thirty-eighth anniversary of his appointment as official in charge of the public works department undertakings in the maritime provinces.

Mr. Cameron, speaking of the drydocks of Canada, said that one was being constructed on the Pacific coast which was about the same size as that at St. John — either would take the largest vessel in the British navy. Referring to St. John, he said it was one of the great ports of the country and the public works department had nothing to regret in the help that St. John was giving, and had given, to shipping.

At the completion of the speeches the party embarked on two special street cars, provided through the courtesy of the New Brunswick Power Company, and were brought to the north side of King square. From there they left by automobile for Musquash.

Visit to Musquash

The trip to Musquash was taken on the invitation of the New Brunswick Contracting and Building Company, Herbert Phillips, M.E.I.C., chief engineer, who were also the hosts at dinner.

On this trip more than a hundred were in the party, which included Hon. E. A. Smith, Commissioner Thornton, W. F. Burditt, W. J. Mahoney and some other citizens. The fine weather made the ride very pleasant.

The first stop was made at the power house, which was an object of great interest to the visiting engineers, who inspected it carefully. This was followed by a visit to the West Branch dam, which is completed to the point where it may be closed in a few days. The huge walls of concrete were inspected, and not less interesting were the evidences still there of the destruction wrought when the dam burst last spring. Men and teams, small engines and cars and steam shovel were at work, and great activity prevailed on every side, for there is still considerable filling work to do after the dam is closed. The visitors walked around the two sections of concrete work, and made a thorough examination.

They were next conducted to a temporary dining tent for supper, but as the number present was nearly twice as great as had been counted on, it was necessary to serve the tables twice. The hosts, the New Brunswick Contracting Company, had, however, provided ample food, from soup to coffee, and everybody enjoyed the meal, which was served by a group of young ladies in white.

After the first table had been served, and while all were grouped together, President Francis rose to express the high appreciation of the visitors of the hospitality extended to them, and called for three cheers for Herbert Phillips, which were given with a will.

Mr. Phillips gracefully acknowledged the compliment and expressed the pleasure of the company in having the members of *The Institute* as guests.

In response to calls, Hon. E. A. Smith spoke very briefly, saying that thanks to the vigour with which Mr. Phillips and other contractors had pushed the work, the storing of water would be resumed at once. He was glad to have the engineers examine the work for themselves. His hope was that the policy of hydro-electric development would be vigourously carried on, and that was a matter of interest to engineers, for the development of the resources of the province must depend largely upon them.

After all had enjoyed the hospitality of the supper tent, a large flare being thrown upon the tables as the twilight fell, the party walked back over the rocks and rough ground to the cars and returned to the city, their way lighted by the harvest moon just risen above the horizon. The visitors were greatly pleased with the outing, affording a personal inspection of the much discussed Musquash development.

Public Meeting in Evening

The evening session took the form of a public meeting at which an instructive address on Loud Speakers and Public Address Systems was delivered by H. J. Vennes, A.M.E.I.C., of the Northern Electric Company. It had been intended to hold the meeting in the Board of Trade rooms but as the auditorium there was not large enough to accommodate those wishing to attend, the New Brunswick Telephone Company building was secured. The address was illustrated with lantern slides.

Mr. Vennes' paper is published in full in this issue.

Second Session. Thursday Sept. 27

The second session opened at 10 o'clock in the Board of Trade rooms with Professor Fred R. Faulkner, M.E.I.C., chairman of the Halifax Branch in the chair. In a gracious speech Professor Faulkner called upon F. W. W. Doane,

M.E.I.C., city engineer of Halifax to preside. He referred to Mr. Doane as one of the leading municipal engineers in the Dominion, a man of sterling worth and proven engineering ability, whose work was appreciated by his fellow engineers. His sentiments were loudly applauded. Mr. Doane accepted his duties in a modest speech and presided in a most acceptable manner.

Locomotive Tonnage Rating

Chairman then called upon W. U. Appleton, general superintendent Atlantic Region, Canadian National Railways to read his paper on locomotive tonnage rating. This paper is published in another section of *The Journal.* The paper evoked considerable interest and was followed by a lively discussion, during which Mr. Appleton answered many questions. The following members took part in the discussion: C. S. J. Rogers, A.M.E.I.C., Moses Burpee, M.E.I.C., W. G. Chace, M.E.I.C., C. C. Kirby, M.E.I.C., E. G. Evans, M.E.I.C., John N. Flood, A.M.E.I.C., and Phil Freeman, M.E.I.C.

Metallurgical Reheating Furnaces for Blooms, Billets and Slabs

In the absence of the author, A. F. Theuerkauf, M.E.I.C., assistant chief engineer British Empire Steel Company, the paper on Metallurgical Reheating Furnaces for Blooms, Billets and Slabs, was read by Professor H. W. McKiel, A.M.E.I.C., professor of engineering, Mount Allison University. This paper was illustrated by numerous views showing active operations in the plant.

Guest of St. John Branch

At noon the party which now numbered over one hundred and fifty proceeded to the Pythian Castle where as guests of the St. John Branch an enjoyable luncheon meeting was held. At the conclusion of the meal Professor F. R. Faulkner, in a witty after dinner speech ending with a poem paying a tribute to the civil engineer, moved a vote of thanks to the St. John Branch for the magnificent programme they had provided for the professional meeting, paying a special tribute to the various committees, the hard work they had done, for the generous hospitality and all that went to make up the most successful maritime professional meeting yet held. The vote of thanks was seconded by W. G. Chace, M.E.I.C., in an equally interesting manner and received by the visitors with generous applause. Gray Murdoch, M.E.I.C., moved, seconded by Alex. Gray, M.E.I.C., hearty votes of thanks to the St. John Drydock and Shipbuilding Company for the trip around the harbour, the visit to the drydock and the generous luncheon they provided, to New Brunswick Contracting and Building Company for the opportunity of visiting the Musquash development and entertaining the members to a splendid dinner; to the Riverside Golf and Country Club for extending club privileges to the visiting members; to the New Brunswick Telephone Company, for making the paper on loud speakers possible and for providing a meeting hall for the public meeting; to the Board of Trade of St. John for placing their assembly hall at the disposal of the St. John Branch; to the St. John Power Company, for providing cars; to Canon Scott of St. John for his address illustrating loud speakers; to Professor McKiel for reading Mr. Theuerkauf paper; to H. J. Vennes, A.M.E.I.C.; the press of St. John and all others who assisted in making the meeting a success.

Others speakers at the luncheon were M. J. Murphy, A.M.E.I.C., secretary of the Moncton Branch and H. J. Crudge, A.M.E.I.C., member of the executive of the Moncton Branch.

Afternoon Session

C. S. G. Rogers, A.M.E.I.C., of Moncton, presided at the afternoon session in the Board of Trade rooms at which K. L. Dawson, A.M.E.I.C., of Halifax, read his paper on "A Lump of Coal". Mr. Dawson sounded a warning against the indiscriminate use of the commodity lest the easily available supply should become exhausted. He touched on the relationship of the physical and chemical properties of coal to combustion, and sketched the history of the individual lump from its resting place in the bowels of the earth until it reached its ultimate destination and was converted into heat and power.

This meeting finished the business sessions of *The Institute.* On its conclusion the members were taken by automobile to the Riverside Golf and Country Club for golf and dinner.

A Rousing Conclusion

Although the arrangements up to the time of the dinner were all that might be desired by the most fastidious and although every session and event had been considered ideal and perfect, the outstanding item on the programme was a dinner with which the proceedings were concluded on Thursday evening at the Riverside Golf and Country Club. Those responsible for the arrangement are past masters of the art of creating a genial atmosphere and the goodfellowship which prevailed was a tribute to their successful efforts. The chair was occupied by H. F. Bennett, A.M.E.I.C., chairman of the St. John Branch, who, on this occasion as at other functions of which he was chairman, showed unmistakable ability for such a position. With him, seated at the head table, were President Francis, Mayor Fisher of St. John, Colonel Murray McLaren, C.M.G., M.P., Hon. John Baxter, K.C., Commissioners R. W. Wigmore, John Thornton and James H. Frink, G. E. Barbour, president, and R. E. Armstrong, secretary of the Board of Trade of St. John, Dr. E. A. Smith, chairman of the N.B. Electric Power Commission and several other distinguished citizens of St. John.

After the toast to the King had been drunk, the toast to the Maritime Provinces was proposed by W. G. Chace,

WILLIAM J. JOHNSTON, A.M.E.I.C.
Secretary-Treasurer St. John Branch.

M.E.I.C., stating that the west owed a great debt to the maritime provinces as it was considered the natural outlet for the progress of the west. He referred to the fine example of patriotism that the east had always shown and emphasized the need for greater immigration. The response was made at considerable length by Colonel Murray McLaren, C.M.G., M.P., who, after complimenting E. G. Cameron on the work of the drydock, paid a tribute to the whole engineering profession. He discussed at length the relationship existing between the maritime provinces and the west which he considered was not understood by the people of Quebec and Ontario. He considered that the whole success of Canada depends on the routing of Canadian trade over Canadian rails and through Canadian ports.

The toast to the city of St. John was proposed by Fraser S. Keith and responded to by Mayor Fisher and Commissioners Wigmore and Thornton. After welcoming the visitors, the Mayor expressed the pleasure it gave him of welcoming the engineers to St. John. He called upon his colleagues of the city council, Commissioners Wigmore and Thornton, both of whom replied in fitting terms.

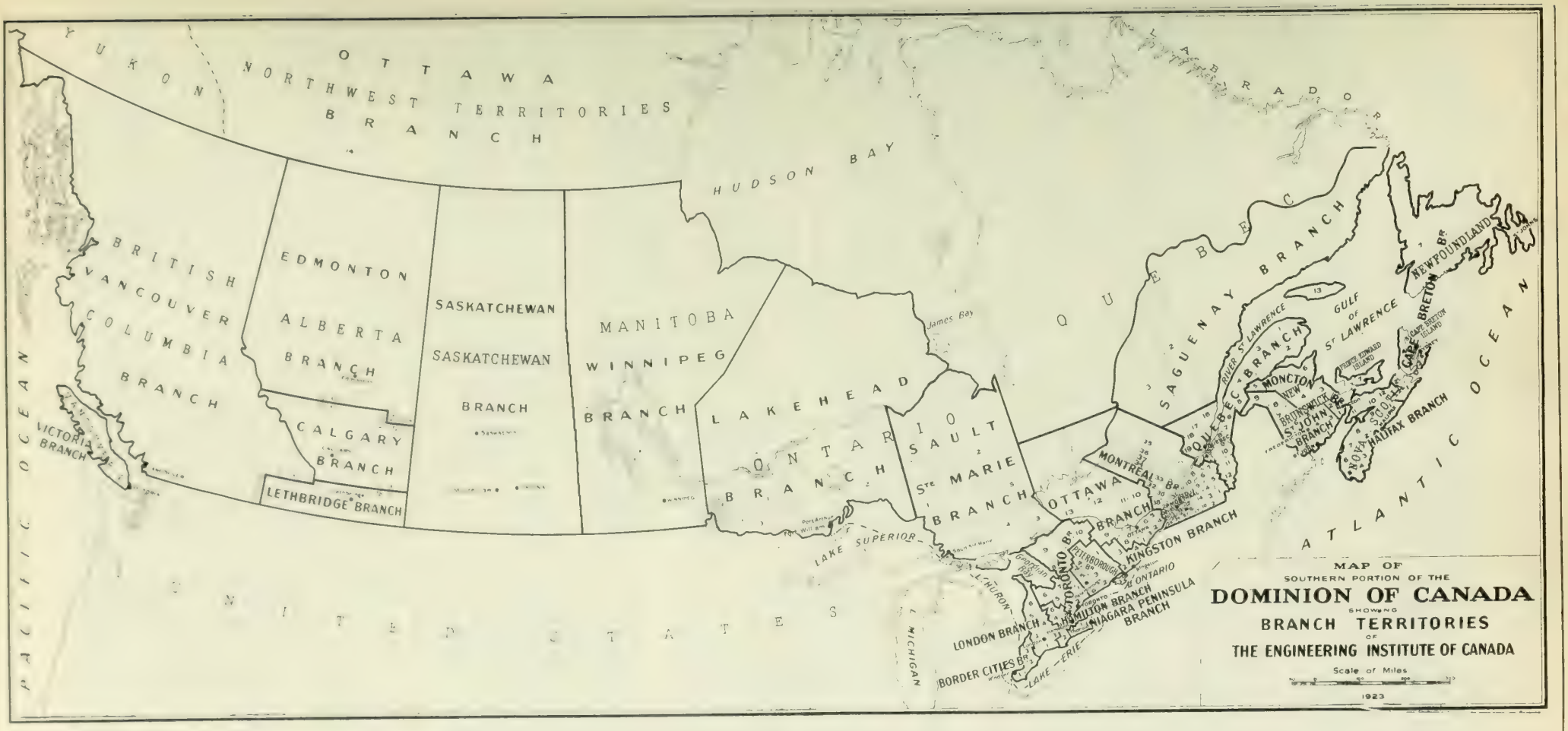
"The Engineering Profession" was proposed by Dr. Baxter who said that a great debt was due the engineers with whom he had had considerable experience having always found them imbued with professional pride and the right procedure always superceded any other consideration. President Francis then replied thanking Dr. Baxter for the support he had given the engineering Profession, the antiquity of which he mentioned and its many developments down through the ages. He stated that engineering methods had been used by Dr. Banting, the discoverer of insulin, in arriving at his conclusion. He referred to the fact that *The Engineering Institute of Canada*, with a membership of well over five thousand, was the only national engineering body in Canada, pointing out the situation existing in engineering colleges where many more students were taking the course than the profession would absorb. Speaking of the fuel problem, he prophesized the establishment of coking plants throughout Ontario as the best solution of the fuel problem in the acute area. In conclusion, he thanked all those who assisted in making the meeting a success.

The above staid account gives no impression whatsoever of the friendly atmosphere prevalent at this meeting, the enthusiasm with which many songs were sung during the course of the banquet, the rivalry of the representatives of the various colleges in giving the greatest prominence to their college yell, making it an evening to be long remembered with pleasure by all who were fortunate to be present.

Maritime Professional Meeting, St. John, N. B. September 26th, and 27th, 1923.

Registration

1. Harry F. Bennett, St. John, N.B.
2. F. G. Goodspeed, St. John, N.B.
3. Geoffrey Stead, St. John, N.B.
4. Moses Burpee, Houlton, Maine.
5. G. G. Hare. St. John, N.B.
6. Hazen P. Moulton, Ottawa, Ont.
7. B. E. Bayne, Moncton, N.B.
8. A. A. Turnbull, St. John, N.B.
9. C. M. Crooks, Halifax, N.S.
10. Walter J. Francis, Montreal, P.Q.
11. Philip A. Freeman, Halifax, N.S.
12. C. A. Fowler, Halifax, N.S.
13. F. A. Bowman, Halifax, N.S.
14. K. S. Pickard, Sackville, N.B.
15. G. L. Dixon, Moncton, N.B.
16. W. Harrison, Moncton, N.B.
17. H. S. VanScoyoc, Montreal, P.Q.
18. F. P. Shearwood, Montreal, P.Q.
19. H. W. McKiel, Sackville, N.B.
20. N. F. Ballantyne, Ottawa, Ont.
21. J. F. Paige, Halifax, N.S.
22. James Cumberford, Amherst, N.S.
23. F. R. Faulkner, Halifax, N.S.
24. R. B. Turner, St. John, N.B.
25. J. S. Armstrong, Fredericton, N.B.
26. G. C. Torrens, Moncton, N.B.
27. Gilbert G. Murdoch, St. John, N.B.
28. D. Walter Munn, Halifax, N.S.
29. F. L. West, Sackville, N.B.
30. George H. Waring, St. John, N.B.
31. A. E. Oulton, Moncton, N.B.
32. E. T. Cain, Moncton, N.B.
33. Frank P. Vaughan, St. John, N.B.
34. A. L. Brown, Halifax, N.S.
35. C. H. Wright, Halifax, N.S.
36. G. T. Medforth, Amherst, N.S.
37. Lieut.-Gov. Todd, St. Stephen, N.B.
38. H. G. (Bert) Evans, St. John, N.B.
39. A. Gray, St. John, N.B.
40. T. J. Locke, Halifax, N.S.
41. C. C. Kirby, St. John, N.B.
42. A. G. Tapley, St. John, N.B.
43. W. R. Pearce, St. John, N.B.
44. E. G. Cameron, St. John, N.B
45. D. L. Hutchinson, St. John, N.B.
46. W. F. McKnight, Halifax, N.S.
47. J. T. Turnbull, St. John, N.B.
48. W. H. Chisholm, Halifax, N.S
49. James A. Moore, St. John, N.B.
50. C. E. W. Dodwell, Halifax, N.S.
51. John P. Mooney, St. John, N.B.
52. F. W. W. Doane, Halifax, N.S.
53. K. L. Dawson, Halifax, N.S.
54. R. H. Cushing, St. John, N.B.
55. H. E. Barnett, Moncton, N.B.
56. W. T. Earle, St. John, N.B.
57. R. Moore, St. John, N.B.
58. C. McN. Steeves, Fredericton, N.B.
59. E. J. Owens, St. John, N.B.
60. Gordon Kribs, St. John, N.B.
61. K. C. Cairns, St. John, N.B.
62. B. E. Norrish, Montreal, P.Q.
63. L. L. Theriault, Fredericton, N.B.
64. P. E. Porter, Fredericton, N.B.
65. John N. Flood, St. John, N.B.
66. E. A. Thomas, St. John, N.B.
67. W. Victor Delaney, Wolfville, N.S.
68. W. G. Chace, Toronto, Ont.
69. J. M. Lamb, St. John, N.B.
70. D. Faraday, St. John, N.B.
71. H. A. Brown, St. John, N.B.
72. John H. Clarke, London, Eng.
73. Fraser S. Keith, Montreal, P.Q.
74. G. E. Martin, St. John, N.B.
75. Herbert Phillips, St. John, N.B.
76. A. R. Crookshank, St. John, N.B.
77. M. J. Murphy, Moncton, N.B.
78. G. H. Thurber, St. John, N.B.
79. W. J. Johnston, St. John, N.B.
80. G. N. Hatfield, St. John, N.B.
81. D. A. Duffy, St. John, N.B.
82. V. S. Chesnut, St. John, N.B.
83. D. W. Greig, St. John, N.B.
84. R. Goldie, Guelph, Ont.
85. J. A. Grant, St. John, N.B.
86. L. C. Webb, St. John, N.B.
87. S. R. Weston, St. John, N.B.
88. James Gilchrist, St. John, N.B.
89. Murray MacLaren, St. John, N.B.
90. E. A. Smith, Shediac, N.B.
91. F. W. Holt, St. John, N.B.
92. W. F. Burditt, East St. John, N.B.
93. K. M. Cameron, Ottawa, Ont.
94. G. S. Macdonald, St. John, N.B.
95. H. R. Logie, St. John, N.B.
96. D. R. Smith, St. John, N.B.
97. B. Allen, St. John, N.B.
98. C. S. Bennett, St. John, N.B.
99. C. C. Langstroth, St. John, N.B.
100. Barry Wilson, St. John, N.B.
101. Grover Keith, St. John, N.B.
102. R. E. Armstrong, St. John, N.B.
103. L. K. White, St. John, N.B.
104. H. D. Macaulay, St. John, N.B.
105. A. A. Dodge, St. John, N.B.
106. J. S. Vaughan, St. John, N.B.
107. P. McKenzie, St. John, N.B.
108. T. E. D. Snow, St. John, N.B.
109. J. Lawton Scovil, St. John, N.B.
110. J. H. McKinney, St. John, N.B.
111. J. H. Moore, St. John, N.B.
112. F. M. Ross, St. John, N.B.
113. A. K. Beard, St. John, N.B.
114. Thomas G. Manning, St. John, N.B.
115. N. K. Cameron, St. John, N.B.
116. Capt. Sullivan, St. John, N.B.
117. G. F. Cameron, St. John, N.B.
118. W. C. Birrell, St. John, N.B.
119. G. C. McAvity, St. John, N.B.
120. Howard E. Beedy, St. John, N.B.
121. C. A. Boulton, Montreal, P.Q.
122. J. C. Tyldesley, Montreal, P.Q.
123. Frank G. Wilson, St. John, N.B.
124. H. E. Josselyn, St. John, N.B.
125. C. N. Wilson, St. John, N.B.
126. A. A. Colter, Fredericton, N.B.
127. A. F. Belding, Fredericton, N.B.
128. John Thornton, St. John, N.B.
129. G. A. Vandervort, St. John, N.B.
130. W. L. Ball, St. John, N.B.
131. G. E. Howie, St. John, N.B.
132. J. L. Feeney, St. John, N.B.
133. J. A. W. Waring, St. John, N.B.
134. H. J. Vennes, Montreal, P.Q.
135. D. A. Massie, St. John, N.B.
136. Frank Williams, Moncton, N.B.
137. E. G. Evans, Moncton, N.B.
138. C. G. S. Rogers, Moncton, N.B.
139. H. J. Crudge, Moncton, N.B.
140. W. N. Appleton, Moncton, N.B.
141. John J. Gorman, St. John, N.B.
142. F. B. Fripp, Moncton, N.B.
143. C. T. Nisbet, Sussex, N.B.
144. R. W. Wigmore, St. John, N.B.
145. G. E. Barbour, St. John, N.B.
146. G. Fred. Fisher, St. John, N.B.
147. James H. Frink, St. John, N.B.
148. Max A. Pooler, St. John, N.B.
149. John B. M. Baxter, St. John, N.B.
150. T. H. Bullock, St. John, N.B.



BRITISH COLUMBIA

Victoria Branch
Vancouver Island

Vancouver Branch

ALBERTA

Lethbridge Branch

Calgary Branch

Edmonton Branch

SASKATCHEWAN

Saskatchewan Branch

MANITOBA

Winnipeg Branch

ONTARIO

Lakehead Branch
1. Kenora
2. Thunder Bay
3. Rainy River
4. Patricia

Sault Ste. Marie Branch
1. Algoma
2. Cochrane
3. Nipissing (north of the Mattawa River)
4. Sudbury (excluding Manitoulin Island)
5. Timiskaming (north and the area in the U.S. within a radius of 25 miles of Sault Ste. Marie)

Border Cities Branch
1. Essex
2. Kent
3. Lambton and the area in the U.S. within a radius of 25 miles of Windsor

Niagara Peninsula Branch
1. Lincoln
2. Welland
3. Haldimand and the area in the U.S. within a radius of 25 miles of Niagara Falls, Ontario

London Branch
1. Elgin
2. Middlesex
3. Oxford
4. Perth
5. Huron
6. Bruce

Hamilton Branch
1. Wentworth
2. Norfolk
3. Brant
4. Waterloo
5. Halton (West townships of Nelson and Nassagaweya)
6. Wellington

Toronto Branch
1. Ontario
2. York
3. Peel
4. Halton (East townships of Trafalgar and Esquesing)
5. Dufferin
6. Grey
7. Simcoe
8. Muskoka
9. Parry Sound
10. Nipissing (south of Mattawa River)

Peterborough Branch
1. Hastings
2. Northumberland
3. Peterborough
4. Haliburton
5. Victoria
6. Durham

Kingston Branch
1. Prince Edward
2. Lennox and Addington
3. Frontenac
4. Leeds

Ottawa Branch
1. Grenville
2. Stormont
3. Dundas
4. Glengarry
5. Prescott
6. Russell
7. Carleton
8. Lanark
9. Renfrew
10. Labelle, Que.
11. Hull, Que.
12. Pontiac, Que.
13. Timiskaming, Que.
14. Yukon and the Northwest Territories

QUEBEC

Montreal Branch
1. Compton
2. Stanstead
3. Sherbrooke
4. Richmond
5. Wolfe
6. Arthabaska
7. Megantic
8. Nicolet
9. Drummond
10. Yamaska
11. Richelieu
12. St. Hyacinthe
13. Bagot
14. Shefford
15. Rouville
16. Brome
17. Missisquoi
18. Iberville
19. St. Johns
20. Napierville
21. Laprairie
22. Chambly
23. Vercheres
24. Chateauguay
25. Huntingdon
26. Beauharnois
27. Jacques Cartier
28. Laval
29. Two Mountains
30. Terrebonne
31. L'Assomption
32. Montcalm
33. Joliette
34. Berthier
35. Champlain
36. St. Maurice
37. Maskinonge
38. Argenteuil
39. Vaudreuil
40. Soulanges

Note: All other territory in Canada not allocated

Quebec Branch
1. Gaspe
2. Bonaventure
3. Matane
4. Rimouski
5. Temiscouata
6. Kamouraska
7. L'Islet
8. Montmagny
9. Bellechasse
10. Dorchester
11. Beauce
12. Frontenac
13. Anticosti
14. Lothiniere
15. Levis
16. Charlevoix
17. Montmorency
18. Quebec
19. Portneuf

Saguenay Branch
1. Saguenay
2. Chicoutimi
3. Lake St. John

MARITIME PROVINCES

Moncton Branch
1. Albert
2. Westmoreland
3. Kent
4. Northumberland
5. Restigouche
6. Gloucester
7. Prince Edward Island

St. John Branch
1. St. John
2. Charlotte
3. Kings
4. Queens
5. Sunbury
6. York
7. Carleton
8. Victoria
9. Madawaska

Halifax Branch
1. Halifax
2. Lunenburg
3. Queens
4. Shelburne
5. Yarmouth
6. Digby
7. Annapolis
8. Kings
9. Hants
10. Colchester
11. Cumberland
12. Pictou

Cape Breton Branch
1. Guysborough
2. Antigonish
3. Richmond
4. Inverness
5. Victoria
6. Cape Breton
7. Newfoundland

THE
ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

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Student Activities.

During the past year considerable attention has been given to the question of student activities, there being a general feeling that *The Institute* should make a greater appeal to the students of the universities, and also be of greater service to its Student members. A special committee was created by Council under the chairmanship of Geo. R. MacLeod, M.E.I.C., who had the benefit of the advice and co-operation of T. R. Loudon, M.E.I.C., R. W. Downie, A.M.E.I.C., and A. M. Reid, S.E.I.C., who made a report which was conveyed to Council by the chairman in a letter under date of August twenty-fifth. In view of the fact that this report contains constructive suggestions, it was resolved by Council that it should be brought to the attention of the entire membership for consideration. The report follows:—

REPORT OF COMMITTEE (TORONTO SECTION)

The Toronto members of the committee have considered the question of linking up *The Institute* and its facilities with the students in the Faculty of Applied Science and Engineering in the University of Toronto. They have had the assistance of the president of the Engineering Society, F. J. Lyle, S.E.I.C., at their councils and have at all times endeavoured to take a point of view in harmony with the feelings of the graduate and undergraduate body of the "School".

The Toronto members are convinced that *The Engineering Institute* can justly claim the right to be called the Canadian Engineers' National Organization, and as such should have the support of every engineer and engineering student in Canada. They recognize that the student may receive great benefits through active association with *The Institute* under favourable conditions, and that it is to the future advantage of *The Institute* to ensure that every student graduating who intends to take up engineering should be a member.

It is necessary, however, to consider the practical side and to recognize present limitations if the final success of the scheme is not to be endangered. The development of friction between different technical societies should be guarded against. There are limitations on the student's time in view of the crowded character of his curriculum and the diversity of his interests. Many activities which might be suggested could quite well be carried on by the undergraduate organization, the University Engineering Society, working in harmony with *The Institute*, — visits to plants, etc. These points might be elaborated but their statement shows the need for the exercise of caution and tact. The present situation is abnormal as a result of the large numbers of returned men in the college and should not be taken as a criterion for the future. Hence it is felt that the following suggestions while they may not appear drastic, will make for a steady improvement in conditions and offer as little cause for future complications as possible.

Recommendations.

It is the opinion of the Toronto members of the Committee on Student Activities:—

(1) That the interest shown by students in engineering in Toronto in *Institute* affairs in general, and student activities and participation in local matters in particular will always depend on the efforts and activity of the Toronto Branch of the E.I.C., in stimulating and encouraging that interest.

(2) That as a medium for the exercise of such interest, a sub-committee of the local branch be appointed each year to confer on the best way of advancing E.I.C., interests in the college, the president of the University Engineering Society to be a member of such sub-committee. It is also suggested that the faculty be represented on this committee.

(3) That it be recognized that the introducing of undergraduate members to older members at E.I.C., meetings should receive special attention: — the method adopted to be left to the committee together with other such details.

(4) That the experience of the last two years would indicate that the field for student activities may well include, (a) branch meetings at which students give papers, (b) informal smokers at which a combined programme may be given by senior and student members.

(5) That in any discussion on formation of programme the following points should be borne in mind:—

The establishment of a Student Branch of the E.I.C., in Toronto, or anything approaching the Student Chapters of the American organizations, should not be considered at any time.

NOTE.—It is felt that the Engineering Society must be without question the senior society in the faculty, and that the introduction of such an organization would inevitably lead to friction and militate against the best interest of *The Institute* in the end. (See also extract from article in Engineering News-Record of February 1, 1923.)

(6) Propaganda with a view to membership in *The Institute* should be confined to the third and fourth years and should be presented by a corporate member of the E.I.C. The aims, functions and general policy of *The Institute* should, however, be impressed on all students when they enter the faculty, and all should be invited to branch meetings.

NOTE.—This is to prevent to some extent the joining of students who drop out in junior years or who decide to continue the course for its business training only. It should also tend towards an association of student membership with progress in the engineering education of the student, and so represent some advance in prestige.

First World Power Conference

As a result of important conferences in London and Paris during the month of August of representatives of the principal participating countries concerned with the First World Power Conference, to be held in London, in July 1924, arrangements have now been effected for the programme of the conference, and for the manner and extent of the preparations that are necessary on the part of the different countries. The following countries were represented: — Great Britain, France, Switzerland, Italy, Belgium, Spain, Norway, Sweden, the United States and Canada.

The United States was represented by O. C. Merrill, executive engineering secretary of the Federal Power Commission at Washington. J. B. Challies, M.E.I.C., director of water power of the Department of the Interior, personally represented the Honourable Charles Stewart, Minister of the Interior, under whose immediate supervision Canadian participation is being arranged.

The object of the Power Conference will be to consider how the industrial and scientific sources of power may be adjusted nationally and internationally; by considering the potential resources of each country in hydro-electric power, oil and minerals; by comparing experiences in the development of scientific agriculture, irrigation and transportation by land, water and air; by conferences of civil, electrical, mechanical, marine and mining engineers, technical experts and authorities, and industrial research; by consultation of the consumers of power and the manufacturers of the instruments of production; by conferences on technical education to review the educational methods in different countries, and to consider means by which existing facilities may be improved; by discussions on the financial and economic aspects of industry; by conference on the possibility of establishing a permanent world bureau for the collection of data, the preparation of inventories of the world's resources and the exchange of industrial and scientific information through appointed representatives in the various countries.

In response to an invitation received early in the year for Canadian participation, the Honourable Charles Stewart, Minister of the Interior, convened a preliminary committee, representing among other organizations the following:—

The Quebec Streams Commission.
The Ontario Hydro-Electric Power Commission.
The Nova Scotia Power Commission.
The New Brunswick Electric Power Commission.
The British Columbia Water Rights Branch.
The Engineering Institute of Canada.
The Canadian Electrical Association.
The British Columbia Electric Railway Company.
The Shawinigan Water and Power Company.
The Southern Canada Power Company.
Quebec-New England Hydro-Electric Corporation.
The Dominion Fuel Board.
The Dominion Water Power Branch, Dept. of the Interior.
The Electricity and Gas Inspection Service, Dept. of Trade and Commerce.

This committee has arranged for the following papers which are now well under way:—

National Review — covering water power resources generally, their investigation and administration, by J. B. Challies, M.E.I.C., director of water power, who will collaborate with the administrative officials of the various provinces.

A symposium on *Power Production* — covering the civil and hydraulic aspects of power developments in Canada. Principal collaborator, H. G. Acres, M.E.I.C., chief hydraulic engineer, Hydro-Electric Power Commission of Ontario.

A symposium on *Power Transmission and Distribution.* Principal collaborator, Julian C. Smith, M.E.I.C., chief engineer and vice-president of the Shawinigan Water and Power Company.

A symposium on *Hydro-Electric Energy in Industry in the Dominion.* Principal collaborator, P. T. Davies, president of the Canadian Electrical Association and director of the Southern Canada Power Company.

A symposium on *Carbo Power Production in Canada* Principal collaborator, B. F. Haanel, M.E.I.C., chief engineer of fuel testing division, Department of Mines.

Following the meetings in London and Paris the Minister of the Interior has in view the enlargement of the preliminary committee so that every organization in the Dominion concerned with power production in Canada will be afforded an opportunity of co-operating with the preliminary committee with a view to taking full advantage of the World Power Conference facilities for making Canada's unique and unrivalled achievements in power production thoroughly known and appreciated.

OBITUARIES

H. M. Armstrong, S.E.I.C.

H. M. Armstrong, S.E.I.C., was accidently killed at the Davenport works of the Canadian General Electric Company, Limited, on the night of April 21st, 1923. The late Mr. Armstrong, was born at Napanee, Ontario, on September 5th, 1898, and was admitted to *The Institute* on November 25th, 1919, at which time he was attending the University of Manitoba. In the spring of 1922 he received his degree of B.S., and subsequently was employed on surveying and transmission line erection, later joining the staff of the Canadian General Electric Company, Limited.

William A. Clement, M.E.I.C.

The Institute has lost another of its earliest members in the death of William A. Clement, M.E.I.C., which occurred at his home in Somenos, B.C., on Sunday August 19th, 1923. Although he had not been enjoying very good health for some time, Mr. Clement had not been confined to the house, and his death which was very sudden came as a great shock to his many friends.

The late Mr. Clement was a native of Ontario, his parents having resided in the township of Niagara, where he was born on August 27th, 1865. His high school education was received at Niagara, and his engineering training at the School of Practical Science, Toronto, from which he graduated in 1889. His first work after graduating was on a government boundary survey of the Welland ship canal, where he acted as transitman. The following year he was appointed assistant draughtsman on the engineering staff of the sewer department of the city engineer's office, Toronto, under Chas. H. Rust, M.E.I.C., and the late Wm. T. Jennings, M.E.I.C. From that time Mr. Clement's work for the city of Toronto covered many branches of municipal engineering. Later he was city engineer of Vancouver, which position he occupied during the boom years of the city's growth. At the time of his death he was municipal engineer of Somenos, Vancouver Island, B.C. The late Mr. Clement was admitted as a Student of *The Institute* February 24th, 1887, and was transferred to Associate Member October 12th, 1899, and to full membership on October 9th, 1902.

PERSONALS

V. R. Currie, S.E.I.C., is at present on land division work for the British Columbia government. Mr. Currie is a graduate of Queen's University in civil engineering.

P. R. Drummond, S.E.I.C., who received the degree of B.A.Sc., from the University of Toronto this spring, is with the New Jersey Zinc Company of Franklin, N.J.

E. S. Kelsey S.E.I.C., has recently joined the engineering staff of the Northern Electric Company, Limited, at Montreal, Que.

R. A. Garvie, A.M.E.I.C., of the Acme Steel Goods Company of Chicago, Ill., has been elected an associate member of the Western Society of Engineers.

P. A. Laing, A.M.E.I.C., who until recently has been associated with the Osage County and Santa Fe Railway at Caney, Kansas, has accepted a position at Dubuque, Iowa, with the Illinois Central Railroad Company.

A. G. McLerie, A.M.E.I.C., formerly of the Canadian Air Force, Camp Borden, Ontario, is now with the Fairchild Aerial Survey Company, Limited, at Grand Mere, Quebec.

Rex. E. Buckley, A.M.E.I.C., is located at Altmar, N.Y., with the Niagara Lockport and Ontario Power Company as field engineer on the construction of a power house and dam on the Salmon river.

J. M. Campbell, A.M.E.I.C., division engineer for the Canadian Pacific Railway at Winnipeg, Man., has been transferred to Moose Jaw, Sask., as division engineer of that division.

L. S. McLennan, Jr.E.I.C., of Vancouver, B.C., is with the Sullivan Constructing Company of Oswegatchie, N.Y. Mr. McLennan received his degree of B.Sc., in 1912 from McGill University.

Arthur R. Murphy, S.E.I.C., who until recently has been associated with the Detroit Stoker Company has returned to Toronto, having been appointed editor of Power House, with the MacLean Publishing Company.

Herbert H. Mueller, S.E.I.C., who graduated from the University of Toronto with the class of '22 is on the staff of the chemical division of Proctor and Gamble Company at Ivorydale, Ohio.

E. C. Higgins, Jr.E.I.C., has been for the past year assistant station engineer (structural) with the Hydro-Electrical Power Commission of Ontario. He was formerly checker and designer for the commission.

V. R. Davies, Jr.E.I.C., who has been associated with McGill University as demonstrator in the department of civil engineering has joined the staff of the department of civil engineering of the University of Manitoba.

Cecil R. Scott, A.M.E.I.C., has moved from North Bay, Ont., to Cochrane, Ont., and has accepted a position with the Sir William Arrol Company, Limited. Mr. Scott is a graduate in civil engineering from the University of Toronto in 1918.

J. B. Nelson, A.M.E.I.C., is designer and checker in the structural steel and bridge department of the Canadian Allis Chalmers, Limited. He was for a time with the Trussed Concrete Steel Company, and on the engineering staff of McGregor and McIntyre, Limited.

J. Harvey Westren, S.E.I.C., has accepted a position in the quality department of the Dunlop Tire & Rubber Goods Corporation of America at Buffalo, N.Y. Mr. Westren graduated from the University of Toronto in 1922.

Lawrence E. C. Frith, Jr.E.I.C., has been appointed inspector of electricity and gas with the department of Trade and Commerce of the Dominion Government at Winnipeg, Man. Mr. Frith graduated from the University of Manitoba in electrical engineering in 1921.

H. W. Nablo, S.E.I.C., of Cayuga, Ont., has accepted a position in the switchboard department of the draughting office of the Canadian Westinghouse Company Limited at Hamilton, Ont. Mr. Nablo graduated from the University of Toronto this spring.

E. G. Richards, A.M.E.I.C., formerly with the construction department of the Canadian National Railways at Edmonton, Alta., has been appointed district engineer of the C.P.R. surveys at Seccondee, British West Africa for the Gold Coast Railways.

F. L. Lawton, S.E.I.C., W. R. Bunting, S.E.I.C., and R. W. Beckett, S.E.I.C., all graduates of the class of '23 of the University of Toronto, have been appointed to the students' engineering training course, at the Schenectady works, of the General Electric Company.

W. R. Richardson, S.E.I.C., is with the Parke Davis and Company of Detroit, Mich. Mr. Richardson graduated with honours in chemical engineering, from the University of Toronto in 1922 and he was for a time with the Proctor and Gamble Manufacturing Company of Hamilton, Ont.

A. E. Johnson, M.E.I.C., is western manager for the Ohio Locomotive Crane Company of Bucyrus, Ohio, with offices in the Railway Exchange Building, Chicago, Ill. Mr. Johnson was for a time associated with the Dominion Bridge Company, Limited, at Lachine, Que., as mechanical engineer.

Brian L. Reid, A.M.E.I.C., is with the construction department of the Canadian Pacific Railway Company at Winnipeg, Man. Mr. Reid has for some years been employed on railway construction and maintenance work, having recently been resident engineer in charge of operation and construction, of the Peace River extension, Central Canada Railway.

F. V. Seibert, M.E.I.C., and W. J. Boulton, A.M.E.I.C., engineers of the Natural Resources Intelligence Service, Department of Interior, are carrying on economic investigations for the Department, the former in the Edmonton district and the latter in western Ontario. F. H. Kitto, M.E.I.C., recently returned to Ottawa after completing similar investigations in Hants County, Nova Scotia.

I. M. MacLean, Jr.E.I.C., is with the construction department of the Canadian General Electric Company, Limited, at Toronto, Ont. Mr. MacLean graduated in electrical engineering from the University of New Brunswick in 1916, enlisting with the C.F.A. in the spring of that year. In 1920 he took the student's test course at the Peterborough plant of the Canadian General Electric Company.

C. E. W. Dodwell, Hon. M.E.I.C., for many years district engineer for Nova Scotia for the Department of Public Works, Canada, has been promoted to supervising district engineer for the maritime provinces. Mr. Dodwell has just returned from a trip to London where he was the official representative of *The Institute* at the meeting of the Permanent International Association of Navigation Congresses, a report of which will be found in this *Journal*.

John McLeish, M.E.I.C., and C. P. Hotchkiss, A.M.E.I.C., vice-chairman and executive secretary, respectively, of the Dominion Fuel Board, recently returned to Ottawa after having made a four weeks' tour of the Maritime coal fields. The study of the available markets and marketing conditions for coal suitable for domestic purposes and of the general condition affecting the possibility of extending these markets westward were made. The itinerary of the Fuel Board officials included Minto, Joggins, Springhill, New Glasgow and Sydney.

Gavin N. Houston, M.E.I.C., who has had twenty-five years experience in engineering and was formerly Acting Commissioner of Irrigation for the Dominion and a member of the Irrigation Council of Alberta, has opened an office in the Oliver Block, Lethbridge, Alberta, as consulting engineer. Mr. Houston is prepared to make reports on or design and supervise the construction of irrigation and water power, water supply, including water purification, sewerage, including sewage disposal, highways and highway bridges.

Capt. R. O. Thexton, A.M.E.I.C., has spent the past eighteen months on the West Coast of Africa, where he has been in charge of maintenance of the first eighty miles of the new Nigerian Eastern railway. The work on this section included the erection of station buildings and quarters, etc., in addition to roadbed construction. In a interesting letter Capt. Thexton speaks highly of the life on the West Coast of Africa and in describing the work states that the station buildings, etc., are being constructed of concrete blocks made on the job. Capt. Thexton, is at present on leave and will be at Twyford, Nr. Winchester, Hants, England, until the end of January, 1924.

W. L. Ketchen, M.E.I.C., has resigned from the Riordon Company, Limited, and has joined the Whalen Pulp and Paper Mills, Limited, at Port Alice, B.C. His early engineering education was received at the Edinburgh School of Technology and Heriot Watt Engineering College and after three years engineering work in the Old Country he came to Canada in 1902. For the next twelve years he was with the Canadian Pneumatic Tool Company, the Dominion Pneumatic Tool Company, and J. A. Jamieson, M.E.I.C., consulting engineer, for a short period, and the Dodge Manufacturing Company, Ltd., for seven years. In 1914 he joined the Riordon Pulp and Paper Company and was placed in charge of outside construction at Hawkesbury, Ont., later being appointed chief engineer of construction first at Merriton, Ont., than at Hawkesbury and later on the new mill at Temiskaming, Ont., where he was subsequently appointed manager.

Advisor to Economic Conference

Dr. Charles Camsell, M.E.I.C., deputy minister of Mines, sailed for London on the Regina on September 1st, and is reported to have reached his destination on the 10th inst. His address while away is c/o High Commissioner for Canada, Kinnaird House, Pall Mall East, London S.W. 1.

Dr. Camsell's most important commission is to act as technical adviser on problems related to the mining industry to the Cabinet delegation to the Imperial Economic Conference. Prior to the opening of the conference he will confer with a representative of the department who has been associated with the Canadian exhibition train in France, with the Imperial Mineral Resources Bureau, and with other organizations and officials through whom information concerning Canada's mineral resources can best be disseminated in Great Britain and the continent.

Returned from European Conference

J. B. Challies, M.E.I.C., director of the Dominion Water Power Branch, Department of the Interior, returned to Ottawa on September 17th from London and Paris where he represented the Hon. Charles Stewart, minister of the Interior, in conferences of delegates from the principal countries participating in the World Power Congress which is to be held in London, England, during July 1924.

As a result of this International Conference a unanimous agreement was reached respecting the purposes and the programme of the congress. A statement regarding preparations for Canadian participation in the congress will no doubt be issued as soon as Mr. Challies has had an opportunity of reporting to his minister. It is understood that besides Great Britain, France, Italy, Spain, Belgium, Norway, Sweeden, the United States and Canada all signified active interest in the congress.

Awarded Cross of the Legion of Honour.

Dr. L. A. Herdt, M.E.I.C., for many years head of the Department of Electrical Engineering at McGill University, is receiving the congratulations of his many friends on the tribute paid to him by the French Government in awarding him the Cross of the Legion of Honour. Dr. Herdt is of French origin having been born in Trouville, France, but has lived in Canada since his childhood.

This distinction has been awarded by the French Government in recognition of the services rendered by Dr. Herdt to the cause of higher scientific education and also on account of signal services rendered by him to France during the war. At the outset of hostilities in 1914, Dr. Herdt immediately left for France as a French war reservist and for four years he devoted his energy to the cause of France. He was appointed Technical Representative of the French Republic for war purchases in Canada, his work in connection with which was an outstanding success.

Changes in New Brunswick Electric Power Commission.

S. R. Weston, A.M.E.I.C., formerly assistant chief engineer of the New Brunswick Electric Power Commission, has been appointed chief engineer, C. O. Foss, M.E.I.C., formerly chief engineer, having resigned. Mr. Weston graduated with the degree of B.Sc. in civil engineering from the University of New Brunswick in 1914, the summers having been spent surveying with the New Brunswick Railway Company. After graduation he carried on general survey work until 1916 when he was transitman on location survey for the St. John and Quebec Railway, Gagetown to Westfield, under Herbert Phillips, M.E.I.C. In September 1916 he was made engineer in charge of construction, Evansdale to Browns Flats, for the same company. In April 1918 Mr. Weston became chief engineer of the Midland Coal Company, Limited, at Salmon Arm, B.C. In April 1920 he was appointed assistant chief engineer of the New Brunswick Electric Power Commission, in charge of hydraulic work, Musquash development, and responsible for general field construction.

The position of construction engineer has been filled by the appointment of C. McN. Steeves, M.Sc., M.E.I.C., formerly Captain in the C.E.F. Mr. Steeves graduated from the University of New Brunswick in 1905, and since graduation has taken an active part in the affairs of the University. After graduation he was engaged in railway engineering and later entered the service of the Federal

government in the Department of Public Works, resigning to take the position of chief engineer of the Maritime Dredging Company. Following active service overseas Mr. Steeves was for a time engineer officer, Military District No. 7, St. John, N.B., and later resident superintendent, engineering branch, D.S.C.R., maritime provinces. In 1921 he was contractors engineer, International Bridge, Edmundston, N.B., to Madawaska, Me. He resigned from the position of engineer for Concrete Builders Limited, Fredericton, N.B., to assume his new position.

ELECTIONS AND TRANSFERS

At the meeting of Council held on September 18th, 1923, the following elections and transfers were effected:—

Member.

TAYLOR, Howard Smith, B.C.E. (Univ. of Maine), consulting engineer, Dayton, Ohio, and Montreal, Que.

Associate Members.

BLAKE, James Hewat, mech. inspr., Dept. of Lands, B.C., Prov. Govt., Victoria, B. C.

BOWER, Joseph Henry Winteringham, B.A.Sc. (Honours), (Univ. of Toronto), secretary, Hydro-Electric Inquiry Commission, Toronto, Ont.

HENDERSON, Judson Pulford, B.A.,M.A., (Univ. of Toronto), in charge of radio equipment, Dominion Observatory, Ottawa, Ont.

McCARTHY, Clarence Wilbert, Highway Board of Nova Scotia, Halifax, N.S.

PATTENDEN, Albert Henry, elect'l. engr., Canadian Consolidated Rubber Company, Montreal, Que.

SCHULTE, Theodore, supt., telephone electrical equipment, C.P.R., D.N.R., Calgary, Alta.

TOPPING, Victor, B.A.Sc. (Honours), (Univ. of Toronto), engr. of traffic analysis, Toronto Transportation Commission, Toronto, Ont.

WALLACE, Gordon Leslie, B.A.Sc. (Univ. of Toronto), designing engr., Norman McLeod, Limited, General Contractor, Toronto, Ont., also private practice on bldg. constrn.

Juniors.

CONSTABLE, Laurence Earl, instr'man., H.E.P.C. of Ontario, Niagara Falls, Ont.

GERIN, Maurice, B.S., (Univ. of Montreal), M.S. (Mass. Inst. Tech.), salesman, pump and elec. dept., Canadian Fairbanks Morse Co. Ltd., Montreal, Que.

HOGG, Robert, senior laboratory asst., Welland Ship Canal, Testing Laboratories, Thorold, Ont.

LAKE, Henry Morton, senior dftsman, on blast furnace repairs, Algoma Steel Corporation Ltd., Sault Ste Marie, Ont.

STALKER, Collin Holmes, locating engineer, Larder lake extension, Nipissing Central Rly., Toronto, Ont.

TREMPE, J. C. Lucien, B.A.Sc., C.E., (Ecole Polytech.), asst. mtce. engr. of highway bridges, Public Works and Labor Dept., Quebec, Que.

Affiliate.

EVANS, Herbert George, district manager, Canadian Ingersoll-Rand Co., Ltd., St. John, N.B.

Transferred from the Class of Associate Member to that of Member.

FOWLER, Charles Allison DeWitt, B.Sc. (N.S.Tech. Coll.), private practice, Halifax, N.S.

McKIEL, Harold Wilson, B.A., B.Sc. (Queen's Univ.), senior professor of engineering, Mount Allison University, Sackville, N.B.

Transferred from the Class of Junior to that of Associate Member.

CHAPLEAU, Joseph Paul, B.Sc., C.E. (Ecole Polytech.), res. engr., Alma and Jonquieres Railway Co., St. Joseph d'Alma, Que.

DAVIES, Vernon Russell, B.Sc., M.Sc., (McGill Univ.), M.C.E. (Univ. of Man.), demonstrator, dept. of geodesy and surveying, McGill University, Montreal, Que.

HUGHES, Bernard Hope, asst. engr., The Nigerian Railways, Kakuri, Nigeria.

ROBERTS, Stanley Orley, engr., Geodetic Survey of Canada, Ottawa, Ont.

Transferred from the class of Student to that of Associate Member.

NOONAN, William Hysanth, B. Sc. (N.S.Tech. Coll.), private practice, Halifax, N.S.

PERRY, Rolf Selby, B.Sc. (McGill Univ.), acting supt. in charge of laboratory, Forest Products Laboratories of Canada, Vancouver Branch, Vancouver, B.C.

Transferred from the class of Student to that of Junior.

DONALDSON, Arthur, B.Sc. (C.E.), (Univ. of Alta.), timekpr. and material clerk, Carter Halls Aldinger Co. Ltd., Winnipeg, attached to the Alberta Provincial Office, Edmonton, Alta.

JACKSON, Carl Henry, B.Sc. (McGill Univ.), testman, Can. Gen. Elec., Co. Ltd., Montreal, Que.

LOGAN, William Hector, C.N.R., Fort William, Ont.

THOMPSON, Howard Grant, B.A.Sc. (Univ. of Toronto), stores engr., Kipawa Mill, Riordon Company, Limited, Timiskaming, Que.

The following Student was admitted:—

CHAMPION, Cecil Hugh, Apt. No. 1, 21 Chesterfield Avenue, Westmount, Que.

EMPLOYMENT BUREAU

Situations Wanted

Mechanical Engineer.

Mechanical engineer, graduate, S.E.I.C., age 25, open for immediate engagement, experience in sawmill and general construction work, good references, desires permanent position. Apply Box 120-W.

Construction Engineer.

Construction engineer, M.E.I.C., M.Am.Soc.C.E., professional engineer of Ontario, graduate and post graduate prominent engineering college, with thirty years experience in railway, municipal and water power engineering, desires connection with engineering or contracting firm. Have specialized in heavy construction in power development. Apply Box 121-W.

Construction Engineer.

Construction engineer, McGill graduate, age 34, married, desires permanent connection with consulting engineer or manufacturing company about to engage in construction work or addition to plant. Construction of steel and mill buildings, railroads, dams and smelters, surveying engineering office and plant chemist experience. Apply Box 122-W.

Construction Engineer.

Engineer qualified by London Civil and Military examination, with good practical constructional experience in municipal town planning and bridge engineering, pioneer irrigation and water supply, seeks post as developer in details for suggested projects or constructional engineer; age 30. Apply Box 123-W.

Civil Engineer.

Civil and sanitary engineer, A.M.I.S.E. (London) requires re-engagement in Canada. Past thirteen years assistant engineer and superintendent to London firm of engineers and contractors. Bridges, harbours, sewerage, roads. At present building bridge. Late Lieut. Canadian Railway Corp. Own passage paid. Apply Box 124-W.

Situations Vacant

Mechanical Draughtsmen

Two mechanical draughtsmen, technical graduates preferred, one to three years' experience required. Reply stating age, salary required and when available to Box No. 53-V.

Mechanical Designers

Company central district, Canada, manufacturing large machinery of diversified nature needs two designers capable of making close estimates and laying out work for draughting office. Please state education, full qualifications, salary, age, etc., in first letter. Apply Box No. 54-V.

Hydro-electric Plant Designers and Tracers

Large power company in Quebec wishes to secure the services of two engineers with experience in hydro-electric power plant design, and also two first-class tracers. Apply Box No. 55-V.

Mechanical Designers and Draughtsmen

Several good men wanted with experience in design and detailing of cranes, head gates and operating machinery, etc. Location central Canada. High-class men only, wanted. Please state education, ful qualifications, salary, age, etc., in first letter. Apply Box No. 56-V.

Classification, Remuneration and Tariff of Fees of Engineers

Schedules adopted as a guide for the members of the Institute.

The Committee on Classification and Remuneration has issued two reports, one on classification and remuneration and the other on fees of engineers, both of which are published in this issue of *The Journal* by the authority of Council with the object of their serving as a guide to the members. *The Institute* committee was appointed by the Council of nineteen twenty, which approved of the establishing by *The Institute* of rates of remuneration for its members, both by fee and by salary. The report relating to the annual compensation of engineers and to the classification of those not in consulting practice was published in *The Journal*, November nineteen twenty-two, having been first referred to the branch executives for their opinion. This report was presented to the last annual meeting and adopted, being referred to the Council for action. The final decision of Council was that this report should be placed before the members to be used as a guide for reference in considering classification and remuneration of members of *The Institute* on salary.

Members are invited to make any comments with a view to revision if considered desirable at the next annual meeting.

Classification and Remuneration

The Committee was constituted by resolution of Council dated March 23, 1920. Progress reports have been submitted from time to time.

The report of your Committee is divided into two parts:

Part I — Relates to annual compensation.

Part II — Relates to fees for special work, particularly that of a consulting engineering nature.

Your Committee, in preparing this report, has had before it the reports of the Toronto, Winnipeg, Vancouver, Saskatchewan, Quebec and Halifax Branches of *The Engineering Institute*, that of the British Columbia Technical Association, reports of certain of the societies of the United States, as well as that of Engineering Council of New York. It has also availed itself of the information to be obtained from time to time in the technical press. Full consideration has been given to the classification of the Dominion Government engineering and allied services made under the supervision of the Civil Service Commission of Canada.

Classification

Your Committee realizes that the first essential towards any concerted or general effort on the part of the engineering profession in Canada towards proper compensation for its services is a standardized classification with accompanying rates of remuneration. It has, therefore, been the main purpose of your Committee to evolve an appropriate classification and scale of remuneration. After a careful study of the several reports, that proposed by the Engineering Council recommends itself to your Committee and, with some alterations, has been adopted as the basis of this classification. The subdivision into professional and subprofessional service has been discarded as it was felt to be impossible to draw any marked distinction between them, and that there was no advantage in doing so. This required a certain revision of grades V, VI, and VII in regard to duties and qualifications. Another slight revision has been made to give the college graduate less advantage over the non-graduate with experience for the first year or so after graduation, and a greater advantage thereafter until the higher positions are reached. It is felt that for the higher positions a fixed difference in years of experience between the graduate and non-graduate is purely academic but the Engineering Council periods have been retained.

While the names attached by the Engineering Council to the different grades in the classification have been retained, it has been only for the purpose of identifying the different grades by association with a name; the name attached to an engineering position need not necessarily be an indication of the grade that would be accorded that position in this classification. The name of Chief Engineer of a small industrial concern or a small municipality might correspond to grade V or VI in the matter of duties and qualifications. It should be possible, however, from the nature of the duties required and the qualifications demanded for any position, to assign that position to its proper grade in the classification. The list of positions given corresponding to each grade is merely suggestive.

Chief Engineer: There are certain engineering positions of great importance which require men of the highest engineering ability and training and executive attainments and the occupants of such positions your Committee has given the title of Chief Engineer. Such positions are considered as being outside the scope of engineering classification.

The Classification prepared by your Committee is as follows:

Grade I—Assistant Chief Engineer

Duties — To act in administrative charge of a technical organization, or of a main division thereof; to determine the general policies of the organization under the limitations imposed by law, regulation or other fixed requirements; to have final responsibility for the preparation of reports, cost, estimates, designs, and specifications and for the construction, maintenance, or operation of engineering works or projects; to have full charge of the collection and presentation of data for the conduct of valuation proceedings; to conduct or direct the most comprehensive lines of engineering research.

Qualifications — Training and experience of a character to give substantial evidence of engineering knowledge and ability or of executive capacity of highest order along lines of work similar to those involved in the position to be occupied and of at least twelve years' duration of which at least four years shall have been spent in work of a similar character in a subordinate position, and at least five years in responsible charge of important work or projects. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in the absence of such degree at least four years additional experience. The completion of each year of such standard course shall be considered the equivalent of one full year of such additional experience.

Positions corresponding to this Grade: Assistant Chief Engineer, City Engineer, Superintending Engineer for a Province, etc.

Grade II—Engineer

Duties — Under general administrative direction and within the limits of the general policies of the organization, to have rsponsible charge of and to initiate and determine policies for a major subdivision of an organization; to prepare for final executive action reports, cost estimates, designs, specifications, and valuation studies and data; to have immediate charge of the construction, maintenance or operation of engineering works or projects of major importance; to conduct or direct major lines of engineering research; or to furnish for execution action expert or critical advice on engineering works, projects or policies.

Qualifications — Active professional practice or executive charge of work for at least eight years, of a character to demonstrate a high degree of initiative and of ability in the administration, design, or construction of engineering works or projects of major importance, of which at least three years have been spent in work of a similar character in a subordinate position and at least three years in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in the absence of such degree, at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Positions corresponding to this Grade: Engineer, District Engineer, Designing Engineer, etc.

Grade III—Senior Assistant Engineer

Duties — Under general administrative and technical direction to be in responsible charge of an intermediate division of an organization; to exercise independent engineering and assume responsibility in studies and computations necessary for the preparation of reports; cost estimates, designs, specifications or valuations; to have immediate charge of the construction, maintenance or operation of important engineering works or projects; or to conduct or direct important lines of engineering research.

Qualifications — Active professional practice or executive charge of work for at least five years, of which at least three years shall have been spent in work of a similar character in a subordinate position, with at least one year in responsible charge of work. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in absence of such degree, at least five years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Positions corresponding to this Grade: Senior Assistant Engineer, Division Engineer, Engineer of a Department.

Grade IV — Assistant Engineer

Duties — Under specific administrative and technical direction, to be responsible for the conduct of the work of a minor subdivision of an organization, to collect and compile data for special items of engineering studies; to take immediate charge of field survey projects and of the design and construction of engineering work; to lay out and develop work from specifications and to supervise the work of draughting or computing force; or to conduct specific tests or investigations of apparatus, materials or processes.

Qualifications — Experience for at least three years of which one year shall have been spent in duties of a similar character in a subordinate position. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in absence of such degree, at least five years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

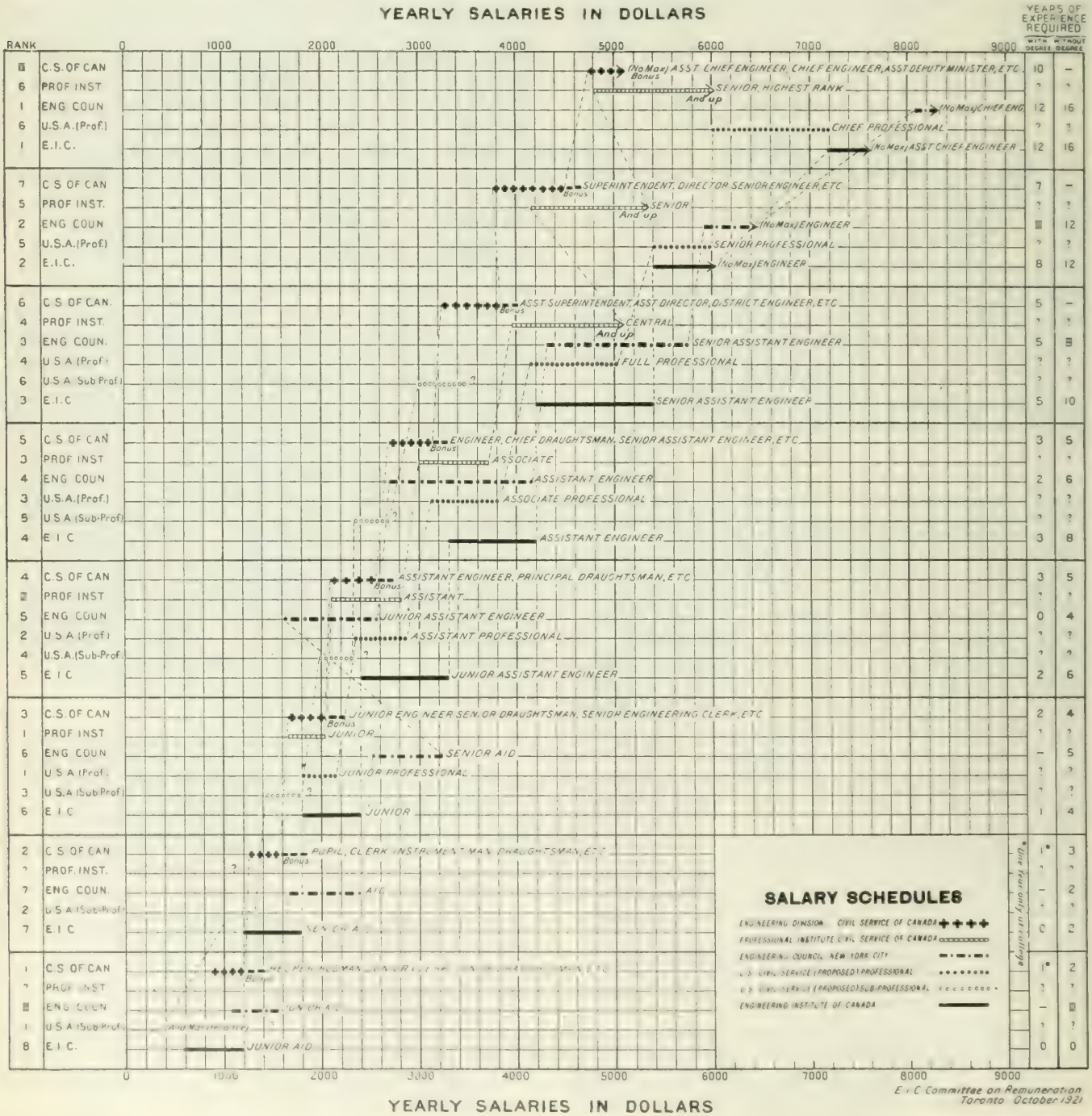
Positions corresponding to this Grade: Assistant Engineer, Estimating Engineer, Chief Engineering Draughtsman, Engineer on Construction, etc.

Grade V — Junior Assistant Engineer

Duties — Under immediate supervision to take charge of squads in draughting office; to direct work of field party on surveys or construction; to direct the work of computing surveys, estimates; to design minor engineering works; to compute and compile data for reports or records; to investigate minor details of engineering work; to perform tests of apparatus, material or processes; to have charge of inspection of engineering works under construction.

Qualifications — Experience for at least two years in duties of a similar character in a subordinate position. Fundamental training equivalent to that represented by professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in absence of such degree, education equivalent to graduation from a high school and at least four years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Positions corresponding to this Grade: Junior Assistant Engineer, Inspecting Engineer, etc.



Grade VI—Junior

Duties — To supervise the plotting of notes and maps, to perform work involving the use of surveying, measuring and draughting instruments; to take charge of parties on survey or construction work; to design details from sketches and specifications; to compute and compile data for reports or records; to inspect or investigate minor details of engineering work; to supervise construction or repair work; to check plans, surveys and other engineering data.

Qualifications — Experience for at least one year in work of a similar nature in a subordinate position. Fundamental training equivalent to that represented by a professional degree granted upon the completion of a standard course of engineering instruction in an educational institution of recognized standing, or, in the absence of such degree, education equivalent to graduation from a high school and at least three years of additional experience. The completion of each full year of such standard course shall be considered the equivalent of one year of such additional experience.

Positions corresponding to this Grade: Senior Draughtsman, Inspector, etc.

Grade VII—Senior Aid

Duties — To prepare general working drawings where design is furnished; to plot notes and prepare maps; to design simple structures; to make computations and compile data for reports and records, to prepare routine tests of apparatus or materials, to run surveying instruments and to adjust and care for same; to compute surveys and estimates to make minor engineering computations; to inspect incidentally construction or repair work.

Qualifications — Experience for at least two years in work of a nature to qualify for this grade. Education equivalent to graduation from a high school and familiarity with the use of the slide rule and to logarithmic and other simple mathematical tables. The completion of each full year of a standard course in an educational institution of recognized standing shall be considered as the equivalent of one year of the experience otherwise required.

Positions corresponding to this Grade: Draughtsman, Leveller, Transitman, etc.

Grade VIII—Junior aid

Duties — To trace and letter maps and plans; to make simple drawings from sketches and data; to make minor calculations; to run tape or levelling rod; to perform other miscellaneous subordinate duties in survey party in field or office, as directed.

Qualifications — Education equivalent to graduation from a high school.

Positions corresponding to this Grade: Tracer, Chainman, Rodman, etc.

Remuneration

In arriving at a scale of remuneration, your Committee has paid particular attention to the report of the Branches of *The Engineering Institute* as representing the opinion of the members of *The Institute* throughout Canada as to what would be a reasonable rate of compensation for engineering services in salaried positions. These reports show a very wide range in the salaries proposed, especially in the higher grades and the variation does not appear to be a question of location or the section of the country in which the report was made. The difference of opinion of different groups of men is very well exemplified by the report of the Vancouver Branch where the scale of remuneration proposed by a committee appointed by the Branch was raised from fifteen to twenty per cent, for the intermediate grades at a general meeting of the Branch.

In this report no attempt is made to give different salary schedules for different services such as "Railroad", "Municipal" or "Industrial". Duties of the same nature, or work of the same grade should command the same remuneration, other conditions being the same, whether the work is being done in the service of a railroad, a municipality or an industrial concern. The range between minimum and maximum in the salaries suggested allows latitude for the difference in the abilities of occupants of the same position in the lower and intermediate grades. Your Committee feels that it would not be warranted in suggesting salaries for the higher grades beyond stating what it thinks to be a reasonable minimum.

While the rates of remuneration proposed in this report may seem too low to many of the members of *The Institute*, your Committee felt that it would be advisable to be moderate in the first scale, that there would be danger of defeating the object for which the schedule is designed if too high a rate were proposed. Demands to an employer which to him seem unreasonable will receive but slight consideration. Nor can there be any hope of making a schedule effective if it is so high that many of the members of the profession who are not members of *The Institute* would be satisfied to accept positions at a lower salary than that proposed by the schedule.

On the other hand your Committee is of the opinion that the salary ranges for the different engineering positions in the Dominion Government service are inadequate for the professional qualifications exacted. It would seem that adjustments should be made either to give higher salary ranges for the present specifications, or reduced qualifications for the present salary ranges if it desired to attract and retain a staff of properly qualified engineers in the Government service.

The following table gives the grade, years of experience, with and without a college degree and the proposed minimum and maximum salaries for each grade:—

Grade	Title	Years with degree	Years without degree	Salary Range Min.	Max.
VIII	Junior Aid	0	0	600	1,200
VII	Senior Aid	0	2	1,200	1,800
VI	Junior	1	4	1,800	2,400
V	Junior Asst. Eng.	2	6	2,400	3,300
IV	Asst. Eng.	3	8	3,300	4,200
III	Senior Asst. Eng.	5	10	4,200	5,400
II	Engineer	8	12	5,400	no limit
I	Asst. Chief Eng.	12	16	7,200	no limit

What steps *The Engineering Institute* may take to put this or any other scheme of Classification and Remuneration into effect is not within the scope of this Committee to advise. It is the opinion of the Committee, however, that the larger part of any material improvement must come from the action of the members of the profession themselves. The value the individual member of the profession places upon his services and the remuneration he insists upon obtaining, must, in the long run, be the greatest factor in bringing about a financial improvement in the profession. It is hoped by your Committee, that this report will set an equitable standard for that value, and will be a guide to the members of the profession so that there may be some uniformity in regard to the remuneration asked for the performance of duties of a similar character.

Tariff of Fees

The Institute's committee having spent many months going into the subject finally submitted to the Council a suggested tariff of fees for members of the profession. This report which is published herewith for the first time has been received by Council, and after a thorough discussion in which nearly every member of Council took part, it was accepted by the Council on behalf of the Institute as a guide for minimum charges to apply in the absence of a definite agreement, strong recommendation being made that engineers in practice do make specific arrangement in every case.

Schedule of Minimum Charges for Services rendered by Members of The Engineering Institute of Canada in Private Practice, or acting as Arbitrators or Experts in Court.

The following schedule shall apply in absence of any specific written agreement between the professional engineer and his client.

Ordinary Consultations.

1. — For consultations which do not necessitate a written report, the charge to the client shall be established in accordance with the time spent. The basis shall be a professional day of six hours remunerated at the rate of $50.00. Charges for fraction of a day shall be made as follows, namely $30.00 for one-half of a day, and for shorter time $15.00 for the first hour or fraction of an hour, depending on the importance of the consultation.

Written Reports, Valuations, Arbitrations, and Expert Testimony

2. — For investigations or study of a project with a preliminary report based on reconnaissance only and not involving detailed surveys and preliminary plans, or for investigations or study of a report prepared by another engineer accompanied by a report on the subject, for study and report on questions in litigations for work as valuator or as arbitrator, or for preparations and depositions before a court of justice or a board of arbitration, or for attendance or evidence in Court during an enquiry, the engineer's fees shall be $50.00 per day. The client will pay besides the above, all out-of-pocket expenses incurred by the engineer in connection with the work, and shall also pay for all salaries paid for by the engineer to his assistants together with an additional sum equivalent to 100 per cent of the said salaries to cover office and overhead expenses. The client shall deposit with the engineer before the commencement of the investigations an amount equal to the estimated out-of-pocket expenses thereon.

Written Reports with Preliminary Plans and Estimates of Cost Preparatory to the Preparation of Construction Plans and Specifications

2a. — For the preparation of a written report on a project with surveys, investigations, studies and conferences, and including preliminary plans and estimates of cost, the engineer's fee shall be based upon a percentage of the estimated cost of the project as follows: — Where the estimated cost is $50,000 or less, 2 per cent, and not less than $100.00; over $50,000 and not over $100,000, 1¾ per cent; over $100,000 but not over $500,000, 1½ per cent; over $500,000 but not over $1,000,000, 1¼ per cent; over $1,000,000, 1 per cent.

In addition to the above fees the client shall pay all out-of-pocket expenses incurred by the engineer in connection with the work, and shall also pay for all salaries paid by the engineer to his assistant together with an additional sum equivalent to 100 per cent of the said salaries to cover office and overhead expenses, the client shall deposit with the engineer before the commencement of the investigation an amount equal to the estimated out-of-pocket expenses thereon, and pay to the engineer further sums from time to time as he may request to cover the salaries of assistants actually employed in connection with the project.

Preparation of Construction Plans and Specifications and Supervision of Work and Acceptance of Complete Work

3. — For the preparation of construction plans and specifications, advising on the award of construction contracts, for the supervision of construction, for the testing and acceptance of machinery or construction works, the remuneration shall be proportionate to the cost of the undertaking. Fees shall be in the first place based upon the estimate cost of the project, and in case of works proceed to construction the actual fees shall be in accordance with the total cost of the undertaking. The following percentages shall represent the fees of a professional engineer and shall include remuneration for service of his office and overhead expenses:—

Preparation of Construction Plans and Specifications

a. — For the preparation of construction drawings and specifications necessary for the receipt of tenders, the fees of the engineer shall be 3 per cent of the cost of the works, provided the estimate is for an undertaking of $50,000 or less, with a minimum remuneration of $300.00 for enterprises of a cost of $10,000 or less. The undertaking to cost over $60,000 and less than one million dollars, the fee shall be 2½ per cent of the cost, and for all expenditure over one million dollars, the fee shall be 2½ per cent on the first million dollars and 2 per cent for all expenditure in excess of one million dollars.

Supervision of Construction. Testing and Acceptance of Construction Work and Machinery

b. — *Partial Supervision.*—Partial supervision comprising consultation at the engineer's office and occasional visits to the works during the normal duration of construction shall be remunerated at the rate of 3 per cent to 2 per cent of the cost of the undertaking, depending on the importance of the works. The remuneration of the engineer shall be 3 per cent of the cost of the works, provided the estimate is for an undertaking of $50,000 or less, with a minimum remuneration of $300.00 for enterprises of a cost of $10,000 or less. For undertakings to cost over $50,000 and less than $500,000, the fees of the engineer shall be 2½ per cent of the cost, and for all expenditure of over $500,000 the fee shall be 2 per cent of the cost.

c. — *Complete Supervision.*—Complete supervision, comprising consultations at the engineer's office, visits to the works, and in addition, the necessary representative of the engineer on the works, the testing of supplies and machinery and the acceptance of machinery or works, shall be remunerated at the rate of 7 per cent to 3½ per cent of the cost of the works, depending upon the importance of same. A remuneration of 3½ per cent shall apply to undertakings of more than one million dollars, 4 per cent for works costing between $500,000 and $1,000,000, 5 per cent for works costing between $200,000 and $500,000, 6 per cent for works costing between $50,000 and $200,000, and 7 per cent for works costing $50,000 or less. The minimum remuneration for complete supervision shall be $700.00 for works of $10,000 or less.

General Conditions

4. — A day's work of a professional engineer shall be computed as six hours. Nevertheless, when an engineer is obliged to go out of the city where his office is situated, his fees, when working on the per diem basis, shall be computed for each calendar day at the rate fixed, and each 24 hours or fraction thereof shall be considered as a whole day without taking into consideration the time actually spent on the work each day.

5. — The fees of a professional engineer in case of questions in litigation are not contingent on the decisions of the court of justice, and shall be settled by the client immediately after the enquete.

6. — For reports, studies, plans and specifications, the client shall pay one-half of the fees of the engineer at the time the engineer will inform him that the preliminary studies have been terminated, and the other half shall be payable upon the delivery of the report or the plans and specifications.

7. — All test borings, assays or analyses necessary for the complete examination of any site or foundations for the erection of any structure shall be paid for by the client in addition to any other fees or percentages.

8. — If the client desires changes in accepted specifications or plans, the engineer shall be entitled to remuneration based upon the necessary delay and time required to alter such plans and specifications either by himself or by his office staff, the said remuneration to be based upon the per diem rates hereinbefore mentioned in paragraph 2.

9. — In the preparation of specifications and plans or during the supervision of construction, particular problems may arise which may necessitate calling a specialist into consultation. In such case the fees of the specialist, whose engagement must be authorized by the client, shall be directly paid by the client in addition to the fees of the engineer.

10. — The actual cost of all travelling expenses and other disbursements incurred by the engineer in connection with the supervision of works, except the salaries, travelling expenses and living expenses of his staff to and from and on the works, shall be paid monthly by the client in addition to the percentage mentioned above in paragraph 3.

11. — The percentages named for remuneration in paragraph 3 for supervision during construction are intended to cover the services of the engineer and of his staff during the period ordinarily expected to be covered by such construction, and in the event of delays occurring in the construction, through no fault of the engineer, the engineer's remuneration shall be increased to compensate him for the extra time necessarily spent by him and his staff in supervision, on the basis of the per diem rates for personal services and staff mentioned above in paragraph 2.

12. — During the construction period the monthly payments made by the client to the engineer shall not be less than $400.00 for works costing less than $10,000; $600.00 for those over $10,000 and less than $50,000; $1,000.00 for those between $75,000 and $100,000, and $1,500.00 for works costing between $150,000 and $500,000, and proportionately for works costing over $500,000. The balance of any amount due for services during the construction period shall be paid by the client to the engineer on acceptance of the complete works by the engineer.

13. — In case of bankrupcy or failure of a contractor on the construction work involving additional works on the part of the engineer over and above that contemplated in his original agreement, or in case any other work may be necessary and not directly relating to the preparation of specifications and plans and to the supervision of the work, the client shall reimburse the engineer and his staff on the per diem basis hereinabove mentioned provided in paragraph 2 for all such services.

14. — All specifications and plans, and construction documents and data are the property of the engineer. The client is entitled to a copy of plans and specifications for record purposes only and he shall not use any of these for the construction of another project without remunerating the engineer therefor.

The Electric Furnace for Iron and Steel

By Alfred Stansfield, D.Sc., F.R.S.C., M.E.I.C.

In 1907 Dr. Stansfield published a textbook on "The Electric Furnace" and six years later issued a re-written edition of the same. The present volume entitled "The Electric Furnace for Iron and Steel" which has been published within the last few months, and is devoted entirely to the use of the electric furnace in the metallurgy of iron and steel; its uses in other branches of metallurgy will be described in a later volume.

The subject is divided into three parts, the first part giving a brief history of the electric furnace and steel metallurgy and the fundamental points of the electrical requirements for this purpose. In the second part, the electrical smelting of iron ores by various methods, and the production of ferro-alloys is dealt with in a most comprehensive manner, while in the third part the manufacture of steel and the important types of electric furnaces used for this purpose are fully described. The production of sponge iron, on which Dr. Stansfield has devoted considerable time in research, is treated in a chapter on "Indirect Electric Smelting of Iron Ores". To those familiar with Dr. Stansfield's former works on the electric furnace, this latest volume will have a special appeal as representing the most recent treatise on the subject. The book is well illustrated and contains some 450 pages, and is published by McGraw-Hill Book Company, 370-372 Seventh Ave., New York.

BRANCH NEWS

Peterborough Branch

R. C. Flitton, A.M.E.I.C., Secretary.

Peterborough Branch Banquet.

At a recent meeting of the executive committee it was decided to hold this year's branch banquet on the evening of November 20th.

Toronto Branch

J. A. Knight, A.M.E.I.C., Secretary-Treasurer.

L. W. Wynne-Roberts, A.M.E.I.C., Branch News Editor.

Activities for the coming session will be resumed on October 12th, when E. J. Mehren, vice-president, McGraw-Hill Co., Inc., and editor of Engineering News-Record, will address a luncheon meeting at the King Edward hotel on "Random Thoughts on Engineering Purpose", being a commentary on the changing views on the status of the engineer and his work. The chairman's inaugural address will be given on October 18th, on "The Rise of the Engineer". It will trace the struggle of the early engineers from the time of Brindley and Smeaton to gain professional recognition and will sketch the contributions to civilization which the engineer has made and is making at the present time. On October 25th, Hon. George S. Henry, minister of public works and highways for Ontario, will speak on "The Highway Situation in Ontario".

The Fuel Committee of the branch is at work vigourously. Its labours have up to the present been directed towards co-operating with the general fuel committee of *The Institute* in securing local data for the purposes of the general study. It has seemed to the branch committee to be best to work in this way at the outset.

For the session 1923-24, all meetings of the branch, unless otherwise announced, will be held in *room 22, Mining Building, University of Toronto.* It is believed that the improved accommodation here available will react most favourably on the attendance at branch meetings.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.

W. St.J. Miller, A.M.E.I.C., Branch News Editor.

Following a luncheon at the Board of Trade rooms on August 25th, a very interesting address was delivered by C. M. Moore, superintendent of the Imperial Oil Refineries plant in East Calgary. Some fifty members of the branch were present and the guests included R. L. Dunsmore and J. J. Hanna, members of the Oil Refineries staff.

The speaker dealt with the technical details of oil treatment very ably, and impressed his hearers with his description of the magnitude and general arrangements of this particular refinery, especially emphasizing the fact that when completed it would be second to none on this continent in the up-to-date methods of refining the crude oil. The chemical process of distillation was thoroughly explained. The gathering adjourned and, under the guidance of the superintendent and his staff, left in automobiles for a visit to the refineries. Here the members were divided up into groups, and a most instructive and enjoyable time was spent. In the short time at our disposal we were only able to make a general exploration of the plant, but sufficient to enable everyone to grasp the outstanding features of interest.

Owing to the incessant noise of hammer and rivetting implements it was difficult to follow our leaders with any degree of certainty as to what was being so thoughtfully demonstrated.

A visit to the works at this stage of construction proved perhaps more interesting to the inquisitive nature of the engineers than would have been the case had the plant been completed. One could the more readily follow the progress of oil through the many processes from the tank cars to the final treatment. The internal anatomy of the multitubular Kidwell (Stirling) type boilers exhibits a fascinating construction not realized when enclosed in its outer shell, at least not to the average visitor. Pipes, scraper ash-conveyors, mechanical stokers, and other underground equipment, now exposed to view, will all be eventually hidden from the sight of the curious.

In the naphtha treatment plant we find that the acid used in the process is blown into the tanks and not pumped in, for obvious reasons. An explanation of the lead lined aerated agitation or deformation tanks proved of considerable interest. The main pump house is centrally located, containing three steam and five electrically driven duplex pumps. Another set of pumps used for distribution to the oil storage tanks at the east end comprises one steam and two electric installations. The unloading capacity will be at the rate of 45 cars of oil every 24 hours.

There are nine stills of immense size, each capable of handling 1,000 barrels of oil and arranged in groups of three stills each under one exhaust stack.

It is not the object of this account to describe this plant in detail. This we hope may be undertaken at a later date. The arrangements for handling stores and equipment, unloading and heating tank cars, construction of settling tanks, "cracking" apparatus, and a hundred other details will most probably form the subject of an interesting future address.

The works will not be completed until probably late in November, on account of the failure of equipment to arrive as expected. About 1,050 men are employed on erection work, which number will be maintained pending the arrival of the necessary material.

It was hoped to publish Mr. Moore's address in full, but owing to his absence in the east he has requested that this be postponed until his return to Calgary.

Windermere Highway

Several of the Calgary members have recently driven over the new Rocky Mountain highway and are very enthusiastic about the wonderful scenery and excellent alignment of the road. Two novices at driving went to Sinclair Springs and back without mishap of any kind and were particularly impressed by the admirable catering provided by the ladies who have undertaken this work in co-operation with the C.P.R. They have very successfully combined artistic features with a delicate suggestion of camp environment and any members venturing on the trip may rely upon courtesy and comfort at all stages of a most enjoyable holiday. One of our members is constructing the new Park Gateway at Sinclair Springs and reports much benefit from a daily immersion in the Radium Bath, with a temperature of 120 deg. F. followed by a cold dip in the adjoining mountain creek. It was pleasing to note that Canadians were well represented among the large number of tourists taking advantage of the new route.

Saskatchewan Branch

D. A. R. McCannel, A.M.E.I.C., Secretary-Treasurer.

Annual Summer Meeting

Those members and guests of the Saskatchewan Branch who were fortunate enough to be able to attend the summer meeting at Estevan, are congratulating themselves on their good fortune. The many expressions of pleasure and thankfulness for what was probably the best and most enjoyable convention ever participated in by the members under the Saskatchewan Branch; the spirit of camaraderie, and the keeness of the individual exhibited towards the success of this most important part of our annual programme, is a signification that the members will have something to look back upon with real pleasure and with the hope that the future annual function will be up to the standard of the one just terminated.

From the start from Regina, by automobiles on the morning of Thursday, August 16th — which, by the way, was made under none too clement weather conditions, the take-off being heralded by a steady downpour of rain, which, however, did not dampen the ardour of the party and which show of stoicism was rewarded after a few hours by a clear sky and continuous good weather, — to the close of the meeting, there was not a dull moment; the only expression of regret being for the limited time into which the many interesting features of the trip had to be crowded.

Without any serious delays the party arrived at Weyburn in the late afternoon where the initial part of the programme was to take place. After a very interesting inspection — which was not without its educational value, — of the large and beautiful group of buildings erected by the government as a sanatorium and mental hospital; the journey to Estevan was resumed. On arrival at Estevan, which was made shortly after midnight, the party was met by members of the Board of Trade and by J. B. Hamilton, A.M.E.I.C., town engineer, under whose direction the programme was to be carried out.

On Friday morning, the party, accompanied by several Board of Trade and Estevan city officials, motored to Bienfait and visited the Dominion Collieries mine, which is one of forty-two mines being developed adjacent to Estevan.

Various details in connection with the mine were explained by Mr. Miller, the manager, following which the party left for the Manitoba and Saskatchewan mine, luncheon was served at noon by manager Gallaway, and a vote of thanks was accorded the company for their reception. A visit to the mine workings proved very interesting, the ladies in the party making the trip, experiencing the thrills of descending in a mine cage and groping around the dim recesses of the cool underground. The mechanical appliances for cutting coal from the seam, the method of blasting and the up-to-date box car loading equipment were demonstrated and proved interesting. A visit to the briquette plant, under the guidance of resident engineer Roche, A.M.E.I.C., and the consulting chemist, A. Strong, A.M.E.I.C., enabled

the visitors to witness a demonstration of carbonization of lignite by the recently installed Hood-Odell carbonizer with which co-operative tests are being carried out in conjunction with W. W. Odell, fuel engineer of the Bureau of Mines, Washington, who explained the process of carbonization.

The party then left for a motor trip through the Souris valley to see the geological formations which proved very interesting, and a stop was made at Roche-Percée to allow for an examination of a new type of heater for use of lignite coal.

The party returned to Estevan about 6 p.m., and dinner was held at 8 p.m., at the International hotel to which the city council officers of the Board of Trade and others were the guests of the branch. Following the dinner under the chairmanship of Col. Garner, M.E.I.C., the programme was proceeded with, consisting of several toasts and a paper on "Saskatchewan Coals for Boiler and Domestic Purposes", by J. B. Hamilton, A.M.E.I.C.

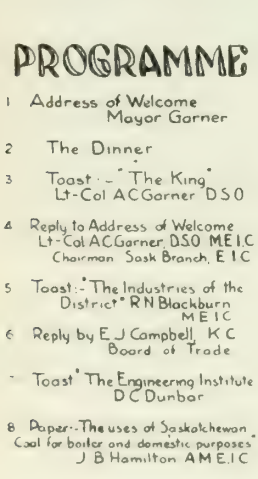
On Saturday morning the members of the party motored to the Anderson mine being a coal deposit of about fourteen feet seam depth, situated about six miles from Estevan. This deposit was being developed for local consumption and was believed to be the best grade and deepest seam in the district. Refreshments were served to the party by Mrs. Anderson, following which the party left for the Estevan Brick Company's plant, where the various processes of manufacture were explained in detail by the manager, Mr. Bannatyne.

Following the inspection of the brick plant the party were the guests of the Estevan Board of Trade to a sumptuous luncheon after which several addresses were given by members of the Board of Trade and members of the branch, under the chairmanship of C. C. Smith, President of the Board of Trade.

The party then motored to the Prairie Nurseries Limited, the largest nursery in Western Canada. The various plots were shown to the members under the direction of Mr. Torgeson, president of the nurseries. A stop was made at the nursery headquarters, where members and their friends were invited to help themselves to the beautiful flowers and an immense strawberry patch. The nursery is situated in the Souris valley, the Souris river passing through it, making the site a very attractive one and an ideal location for nursery development.

Following an enjoyable time, during which refreshments were served under the direction of Mr. Torgeson, the party journeyed back to Estevan, where the closing moments of the convention were taken up by visits to places of commercial interest, including the Estevan creamery, which is an up-to-date creamery in all respects, and the Chipawa bottling works. The majority of the members then left for the return journey to Regina, while others made a detour in order to visit Carlyle lake, and Indian Head nurseries.

1. N. McLeod, Regina.
3. R. N. Blackburn, Regina.
4. T. M. Molloy, Regina.
5. E. A. Duschak, Regina.
6. C. C. Smith, Estevan.
7. R. J. Lee, Estevan.
8. R. W. Allen, Regina.
9. K. MacKenzie, Regina.
10. T. C. Maines, Winnipeg.
11. A. Cox, Regina.
12. S. R. Parker, Regina.
13. J. B. Hamilton, Estevan.
14. J. Carpenter, Regina.
15. Mr. Halliwell, Estevan.
16. D. Bannatyne, Estevan.
17. Prof. A. R. Greig, Saskatoon.
18. Miss H. M. White, Regina.
19. C. W. Roberts, Winnipeg.
20. Lt.-Col. A. C. Garner, Regina.
21. Mrs. R. N. Blackburn, Regina.
22. Mr. Sutherland, Winnipeg.
23. Mrs. H. T. Melling, Regina.
24. H. T. Melling, Regina.
25. Mrs. M. L. Moyer, Regina.
26. H. S. Carpenter, Regina.
27. Mr. Miller, Estevan.
28. M. L. Moyer, Regina.
29. T. McGuinness, Regina.
30. D. A. R. McCannel, Regina.
31. E. Pierce, Estevan.



A Course in Industrial Metallography.

No previous knowledge assumed.

Under the auspices of the department of metallurgy at McGill University an extension course in metallography will be given as in previous years, by Messrs. Harold J. Roast, F.C.S., F.C.I.C., and Charles Pascoe, F.C.I.C.

The course consists of fifteen periods, held on Monday night at the Chemistry and Mining building, McGill University, commencing Monday November 5th, at 8.00 p.m.

Application should be made to Dr. Alfred Stansfield, department of Metallurgy, McGill University.

The fee for the course is $20.00 payable to the Bursar.

In as much as only twelve members can be accommodated at one time, students will be enrolled in order of their applications.

In past years the class has been composed of mechanics, engineers, chemists and those desiring a winter hobby, or whose business brings them in contact with metals and who desire to have more knowledge of their composition. *No previous knowledge is assumed* and the course is essentially practical from first to last.

If any students from a previous year desire to continue their work, provision will be made for an advanced course if sufficient members are obtained.

Ferrous and non-ferrous metals are dealt with equally, training being given in preparing them for examination under the microscope and finally photographing the various structures developed.

OTHER SOCIETIES NEWS

Association of Navigation Congresses

The Engineering Institute was fortunate in being represented in the XIII Convention of the Permanent International Association of Navigation Congresses, held in London, in July of this year, by C. E. W. Dodwell, Hon. M.E.I.C. Mr. Dodwell embodied an account of the convention and his experiences abroad, in a letter which was presented to Council on September the eighteenth. At this meeting it was decided that Mr. Dodwell's letter should be published in *The Journal*, as it is not only interesting in itself, but conveys information that the membership of *The Institute* will appreciate.

Dear Mr. Secretary, E.I.C.;

'Bein' as how' I had the much appreciated honour of being commissioned by *The Institute*, as its duly authorized representative and ambassador plenipotentiary, at the XIIIth Convention of the Permanent International Association of Navigation Congresses held in London in July of this year, it seems proper that I should submit to *The Institute* some account or report of my stewardship, and that the most suitable medium for this will be the columns of *The Journal*, rather than those of the *Proceedings* E.I.C.

In case the membership at large may not be informed as to the status and activities of the Permanent International Association of Navigation Congresses (fortunately its name is not longer), I may say that it is a world-wide organization, chiefly of engineers, but embracing also a number of owners, directors, or managers of steamships and steamship lines. It was formed about forty years ago, with headquarters at 38 Rue de Louvain, Brussels, and at this date it has a membership of several thousand. It only meets every second or third year and since its formation, it has only met thirteen times. The subjoined table gives the date, place and patron of each meeting:

I	1885	Brussels	The Belgian Government
II	1886	Vienna	The Crown Prince of Austria-Hungary
III	1888	Frankfort	The Emperor of Germany
IV	1890	Manchester	H.R.H. The Prince of Wales
V	1892	Paris	The President of France
VI	1894	The Hague	The Queen Regent of Holland
VII	1898	Brussels	The King of the Belgians
VIII	1900	Paris	The President of France
IX	1902	Dusseldorf	The Crown Prince of Germany
X	1905	Milan	The King of Italy
XI	1908	St. Petersburg	The Czar of Russia
XII	1912	Philadelphia	The President Taft of the U. S.
XIII	1923	London	His Majesty King George V.

The XIIth Convention held in 1912

At the XIIth meeting in Philadelphia, in May, 1912 — the only time the association had met on this continent — I was one of six engineers of the federal government that were privileged to be present; and a very brilliant occasion it was.

The total attendance was upwards of one thousand, including over six hundred engineers from thirty-four countries, and the cost of the whole event was said to be nearly $200,000, divided between the city of Philadelphia, the state of Pennsylvania and the government of the United States. The convention was opened by President Taft in the Metropolitan opera house, and the business meetings were held in the Bellevue-Stratford hotel, of which the whole of the first floor was reserved for the congress.

Many papers were read and discussed in each of the two sections into which the work of the association is divided viz: *A*. Inland Navigation. *B*. Ocean Navigation. The time spaces between sessions were tightly filled with lunches, dinners, receptions and other amenities. Alternate days were taken up with "joy-ride" visits to attractions within easy reach, and after the business of the congress was concluded, excursions were made to many places of professional and other interests, e.g.: To Trenton, South Bethlehem, Atlantic City, Washington, (where the delegates were received by President Taft in the White House), Mount Vernon, Harrisburg, Pittsburg, New York, Albany, Boston, Buffalo, Niagara, Cleveland, Detroit, Sault Ste. Marie, Milwaukee, Gary, Chicago. A contingent of delegates visited Toronto, Ottawa, Montreal, and Quebec, at each of which cities they were hospitably received and entertained at lunches, receptions and banquets. (Be it remembered that all this happened in days before this continent was invaded by the prohibition wave of insanity.)

The next congress, of the association, was to have been held in 1915, either in Budapest or Stockholm, depending, as I understood, on whether the Hungarian or the Swedish government offered the better facilities and attractions. Unfortunately, however, the Great War put a stopper on this, and the association subsided into a condition of suspended animation until the present year.

The XIIIth Convention

At a meeting of the Permanent International Commission, the governing body of the association, held at headquarters in Brussels in 1920 it was decided to hold the XIIIth congress in London in July, 1923, and to this convention, I had the dual honour of being delegated by the Honorable Minister of Public Works, and also of being the duly accredited representative of the E.I.C.

I left Quebec on the "Megantic" of the White Star Line on June 16th, arrived at Liverpool on Sunday morning, the 24th, and in London the same afternoon.

The Congress was opened by His Royal Highness, The Duke of York, on Monday morning, July 2nd, before a gathering of over 600 engineers with many ladies, in the Great Hall of the Institution of Civil Engineers, Great George Street, the Right Honorable Lord Desborough, K.C.V.O., being in the chair.

Rather to my dismay and embarrassment, I found myself the sole representative of Canada. However, as about thirty countries were represented by about 600 engineers, I was not singled out for special notice, or for responsibility that might have been anticipated by a member from so large and important a constituency as the Dominion. I regretted my solitude the more because during the proceedings numerous papers were presented and discussed relating to matters of great interest and importance to other departments of our federal government, notable those of marine and fisheries, and railways and canals respectively. The whole of the papers and contributions were brought forward by eminent engineers from widely separated countries, and discussed by specialists in their respective fields of activity and practice. To some of these subjects, I shall make brief reference if space will permit.

Protection of Timber against Destruction by Marine Insects

It is always difficult, and in many cases unprofitable, to make, or to attempt to make, comparisons between British and Canadian methods, systems, types, or developments of harbour, but common to them all are the underlying objects, uses, and principles and many of the materials and methods of construction, besides many of the problems and difficulties by which the engineer is confronted. Of the latter one of the most serious and one of the most widely distributed, is the protection and preservation of timber against the attacks of marine insects of various kinds. Of these pests the most universally prevalent and destructive are the teredo navalis, and the limnoria lignorum.

Others of less importance in our litoral waters at any rate, are the chelura terebrans, and the xylotrya. Of them all there is a voluminous scientific literature describing their habitat, structure and modes of life and activity, the result of protracted observation and experiment in many waters. The only feature of the subject that has direct interest for the engineers of Canada is the discovery and adoption of some practicable method of protecting timber in marine works exposed to the attack of these pests. A full discussion of this important subject would be out of place here, but I may say that it is the general and well considered opinion of engineers that for timber in salt water the only efficacious and practicable treatment is its impregnation with the proper quality and quantity of the dead oil of creosote, a product of the distillation of coal tar. As at the present time in our harbour construction, timber is the most important and widely used material, it is obvious that its preservation is a matter of supreme moment.

Concrete used in Harbour Works

On the coasts of Great Britain, and other European countries are many noble examples of breakwaters, moles, piers, wharves and other features of harbour works, constructed of massive blocks of cut stone, but the stone-age is passing, and at the present time and for several years past, it is being rapidly and very extensively superseded by the age of concrete, a cheaper and more widely applicable material, and which may be said to be to-day the most important in harbour construction. It is obvious therefore, that the composition, preparation, and, of no less importance, the prevention from destructive influences, of this important material, is of the greatest interest to the engineer, and not surprising that it should have been the subject of several papers and discussions at the Congress.

I had the advantage not only of hearing these papers read and discussed, but of seeing a number of typical instances of the modern and very extensive use of concrete in many harbour works of great cost and magnitude at London, Newport, Cardiff, Barry, Avonmouth, and Southampton.

The works at the last named place were of exceptional interest to me, as one of the seniors of the engineering service of the Department of Public Works, because within the past two or three decades, the development of the port has been very remarkable. Situated as it is on the south coast of England, a few hours run from the leading ports of the European main, only seventy-eight miles from London, with peculiar and eminently favourable tidal and other conditions, it possesses natural facilities and advantages, which, supplemented by commercial enterprise, have rendered it without a rival in the Kingdom, as a passenger port and as a cargo distributing centre of first importance

The present docks, with their adjuncts, cover some two hundred acres, situated at the confluence of the rivers Itchen and Test. There are no less than six dry or graving docks, of which the largest is nine hundred feet long. A floating dock is in course of construction, which will accommodate vessels of any size. There are four large and commodious wet or open docks. The whole of the piers, quay-walls and jetties are of the most solid and permanent construction, the preponderant material being concrete. They are all provided with ample sheds and warehouses for the storage of all classes of goods, and equipped with floating, rolling, and fixed cranes up to a capacity of one hundred and fifty tons, for its rapid handling in or out of vessels. The growing importance of the port is shown by the fact that an extension of the dock area is designed to reclaim over four hundred acres of foreshore and to provide four additional piers, each one thousand feet long, and three hundred feet wide, with all necessary and modern appliances and machinery. Of this projected work, to cost several million pounds, the plans are in course of preparation and work will be begun at an early date. The available depth of water at all recent and projected quay walls, piers, and jetties, is thirty-five feet at low water of spring tides.

I am led to the above rather lengthy description of the port of Southampton because I deem it to be the most instructive of all British ports from the point of view of Canadian engineers, to whom in the future will be entrusted the design of enlarged and improved harbour facilities on our Atlantic seaboard.

Let me return for a moment to the subject of concrete. Here in Canada, on the Atlantic seaboard and the coasts of the Great Lakes, our engineers in the use of this material must keep constantly in view the fact that our climatic conditions — the prevalence of temperatures below the freezing point for six months of the year — constitutes a problem of the greatest possible gravity, which practically has no counterpart in the European litoral, except in its extreme north. Here, therefore, we must not only take advantage of the latest and most approved practice in the use of concrete, as exemplified in Europe, but it must be our special endeavour to discover and apply methods for its protection from the destructive influence of frost in all waters, whether fresh or salt, subject to fluctuations of level.

I said above that in Europe constructive engineering, at least in some of its activities, was passing from the age of stone to that of concrete. It is equally true that in Canada we shall, in a not distant future, pass from the age of timber to that of concrete; and this from several considerations. In the first place, timber is steadily increasing in cost, owing, in greater measure than is generally recognized, to its universal and deplorable waste in forest fires, due largely to criminal carelessness. I believe it to be a fact that many times as much timber has been thus destroyed than ever found its way to the saw-mill. Another contributory and remediable cause for the increasing cost of timber is to be found in the feeble and utterly inadequate attempts we are making towards reforestation. Still another, is the indiscriminate and unrestricted export of pulpwood; that is to say, of trees of small size — four or five inches in diameter — which in a few years would by natural growth, be of far greater value as constructive timber for use in our own country. *This wholesale depletion of our forests ought to be stopped altogether, or largely curtailed by the imposition of high export duties.*

In the second place, as our magnificent domain increases in population, prosperity and general development, we shall be confronted by the urgent need of more permanent, extensive, and costly works of every kind, notably and especially of harbours and their various constructions and concomitants.

Relative Draft of large Vessels and Depth of Water in Harbours

Another matter of universal importance, which came up for much discussion, concerned the relative draft of large steamers and the available depth of water in harbours.

For many years a battle was waged between naval architects on the one side, and the designers of naval ordnance on the other. The efforts of the former being directed to the discovery and manufacture of armour that would resist the guns of the latter. Since naval ordnance has attained a muzzle velocity of about three thousand feet per second and a range of nearly thirty miles, the makers of armour have practically retired from the competition. In the past decade or two a corresponding contest has been going on between the builders of large steamers and the designers of harbours for their accommodation, and as between these two factions, no finality of agreement has yet been reached.

It was early assumed by steamship companies as a sound business axiom, that the carrying capacity of a vessel was the measure of its earning power; that the latter increased more rapidly than the cost of construction, and operation. Or in other words, that the cost of transportation varied inversely as the size of the carrier. Therefore, the tendency has been to increase the dimensions of steamers without due regard to the necessity of providing harbours of adequate depth of water and equipped with facilities for docking, for the landing and loading of cargo and for berthing and repairing. On the north Atlantic, steamers of 20,000 to 60,000 tons and draft of 30 to 35 feet are common, but harbours capable of accommodating them are comparatively few in number. Naturally a subject of such vital importance received attention in the proceedings of the congress. One distinguished engineer, — (M. Clavel, Inspecteur Général des Ponts et Chaussées à Bordeaux) — expressed the opinion that:

> "There is reason to believe that the increase in the size and dimensions of ships will continue in the future, without it being possible to determine the limits of this increase nor when these limits, will be attained."

The trend of the discussion and the views of the participants were that there should be conferences between those responsible for the design of ships and harbours respectively with the special view of ascertaining whether naval architects could be induced to so modify or adapt the general principles of ship design as to make it possible to increase the carrying capacity of large steamers by increases in their length and beam without further increase of their draft. Naturally such increase in the horizontal dimensions would necessitate increases in the corresponding dimensions of drydocks, but this would be a less difficult and costly matter than providing increased depths of water alongside existing wharves, jetties, piers and quay walls.

I have dwelt at greater length on this subject than I otherwise should because it has direct bearing on the harbour problems that in both the near and remote future, the engineers of Canada will be called upon to solve. Especially is the subject of immense interest and importance in its relation to the ship channel from Montreal to the gulf of St. Lawrence, destined to be, I might say now, one of the most important stretches of inland navigation in the world.

The Corrosion of Iron and Steel

The corrosion of iron and steel, was another subject of great interest that engaged the attention of the congress, and a very exhaustive paper, replete with statistical tables and photographs, was presented by Sir Robert Hadfield, Bart., F.R.S., D.Sc., Mem. Inst. C.E., the proprietor of immense steel and iron works at Sheffield, to whom I am indebted for much courtesy, both professional and personal. Some two or three years ago, I was made a member of a committee of the Institution of Civil Engineers, "On the Deterioration of Structures Exposed to Sea Action," and in 1919 I submitted a paper, which was published in the first volume of the proceedings of that committee, on the "The Destructive Influences of Tidal Waters on Concrete" with special reference to the piers that were built by the Department of Public Works in the Annapolis river in 1913-14, on my plans and under my supervision. I was also requested by the committee to conduct a series of experiments on the actual and relative corrosive action of sea water on eighteen different varieties and alloys of iron and steel, as prepared at Sir Robert Hadfield's works, and bars of metal, 114 in number, are now under exposure at the Dock Yard in Halifax by permission of the Department of Marine and Fisheries. Similar series of experiments are also being made at Aucland, New Zealand; Colombo, Ceylon; and Plymouth, England. The whole of the experiments are to cover a period of fifteen years, and valuable results are confidently expected.

Excursions and Social Functions of the Convention

In direct connection with the activities of the congress excursions were made by many engineers, and under the guidance and patronage of the local authorities, to the docks and harbour works of the port of London, to those of Liverpool, the Manchester ship canal, Newport, Cardiff, and Barry in South Wales, to Britsol and its port of Avonmouth, and to Southampton. At all these places there are works of very great magnitude and cost. Some day, whether in the near or distant future, we shall have to build on the same liberal scale, if our great country is to attain the measure of progress and development that is its due and manifest destiny.

It would, in my opinion, be a wise policy for the federal government of Canada to give opportunity to its leading executive engineers to broaden their professional knowledge and outlook by occasional visits to engineering works of a type and magnitude, not to be found in Canada.

To the serious business of the congress, interludes of a more or less social character were not lacking.

On the 2nd of July, the Rt. Hon. Sir John Baird, Bart., C.M.G., D.S.O., M.P., His Majesty's First Commissioner of Works and Minister of Transport, gave a reception to the members and delegates to the congress at Lancaster House. (London Museum.)

On the 3rd of July, the British Organizing Committee gave a dinner to the congress in the Edward VII rooms at the Victoria Hotel, London, at which a number of the members of the Imperial Ministry were present.

On the 4th of July, the Corporation of Trinity House gave a luncheon at Trinity House, and on the same day the president, the Rt. Hon. Lord Kylsant, G.C.M.G., and the council of the London Chamber of Commerce, gave a luncheon to others of the congress in the beautiful Hall of the Fishmongers Guild, E.C.

On Wednesday, the 5th of July, the Rt. Hon. Lord Mayor of London gave a very brilliant reception at the Mansion House.

On Saturday, the 7th of July, many members of the congress visited Windsor Castle, and on Sunday the 8th of July, the Rt. Hon. Lord Desborough, K.C.V.O., chairman of congress received the members and ladies at his beautiful place Taplow Court.

On the 9th of July, the members were entertained at luncheon on the S.S. "Olympic" at Southampton, by the manager and directors of the White Star Line.

On the 10th of July, the Lord Mayor of Manchester, gave a tea in the Town Hall, and in the evening the directors of the Manchester ship canal, entertained the members at dinner.

On the 11th, the Lord Mayor of Bristol entertained the congress at luncheon at Avonmouth.

On the 11th also, at Liverpool, some delegates were entertained at luncheon by members of the Dock Board, others at tea on the "Galatea" on which the members were conducted down the river Mersey to view the channel entrance to the wonderful docks of the leading shipping port of the world.

On the 2nd of July, by invitation of the agent general for Nova Scotia, I was privileged to attend the Canadian dinner at the Hotel Cecil, at which Mr. P. C. Larkin, High Commissioner for Canada, presided, and several members of government were present, notably, Mr. Amery, First Lord of the Admiralty, who made an admirable speech.

On Sunday, the 8th, by invitation of General Sir Richard Turner, V.C., and by the kindness of our High Commissioner who was good enough to give me the privilege and status of an official guest, I was fortunate enough, to be present at the unveiling, by the Duke of Connaught, of the Canadian Memorial at St. Julien, near Ypres, to mark the graves of two thousand Canadians, who gave their lives in a successful repulse of the second German attack. At this solemn and intensely interesting function, were small detachments of French, Belgian, and Canadian troops, and a number of eminent men, the Duke of Connaught, the Duke of Brabant, (Crown Prince of Belgium), Marshall Foch, whom I had the honour to meet, the Earl of Ypres, (Lord French), the Belgian Minister of the Interior, General Sir Richard Turner, V.C.; our own High Commissioner, Mr. Larkin, and others. But no doubt you have seen press accounts of the affair.

On Saturday the 11th instant, I sailed from Southampton on the "Pittsburgh" of the White Star Line, landing in Halifax, on Sunday, the 19th.

In conclusion let me ask you to convey to the Council of *The Institute* my appreciative thanks for the honour it did me in appointing me its delegate to the XIIIth Convention of the Permanent International Association of Navigation Congresses.

Yours truly,

C. E. W. DODWELL, Hon.M.E.I.C

Report of the 17th Annual Convention of the Western Canada Irrigation Association at Penticton, B.C.

by R. S. Stockton, M.E.I.C.

The programme emphasized the development of irrigation districts, and the discussion centered around the Irrigation District Law of British Columbia, methods of operating irrigation districts and the problem of settlement with especial consideration of the size of farm unit best adapted to success and to means by which the settlers under irrigation projects may be made to pay their water rental dues and the agricultural practice by which they may become prosperous.

The Hon. C. W. Nichol, Lieut. Governor of British Columbia opened the convention. Reeve E. J. Chambers of Penticton welcomed the delegates to the city. Dr. J. H. King, Minister of Public Works for the Dominion and Dr. McLean, Minister of Public Works for the provincial government, spoke to the meeting and referred to the importance of irrigation to western Canada. D. E. Fisher of Penticton acted as chairman of the meetings until the last day when the Hon. Hewitt Bostock presided. During the second day the meeting was addressed by the Hon. W. J. Bowser, former Premier of B.C. The next convention is to be held at Calgary, Alberta, sometime in June 1924.

Officers for Ensuing Year

The officers for the next year are as follows:—

Hon. Pres. — The Hon. Charles Steward, Minister of the Interior.

President — The Hon. George Hoadley, Minister of Agriculture for Alberta.

Hon. Vice Presidents — G. H. Webster, Mayor of Calgary.
L. C. Charlesworth, M.E.I.C., Dep. Minister Public Works for Alberta.
Grote Stirling of Kelowna, B.C.

Executive — A. S. Dawson, M.E.I.C., Chief Engineer, C.P.R. Dept. Natural Resources, Calgary.
F. W. Hanna, Manager Canada Land and Irrigation Co. Medicine Hat.
H. A. Howard, Vice Pres. Calgary Board of Trade, Calgary.
V. Meek, A.M.E.I.C., Acting Commissioner of Irrigation, Calgary.
T. W. Crofts, Chairman Board of Trustees, Lethbridge Northern Irrig. Dist.
E. J. Chambers, Penticton.
F. E. R. Wollaston, Vernon.
E. M. Carrothers, Kelowna.
G. S. Herringer, Maple Creek, Saskatchewan.

Papers on Irrigation

The first paper on the programme was presented by Major J. C. MacDonald of Kelowna. The subject was "Organization, Administration and Operation of Irrigation Districts" with especial reference to British Columbia conditions. This paper contained a good summary of the B.C. Improvement District Act of 1920 and the general provisions of the law in regard to irrigation districts from the standpoint of an engineer and brought forward certain points for discussion. Various speakers favoured shutting out water to force payment of operation and maintenance charges. Holding water users responsible for irrigation waste water was considered wise. The meeting was agreed that a small number of trustees was desirable for most irrigation districts.

F. W. Hanna, consulting engineer and manager for the Canada Land and Irrigation Co. of Medicine Hat, expressed very well and clearly his conclusions on this paper and the subjects selected for discussion and suggested that waste water could be largely prevented by proper preparation of the land and by care on the part of the irrigator. He favoured including all drainage operations as part of the general project cost unless very definitely confined to some particular unit. Mr. Hanna suggested that where due in advance, one years grace be given before finally shutting off water for failure to pay water rentals. He thought from three to five trustees would be desirable for an irrigation district and emphasized that the essential outline of organization for such a district should include a manager responsible to the board of trustees and empowered to engage all his assistants consisting of canal superintendents, engineers, hydrographers, water clerk, accountants, watermasters and ditchriders. In small projects the duties of one or more of these positions might be combined in one person, but none of them should be eliminated.

O. W. Moore, assistant superintendent of operation and maintenance, C.P.R. eastern section from Brooks, gave a paper on "Some Operation and Maintenance Problems". Mr. Moore outlined the qualification of men suitable for handling water and discussed their duties including methods of handling weed jams in the canals and aquatic plant growth. He also referred to the different classes of machines in use on the eastern section for earth excavation and to a new type of structure known as the "Pipe Drop"which had been built.

Professor P. R. Boving of the University of British Columbia, gave an address on "Seed Growing Possibilities".

Dr. F. B. Linfield, dean of agriculture and director of the U. S. Experimental Station at the Montana State College of Bozeman, Montana, made an address on the settlement of irrigable lands. He stated that in Montana only about 1,607,000 acres had been irrigated out of a total of 2,753,498 acres existing on complete projects. Thus calling attention to the need of settlement, Dr. Linfield proceeded to discuss the plan of operation of the California Land Settlement Board and the methods of settlement as worked out in Wisconsin on the cut over lands. He favoured long time land payments and a closely supervised settlement as had been successful in the cases above referred to. Dr. Linfield spoke again later on the results of experiment station work.

Walter Packard, superintendent of the State Land Settlement at Delhi, California, presented in a clear and forcible way an analysis of conditions governing the proper size of farm units and quoted from their experiences at Delhi to confirm the conclusions arrived at. He pointed out that according to the U.S. census figures, the average size of an irrigated farm for the entire country was from 97 to 107 acres. The U.S. Reclamation Service irrigated farm contained on the average 45 acres. Mr. Packard proposed as an average that the following sized farms would provide a good living and form the basis of a farm home on irrigated land.

For truck farming	from	10	to	20 acres
" fruit	"	20	to	40 "
" dairy	"	40	to	80 "
" grain	"	80	to	160 "

Mr. Packard went into this question from several viewpoints and in a later address again emphasized the desirability of diversification on any size farm so as to have various sources of income and produce all the food required in the farm home. He suggested dairying as a side line for the fruit farmer and showed that this was profitable on the highest priced lands if sufficiently good cows were milked.

A printed statement was handed to the delegates giving a typical settlers experience in the purchase and development of a farm at Durham under the California Land Settlement plan. A 44-acre improved farm was purchased in 1918 at a cost of $12,172 or at the rate of $276.63 per acre. On august 1st, 1922, the assets on this farm including land, buildings, equipment and stock amounted to $21,891.19 and the liabilities from land and water payments and loans was $11,037.10.

Papers on Agricultural Subjects

There were two first rate addresses on agricultural subjects. Percy E. Reed, Dairy Commissioner for Saskatchewan, spoke on "Co-operation and Dairying" and pointed out the possibilities of profit and the steady income to be derived from dairying. This address was of vital interest to the new settlers at Oliver where a sure means of livelihood until the orchards grow to bearing is a necessity.

Professor A. M. Shaw of the University of Saskatchewan, gave a paper on "Livestock on the Irrigated Farm". This was a very clear cut and forcible presentation of the fundamental requirement of livestock for a safe, secure and permanent system of farming whether on irrigated land or not. An appreciation of the basic conception of farming as presented by Prof. Shaw, is valuable to every engineer and business man, and essential to irrigation engineers engaged in building and operating irrigation systems for the purpose of increasing and making profitable agricultural production.

Inspection of Oliver Irrigation Project

The delegates were given an opportunity to inspect the Oliver or Osoyoos Irrigation Project now being constructed and developed by the B.C. Dept. of Lands. The visitors inspected the concrete weir and headworks which diverts 170 second feet of water from Okanagan river into a cement lined canal.

The canal is about 25 miles long and has a variety of structures including a rectangular concrete siphon with a cross section of 8 by 11 feet and carrying the canal under McIntyre creek. The canal crosses the valley in a 78-inch wood stave pipe siphon. There are a number of short galvanized iron metal flumes built and there is now under construction 15,400 feet of zinc metal flume of 99.3 inches diameter. There are two pumping plants using electric power from the Bonnington Falls plant about 150 miles away. There is a cement pipe factory on the project where cement pipes for the distribution system are being manufactured by contract and of very good quality.

The visiting delegates inspected the project nursery and were entertained at the Community Hall at Oliver where a good dinner was served to the delegates and settlers of the project.

The convention was a success and will have some weight in directing and moulding public opinion toward a scientific and well considered policy of irrigation development. A resolution was passed asking the British Columbia provincial government to appoint a commissioner to look into the water laws of that province with the idea of eliminating certain inconsistancies and introducing betterments if possible.

A resolution was passed asking the Dominion government to consider the necessity of proper development of water storage in the National Parks to protect the people from flood damage and to utilize the water for irrigation and power purposes and providing that this be done so as not to mar or destroy the natural beauty of the parks or render them less attractive to tourists and the people at large who wish to use them for recreation.

Second International Conference on Industrial and Engineering Standardization.

In 1921, the first conference of the secretaries of the various National standardizing bodies was held in London. In July, 1923, a second conference of a similar nature was held in Switzerland, at which the standardizing organizations of thirteen countries were represented. The sittings at this conference extended over five days, and it was attended by the following delegates:

Austria
Austrian Standards Committee for Industry and Trade: Jaro Tomaides.

Belgium
Belgian Association for Standardization: G. L. Gerard.

Canada
Canadian Engineering Standards Association: R. J. Durley, M.E.I.C.

Czechoslovakia
Czechoslovakian Standards Society: B. Rosenbaum, R. Matousch and F. Kneidl.
Masaryk Academy of Labor, Standards Committee: Jan. F. Kottland.

France
Permanent Committee for Standardization: Eug. Lemaire.

Germany
Standards Committee of German Industry: W. Hellmich.

Great Britain
British Engineering Standards Association: C. LeMaistre.

Holland
General Committee for Standardization in the Netherlands: J. Goudriaan.

Italy
General Committee for Standardization in the Mechanical Industries: Renzo Curti.

Norway
Standardization Committee of the Norwegian Industrial Association: Alf. Erikson.

Sweden
Swedish Industrial Standardization Committee: Amos Kruse.
Swedish Machine Industries Association: E. Fornander and H. Törnebohm.

Switzerland
Standards Federation of the Association of Swiss Machine Industries: H. Zollinger.

United States
American Engineering Standards Committee: P. G. Agnew.

One of the principal tasks at the conference was the interchange of information between the delegates with a view to furthering international co-operation and the development of engineering and other industrial standards along parallel lines. Arrangements made with this view at the first conference were considered in light of the experience since gained, and modifications suggested by this experience were discussed. It is evidently important for this purpose that the interchange of information regarding proposed standards, whether dimensional or other, should take place at the earliest possible stage of their development, and it is believed that the steps taken at the conference will lead to a marked improvement in this respect.

Among other topics dealt with may be mentioned, — the methods to be adopted for promoting the practical use of published standards in the various countries, the means to be employed for giving publicity to the work, and informing the public as to the advantages of standardization, the interchange of information as to the organization and working methods adopted by the various standardizing offices. Provision was made for continuing the work of the conference, and a committee was appointed to deal with the difficulty which has arisen in finding the exact equivalents in various languages for the technical terms used in standardization.

The discussions were most amicable. The Swiss committee did everything for the comfort as well as the entertainment of the secretaries and in addition to giving a dinner and a lunch, at which members of the Swiss committee were present, they offered the secretaries a visit through the most superb mountain districts of Switzerland, ending with the ascent of the Jungfrau by the new electric railway. The arrangements made by the Swiss secretary were so perfect in every detail that this excursion added in no small degree to the harmony of the proceedings. The secretaries thus had an opportunity of coming into more intimate touch with each other than was possible during the long conference carried on in three languages, and exchanged ideas on many points not discussed at the meetings.

The conference being entirely unofficial has no executive authority, and the recommendations made by the secretaries as a whole will be placed before the executives of their respective National organizations.

Announcement of Meetings

Toronto Branch:— *Secretary-Treasurer, J. A. Knight, A.M.E.I.C., Hydro-Electric Power Commission of Ontario, 190 University Ave., Toronto, Ont.*

Oct. 12th. Luncheon: Address by E. J. Mehren, vice-president, McGraw-Hill Company, In., and editor of the Engineering News-Record, on "Random thoughts on Engineering Purpose".

Oct. 18th. Chairman's inaugural address, on "The Rise of the Engineer".

Oct. 25th. Address by The Hon. George S. Henry, Minister of Public Works and Highways for Ontario, on "The Highway Situation in Ontario".

Montreal Branch:— *Secretary-Treasurer, E. A. Ryan, A.M.E.I.C., 128 Bleury Street, Montreal, Que.*

Oct. 4th. Civil: "St. Lawrence Deep Waterways", by E. A. Forward, B.Sc., M.E.I.C., consulting engineer, Montreal, Que.

Oct. 11th. Electrical: "The Effects of Power Factor; Load Factor and Diversity Factor, on the Cost of Power", by Prof. C. V. Christie, M.Sc., A.M.E.I.C., of McGill University.

Oct. 18th. Mechanical: "Fuel Economizers", by J. B. Hesford, of E. Green & Sons, Ltd., Wakefield, England.

Oct. 25th. Industrial: "Recruiting and Training Methods in a large Electrical Industry", by John Mills, Educational Director of the Engineering Department, Western Electric Company, New York, N.Y.

Preliminary Notice

of Applications for Admission and for Transfer

September 19th, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in October, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be condisered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects, geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BARLTROP—IVAN CHARLES, of Medicine Hat, Alta. Born at Dover, England, Jan. 28th, 1892; Educ., B.A. [illegible] and Mech'l Sciences Tripos, Queen's College, Cambridge Univ., 1914; 1914-20, Royal Engrs. [illegible], Capt.; March 1920 to date, engr. on staff of Canada Land and Irrigation Co. Ltd., Medicine Hat, Alta.

References: J. L. Frazen, D. W. Hays, A. C. Gardner, V. M. Meek, H. G. Dinsdale.

BEATON—GEORGE, of 212 Whitney Avenue, Sydney, N.S. Born at Paisley, Scotland, May 5th, 1879; Educ., 2 years technical school; 1902-05, asst. supt., Terra Nova Foundry and Marine Repair Co., St. John's Nfld.; 1906 to date, shops supt., design, manufacture and report, steel works and mining machinery, Dominion Iron and Steel Company, Sydney, N.S.

References: G. D. Macdougall, A. P. Theuerkauf, J. H. Fraser, W. S. Wilson, H. Longley, W. G. Wilson.

DRAKE—ROBERT LUDLOW, of Ottawa, Ont. Born at Ottawa, Ont., Sept. 24th, 1893; Educ., Ottawa Collegiate Institute. Private studying; 1912, rodman, C.N.R.; 1913, rodman, C.P.R. irrig. dept., Calgary; 1913-14, concrete and material tester, and timber inspr., C.P.R. irrig. dept.; 1914-19, overseas; Can. Engrs.; 1919-22, instr'man., and 1922 to date, junior engr., reclam. service, Dept. of the Interior, Ottawa, Ont.

References: J. B. Challies, G. F. Richan, W. F. M. Bryce, S. H. Hawkins, S. G. Dawson, J. S. Tempest, H. R. Cram.

HERD—WALTER, of Sydney, N. S. Born at Kirkcaldy, Scotland, Dec. 23rd, 1883; Educ., technical course, Heriot Watt College, Edinburgh. 4 years ap'ticeship with mining engr.; 3 years asst. to colliery manager, Scotland,England and South Wales; 1 year colliery manager, Fifeshire, Scotland; 1 year asst. to general manager, United Collieries, Scotland; 1911-12, asst. mining engr., Dominion Coal Company, Glace Bay, N.S.; 1912-13, manager, Wabana Mines, Wabana, Nfld.; 1913-14, supt., Springhill Mines; 1914-16, asst. mining engr., Dominion Coal Co.; 1916-19. overseas; 1919 to date, mining engineer, Dominion Coal Company, Glace Bay, N.S.

References: D. H. McDougall, G. D. MacDougall, T. J. Brown, F. W. Gray, C. M. Odell, J. S. Whyte.

MORROW—THOMAS MACLELLAN, of La Gabelle, Que. Born at St. John, N. B., Sept. 18th, 1883; Educ., B.Sc., McGill Univ., 1913; 1912 (4 mos.), asst. on survey mines branch, dept of mines; 1913 (3 mos.), with Loomis-Dakin Ltd., Sherbrooke, Que.; 1913-16, engr. on constrn., E. G. M. Cape Co. Ltd., Montreal; 1916 (3 mos.), inspr. on dam at St. Hyacinthe, Que. for T. Pringle & Sons, Ltd.; 1916-18, inspecting supt., on C.G.R. elevator at St. John, N. B., for John S. Metcalfe Co., Ltd.; 1918 (3 mos.), engr. on constrn., Grant & Horne, St. John, N.B.; 1918-19, supt., David R. Brown & Hugh Vallance, Archts., Montreal; 1919 (4 mos.), supt. of constrn., Bate & McMahon, Ottawa; 1919-20, engrg. staff, Austin Co., Berthierville, Que.; 1920-22, general contracting, Montreal; 1922 (7 mos.), field engr., St. Lawrence Paper Mills, Ltd., Three Rivers; 1922 (2 mos.), on survey work, Walter J. Francis, Co Ltd., Montreal; At present, field engr., Shawinigan Engineering Co., La Gabelle, Que.

References: J. J. O'Sullivan, M. J. Rutledge, L. B. Kingston, E. A. Ryan, C. Luscombe. F. O. White, J. Weir.

SAMPSON—CYRUS DEXTER, of Glace Bay, N. S. born at Halifax, N.S., Jan. 1st, 1897; Educ., 1 year surveying, N.S. Tech. Col.., 1½ yrs. engrg. course, Acadia University; 1916-18, with Can. Engrs., France; 1919-23, dftsman., transitman and asst. engr., Provincial Highway Board of Nova Scotia; Jan. 1923 to date, designing and dfting., Dominion Coal Co. Ltd., Glace Bay, N.S.

References: J. A. Fraser, S. C. Mifflen, H. C. Chipman, W. M. Sutherland, J. E. Belliveau, J. K. McKay.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

SWAN—ALBERT WILLIAM, of 8 Castle Way, Hanworth, Middlesex, England, Born at Glasgow, Scotland, April 4th, 1893; Educ., B.A.Sc. Univ. of Toronto, 1917; 1916 (summer), steel inspr. under Imperial Munitions Board, at Amer. Rolling Mill Co., Middleton, Ohio; 1917-18, time study, etc., production dept., and 1918-19, engr. preparing advertising and technical literature, Can. Ingersoll Rand Co. Ltd. Sherbrooke, Que.;1919-21, asst. editor,The Engineering Journal, Montreal; 1922 (May-Sept.), production investigation, Sterling Telephone Co. Dagenham, Essex, England, and since Sept. 1922 in charge works office and progress for same company.

References: H. V. Haight, E. T. Spidy, H. C. Nourse, A.M. Snider, A. F. Hanly, N. M. Campbell, F. S. Keith.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

FRASER—THOMAS BRYANT, of Iroquois Falls, Ont. Born at Montreal, Que., Aug. 19th, 1902; Educ., junior matric., eng., science and maths., 1920 surveying, Central Tech. School, Toronto, 1921. I.C.S. surveying and mapping; 1919 (summer), on township survey, Lewis & McRostie, Ottawa; 1920 (winter), asst., city surveying, H. C. Sewell, Toronto; 1921 (May-Nov.), rodman, power house constrn., H. E. P. C., Queenston, Divn. 4; 1922, to date, instr'man., Abitibi Power & Paper Company, Iroquois Falls, Ont.

References: G. G. Gale, N. B. McRostie, W. Jackson, W. B. Crombie, J. M. Gilchrist, [illegible] R. Moore.

McLEAN—BASIL M., of Eldred, Pa., U.S.A. Born at Toronto, Ont., August 28th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1921; 1917 (summer), foreman, TNT Plant, British Chemical Co., Trenton, Ont.; 1918 (summer), chemist, British Acetones, Toronto. Ltd.; 1920 (summer), foreman, Can. Electro Products Co. Ltd., Shawinigan Falls, Que.; Sept. 1921 to date, petroleum engr., The Sloan and Zook Company, Bradford, Kane, and Eldred, Pa., U.S.A.

References: R. W. Angus, P. Gillespie, C. R. Young, J. W. Bain.

PEARSE—WARWICK G., of Toronto, Ont. Born at London, Ont., April [illegible], 1886; Educ., B.Sc. Queen's Univ., 1914; 1911 (summer), rly. constrn., [illegible] Rly.; 1912 (summer), rodman, city engr's dept., London, Ont.; 1913 [illegible] man, mtce. of way, G.T.R.; 1914-15, res. engr., with Chapman and Power; 1915-19, overseas, Can. Engrs.; 1919-20, contractor's engr., W. E. Wood Co., Detroit, Mich.; 1920 to date, designer, works dept., City of Toronto, Ont.

References: G. F. Paterson, J. H. Irvine, J. H. Curzon, F. J. [illegible], G. [illegible], J. C. Murton.

The Planning of the Modern City.

by Nelson P. Lewis, M.Am.Soc.C.E.

Reviewed by James Ewing, M.E.I.C.

It is not surprising that this well known, standard work on city planning, unlike most other volumes on the same subject, has reached its second edition, revised and enlarged. For of all the published books covering or attempting to cover the great question of the design and control of city development in a complete and comprehensive way, this is the most outstanding, going as it does right down to the roots of things, and working up in a scientific, analytic and entirely commonsense manner that is at once satisfying and convincing.

Its appeal is frankly and chiefly made to the student of town planning from an engineering point of view since it deals with fundamental, organic and economic conditions and principles, and an intelligent perusal of the book will completely dispel the unfortunate and altogether too common illusion that city planning is mostly a matter of superficial embellishment.

Notwithstanding the depth and thoroughness of the treatise, it need not be imagined that its style is heavy or abstruce, for the writer is a master of terse, vivid and even epigramatic English, and through it all runs an engaging strain of human interest and friendliness that reflects the author's personality as a man of keen sympathy and understanding, and not without occasional but well subdued touches of intriguing humour.

The book covers a wide range of descriptive, historic and geographic interest both in the old world and in the new, but its main motif is in its adaptation to present day western conditions and requirements, and in its profound and able handling of the problems confronting us and the best methods for their solution.

It is particularly refreshing to note the triumphant optimism that sees in the worst conditions and most formidable obstacles prevailing in our most congested cities possibilities and opportunities for working wonderful improvements at a cost which, with proper handling, can be made to pay for themselves in increased property values. This is in striking contrast to the pessimistic school which regards such conditions as so far gone and beyond redemption that the only thing to do is to leave them alone and to plan and built better elsewhere.

The first edition of the book was published in 1916, and the latest developments in the science of city planning are embodied in the newer edition which incorporates also the most up-to-date phases in regional planning that has more recently been coming into vogue. Some of the chapters have been largely or entirely re-written and special stress has been laid on the question of zoning which has been making wonderful strides and gaining increasing acceptance amongst former short sighted and self interested opponents such as real estate men and land proprietors themselves.

The book is well but not overburdeningly illustrated with plates and diagrams, which in this case are pertinent to the text.

Throughout will be found most interesting and refreshing reading for both layman and professional, a general clearing away of prevailing misconceptions and an illumining of dark and confused issues. It should prove a powerful stimulant to the propagation of the commonsense town planning idea, and as that idea progresses there will be constantly increasing demand for the book, it is safe to say that the second edition is unlikely to be the last. This book is published by John Wiley and Sons, Inc., New York.

Tables and Units for Engineering Students

By C. A. Walker, A.M.I.Mech.E., M.I.Mar.E., and W. S. Ibbetson, B.Sc,. A.M.I.E.E., M.I.Mar.E.

This book contains in a very cheap and portable form a large number of Tables, Constants, Units and Symbols which have been specially prepared to meet the needs of students in Trade and Technical Schools, Colleges and Universities in the subjects of Mechanical and Electrical Engineering. They are mainly intended as a ready reference for values and definitions of the Units, Constants, etc., commonly used in science and engineering classes and laboratories.

The Conversion Tables are particularly useful, as they make clear the relationship between the various sections of study usually so difficult of comprehension by the ordinary student.

The international system of Electrical Units and Symbols has been set out in detail to encourage and assist students to master the difficulty of their general adoption and use.

This book will be found to be a valuable and efficient aid to all classes of students of science and engineering. It is published by E. & F. N. Spon, Ltd., London S.W.1.

Publications Received During the Month.

Transactions, Proceedings, etc,

Presented by the Societies.

Proceedings of the Engineering Society of Queen's University, Kingston, Canada, No. 17, 1923.

The Transactions of the Canadian Institute of Mining and Metallurgy and of the Mining Society of Nova Scotia, 1922. Volume XXV.

Proceedings of The Engineers' Society of Western Pennsylvania. Volume 39, No. 4. May 1923.

Proceedings of The Engineers' Society of Western Pennsylvania. Volume 39, No. 5. June 1923.

Transactions of the Institution of Civil Engineers of Ireland. Volumes XLVII and XLVIII.

The Proceedings and Transactions of the Nova Scotian Institute of Science, Halifax, Nova Scotia. Volume XV, part 2, session of 1919-1920.

Proceedings of the Royal Society of Edinburgh. Session 1922-1923. Volume XLIII, part 2.

Annual Report of the Association of Dominion Land Surveyors together with the papers read at the Sixteenth Annual Meeting, held at the Chateau Laurier, Ottawa, on the 7th and 8th, February, 1923.

Reports

Presented by Dominion Water Power Branch, Department of the Interior, Canada.

Surface Water Supply of Canada, Arctic and Western Hudson Bay Drainage (and Mississippi Drainage in Canada) in Alberta, Saskatchewan, Manitoba, and Western Ontario Climatic Year 1920-21. Water Resources Paper No. 36.

Presented by Geological Survey, Department of Mines, Canada.

Summary Report, 1922, Part A.

Summary Report, 1922, Part D.

La Région de Beauceville (Québec) par B. R. MacKay. Mémoire 127.

The Southern Part of the Sydney Coal Field, Nova Scotia, by A. O. Hayes and W. A. Bell. Memoir 133.

Brockville-Mallorytown Map-area, Ontario, by J. F. Wright. Memoir 134.

Presented by Department of Mines, Canada, Victoria Memorial Museum.

An Album of Prehistoric Canadian Art, by Harlan I. Smith. Bulletin No. 37. June 1, 1923.

Presented by Department of Public Works, Canada.

Reviews of Articles dealing with Improvement of Rivers and Harbours. Fraser River Estuary.

Presented by Department of Mines, Province of Ontario.

Hydro-Electric Development for Gold and Silver Mines of Northern Ontario, by A. R. Webster, Inspector of Mines. Bulletin No. 46.

Presented by Hydro-Electric Power Commission of the Province of Ontario.

Fifteenth Annual Report of the Hydro-Electric Power Commission of the Province of Ontario for the year ended October 31st, 1922.

Presented by Department of the Interior, Bureau of Mines, Washington, D.C.

Explosives, their materials, constitution, and analysis, by C. A. Taylor and Wm. H. Rinkenbach. Bulletin 219.

Presented by The Commonwealth of Massachusetts.

Annual Report of the Metropolitan District Commission, for the year 1922, Third Annual Report.

Presented by the Department of Commerce, Washington, D.C.

Circular of the Bureau of Standards, "Invar and Related Nickel Steels". No. 58, 2nd edition, June 22, 1923. Scientific Papers of the Bureau of Standards, "Alternating-Current Resistance and Inductance of Single-Layer Coils", by C. N. Hickman, Physicist. No. 472, part of volume 19. May 3, 1923.

Presented by The Joint New England Railroad Committee.

Report of the Joint New England Railroad Committee to the Governors of the New England States, Rehabilitation by co-operation, A railroad policy for New England, June 1923.

Presented by Gauthier-Villars et Cie, Paris.

Les Méthodes Modernes d'Organisation Industrielle, par L. Benoist, avec exemples du Calcul des Temps d'Usinage en Construction Mécanique, par Hermann.

Presented by The British Cast Iron Research Association.

Bureau Bulletin of the British Cast Iron Research Association, No. 1, January 1923.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

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A

ABRASIVES

HARDNESS DETERMINATION. Determination of Hardness of Abrasive Materials (Härtebestimmung von Schleifmaterialien), Walter Mindt. Werkstattstechnik, vol. 17, nos. 11 and 12, June 1 and 15, 1923, pp. 321-326 and 360-367, 34 figs. June 1: Development of methods for determining hardness; mathematical formulas of hardness; empirical determination of constants; relation between grinding efficiency, size of grain and quantity of abrasive: tables and curves. June 15: Experimental results and mathematical formulation of measure of hardness; scope of application of method.

ACCOUNTING

PUBLIC-SERVICE CORPORATIONS. Amortization and Depreciation of Public Service Corporation. Geo. H. Johnson. Jl.of Accountancy, vol. 36, no. 1, July 1923, pp. 7-14. Uniform systems of accounting; rule for general amortization; errors most commonly made in application of rules; results of war inflation, changing prices, and costs of replacements.

AERONAUTICAL INSTRUMENTS

CONTROL FORCE RECORDER. Notes on the N.A.C.A. Control Force Recorder, H. J. E. Reid. Nat. Advisory Committee for Aeronautics—Technical Notes, No. 150, July 1923, 4 pp. 4 figs. on supp. plates. Emphasizes desirability of using recording instruments in investigation of characteristics of airplanes, with particular reference to Nat. Advisory Committee for Aeronautics control force recorder: description of instrument developed by technical staff of N. A. C. A. to be used as a laboratory instrument for investigations on different types of aircraft.

DIAPHRAGMS FOR. Diaphragms for Aeronautic Instruments, M. D. Hersey. Nat. Advisory Committee for Aeronautics, Report No. 165, 1923, 32 pp., 5 figs. Outline of historical developments and theoretical principles, together with discussion of expedients for making most effective use of existing diaphragms; summary of experimental research problems.

AIR COMPRESSORS

OPERATION AND UPKEEP. Air Compressor Operation and Upkeep. Textile World, vol. 63, nos. 15 and 16, Apr. 14 and May 5, 1923, pp. 85, 87 and 90 and 82 and 84 5 figs. Suggestions for textile installations; storage tank and piping arrangements; lubrication, removing carbon deposits; cost of leaks; cleaning cylinder, valves and receiver, benefits of reducing temperature and having air as dry as possible; etc. Extracts from Massachusetts regulations governing equipment.

TURBO-COMPRESSORS. Turbo-Compressors at the Bentinck Colliery. Iron & Coal Trades Rev., vol. 107, no. 2891, July 27, 1923, pp. 115-116, 3 figs. Set is of Rateau type manufactured at Fraser & Chalmers Eng. Works of Gen. Elec., Co., and has normal duty of 10,000 cu. ft. of free air per min. compressed to 80 lb. per sq. in. above atmosphere, details of low-pressure engine.

AIR CONDITIONING

AIR COOLING. The Cooling of Air With a Few Notes on Air Filters, J. Roger Preston. Domestic Eng. (Lond.), vol. 43, no. 7, July 1923, pp. 135-139, 2 figs. How conditions approaching ideal may be obtained in a building when it is hot and humid outside, taking wet bulb of 54 deg. to 58 deg. as a basis.

AIRCRAFT

CONTROL IN WARFARE. A Proposed International Aircraft Code. Aviation, vol. 15, no. 2, July 9, 1923, pp. 44-47. Commission of jurists drafts rules making aircraft conform to established usage of warfare.

See also Airplanes; Airships.

AIRPLANE ENGINES

DIFFERENTIAL COUPLING. Airplane Engines and Differential Coupling (Le système moteur-avion: L'accouplement différentiel), A. Le Bidolec. Technique Automobile et Aérienne, vol. 14, no. 121, 1923, pp. 45-50, 7 figs. Evolution of airplane engine; decrease in weight, increase in power and safety, multiple shafts, two-, three- and four-engine differential couplings, and their relative efficiency.

FLEXIBLE MOUNTING. The Flexible Mounting of the Airplane Engine, K. Kutzbach. Nat. Advisory Committee for Aeronautics—Technical Notes, No. 148, July 1923, 5 pp. Deals with suggested installation, of "unbalanced" 8 cylinder V-engine, in that a flexible mounting be used instead of bolting engine rigidly to airplane structure, idea being that flexible mounting would be so adapted that vibrations due to inertia effects would, as it were, "damp themselves out." From Technische Berichte, vol. 3, Pt. 4.

FORCES AND STRESSES, CALCULATION OF. Standard Method of Engine Calculations. Air Service Information Circular, vol. 5, no. 421, Apr. 1, 1923, 36 pp. 27 figs. Outlines and describes methods adopted by Engine Design Branch of Engineering Division, Air Service, for determining forces and analyzing stresses existing in principal parts of an airplane engine.

HIGH-SPEED. Influences in the Selection of a Cycle for Small High Speed Engines Running on Solid or Airless Injection with Compression Ignition, Robertson Matthews. U. S. Nat. Advisory Comm. for Aeronautics, Technical Notes, no. 149, July 1923, 14 pp., 4 figs. Limiting conditions in determining form of pressure-volume diagram are indicated mean effective pressure, fuel economy, and permissible maximum pressure. Consideration of these conditions.

AIRPLANES

ACCELERATIONS WHILE MANEUVERING. The Vertical, Longitudinal, and Lateral Accelerations Experienced by an S. E. 5A Airplane while Maneuvering, F. H. Norton and T. Carroll. U. S. Nat. Advisory Comm. for Aeronautics, Report no. 163, 1923, 3 pp. 7 figs. Investigation carried out at Langley Field Laboratory. Instruments used were N. A. C. A. three-component accelerometer and recording airspeed meter.

AIRFOILS. Two-Dimensional Aerofoil Theory, Muriel Glauert. Roy. Aeronautical Soc.—Jl. vol. 27, no. 151, July 1923, pp. 348-366, 16 figs. Account of certain methods developed by Joukovsky, Mises and other for calculating forces experienced by body of airfoil shape in stream moving in fixed direction with uniform speed.

FLAPPING-WING. New Experiments with Machines with Flapping Wings (Ueber neue Versuche mit Schwingenfliegern, Manfred Reiffenstein. Zeit. für Flugtechniku. Motorluftschiffahrt, vol. 14, nos. 11-12, June 26, 1923, pp. 90-97, 18 figs. Investigations made with models of a Wels flying machine of phenomena occurring with wings in active motion under discharge of energy in the air.

LIFT DISTRIBUTION. The Distribution of Lift Over Wing Tips and Ailerons, David L. Bacon. Nat. Advisory Committee for Aeronautics—Report, no. 161, 1923, 24 pp., 29 figs. Investigation carried out in 5-ft. wind tunnel of Langley Memorial Aeronautical Laboratory for purpose of obtaining more complete information than was heretofore available on distribution of lift between ends of wing spars, stresses in ailerons, and general subject of air flow near tip of wing.

PRESSURE DISTRIBUTION. The Pressure Distribution Over the Stabilizer of the Vought VE-7 Airplane. Air Service Information Circular, vol. 5, no. 419, Apr. 1, 1923, 24 pp., 21 figs. Determination of pressure distribution over horizontal surfaces of VE-7 airplane at various altitudes of flight, apparatus and methods.

RESEARCH. Exponential Law of Variation of Drift and Lift of Models of Airplanes and Wings at Various Velocities, G. Costanzi, and Mario Bernasconi, Aerial Age, vol. 16, no. 7, July 1923, pp. 325-329, 7 figs. Progress of research work conducted by authors in aerodynamic laboratory of Experimental Aeronautic Inst. of Rome.

SPEED MEASUREMENTS. Speed Measurements made by Division "A" of the Airplane Directorate (Flugzeugmeisterei), Subdivision for Flight Experimetns, V. Heidelberg and A. Hölzel. Nat. Advis. Comm. for Aero., Tech. Notes, no. 147, July 1923, 20 pp., 20 figs. Gives order of magnitude of airplane speeds rather than their accurate values. Reliable speed measurements cannot be carried out above 2000 meters with customary methods. From Technische Berichte, vol. 3, no. 5, pp. 174-179, 1918.

WING PROFILES. A Comparison of Some Modern Wing Profiles, Matthew B. Sellers. Aviation, vol. 15, no. 7, Aug. 13, 1923, pp. 182-183, 1 fig. Eleven optimum profiles selected from N. A. C. A. reports satisfy requirements of most airplanes.

WING RIBS. The Strength of Wing Ribs. Air Service Information Circular, vol. 5, no. 443, May 1, 1923, 18 pp., 18 figs. Summarizes results of a study of all available American data on strength of wing ribs in order to develop a standard of comparison for new designs; develops for this purpose curves based on strength weight ratio.

WING SPARS. The Effect of Eccentricities on Stresses in Airplane Spars. Air Service Information Circular, vol. 5, no. 438, May 1, 1923, 10 pp., 10 figs. Illustrates and compares methods of analyzing and computing effect of eccentr cities in wing fittings on moments, shears, and stresses in wing spars.

AIRSHIPS

HELIUM IN. The Employment of Helium in Airships, A. Crocco. Aviation, vol. 15, no. 4, July 23, 1923, pp. 97 and 100. Consumption during navigation, osmotic diffusion; replacement on account of washings.

ALIGNMENT CHARTS

CONSTRUCTION METHOD. Practical Construction of Alignment Charts, R. T. Livingston. Power Plant Eng., vol. 27, no. 16, Aug. 15, 1923, pp. 824-826, 4 figs. Their purpose, methods of use, and outline of method of construction.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

LIGHT AND EXTRA LIGHT. Light and Extra-Light Alloys. Engineering, vol. 116, no. 3006, Aug. 10, 1923, p. 172. Discusses relative methods of both, and points out advantages of extra light alloys.

RUST-RESISTING. Rust-resisting Alloys, W. R. Douglas Shaw. Mech. World, vol. 74, no. 1906, July 13, 1923, p. 25. Survey of number of alloys in light of existing knowledge.

ALUMINUM

CORROSION OF. Aluminum from a Corrosion Point of View, W. R. Douglas Shaw. Beama, vol. 13, no. 64, Aug. 1923, pp. 100-102. Aluminum alloys and their non corrodible properties; aluminum foil; solder and corrosion; aluminum applied in form of oxide coating to protect other metals from certain acids.

SHEET, PROPERTIES OF. The Mechanical Properties of Sheet Aluminum, A. G. C. Gwyer. Birmingham Met. Soc., Jl., vol. 8, no. 2, 1923, pp. 33-49 and discussion 49-52, 13 figs. Describes experiments which were carried out with object of determining certain mechanical properties of sheet aluminum, but which are also of interest in connection with sheet metal generally; methods and machines for hardness testing.

ALUMINUM ALLOYS

ALUMINUM-TITANIUM. Aluminum-Titanium Alloys and the Influence of Titanium on Aluminum. (Aluminium-Titan-Legierungen und der Einfluss des Titans auf Aluminium), Eugen van Erkelens. Metall u. Erz, vol. 20, no. 11, June 8, 1923, pp. 206-210, 1 fig. Investigation of diagram of state, favorable influence of titanium on aluminum seems to be due to dispersion of nitrogen and oxygen present in aluminum.

ALUMINUM-ZINC-TIN. The Ternary System Aluminum-Zinc-Tin. (Il sistema ternario alluminio-zinco-stagno), E. Crepaz. Giornale di Chimica Industriale ed Applicata, vol. 5, no. 3, Mar. 1923, pp. 115-122, 5 figs. Discusses tin-zinc and aluminum-tin alloys, and their manufacture, electrical properties, etc.; results of experiments.

ANALYSIS. The Analysis of Light Aluminium Alloys. Metal Industry (Lond.), vol. 23, no. 3, July 20, 1923, pp. 45-47. Sampling; estimation of copper, lead magnesium, manganese, silicon, iron, zinc, and aluminum. Translated and slightly abridged from Chaleur et Industrie.

ASBESTOS

QUEBEC INDUSTRY. The Quebec Abestos Industry, Ernest Booker. Can. Min. Jl., vol. 44, nos. 27 and 29, July 6 and 20, 1923, pp. 510-511 and 546-548, 5 figs. July 6: Losses in milling of asbestos. July 20: Efficiency in milling asbestos.

AUTOMOBILE FUELS

ALCOHOL. Alcohol as a Motor Fuel (L'emploi de l'alcool comme carburant), Eugène Grandmougin. Génie Civil, vol. 83, no. 1, July 7, 1923, pp. 5-8. Discusses question of production on a large scale and low price; process for production, including chemical; improvements necessary in fermentation process; use of beet sugar.

Paris Buses Test Efficiency of Alcohol as Engine Fuel. Automotive Industries, vol. 49, no. 6, Aug. 9, 1923, p. 257. Experiments show 50-50 mixture with benzol best from dual standpoint of stability and economy; product should be of highest purity to reduce oxidation and carbonaceous deposits.

DEWPOINT DETERMINATION. Direct Determination of Dew Points of Gasoline-Air Mixtures, W. A. Gruse. Indus. & Eng. Chem., vol. 15, no. 8, Aug. 1923, pp. 796-799, 5 figs. Method for direct determination of dewpoints in proportions required for internal-combustion engines; suggested as suitable for comparison and evaluation of motor fuels.

GASOLINE. *See Gasoline.*

AUTOMOBILE MANUFACTURING PLANTS

FRANKLIN CO. PRODUCTION METHODS. Seeking Simple Production Methods Saves Time and Money, W. L. Carver. Automotive Industries, vol. 49, no. 6, Aug. 9, 1923, pp. 276-280, 11 figs. Special department at Franklin constantly studies manufacturing system; has simplified many operations and reduced cost materially without installation of expensive equipment; portable electric and pneumatic tools help to effect economy.

AUTOMOBILES

BRAKES. Four-Wheel Brakes. Autocar, vol. 51, no. 1449, July 27, 1923, pp. 153-157, 11 figs. Practical experiences with cars having brakes on all four wheels; likelihood of many standardized types of cars having four-wheel brakes in 1924.

FRONT AXLES. Manufacture of Automobile Front Axles, Edward K. Hammond. Machy. (N. Y.), vol. 29, no. 12, Aug. 1923, pp. 939-942, 12 fig. Machining operations on axle forgings, steering knuckles, and steering arms.

AVIATION

AIRSHIP LINE SPAIN AND S. AMERICA. The Proposed Airship Line Between Spain and South America. Flight, vol. 15, no. 21, May 24, 1923, pp. 276-278. Abstract of report on plans drawn up by Commandante Emilio Herrera and Hugo Eckener of Zeppelin Co.

AIRWAYS. Organizing the National Airway System. Aviation, vol. 15, no. 2, July 9, 1923, pp. 41-43, 2 figs. What Airway Section of Army Air Service is doing to facilitate flying across country.

CIVIL. Progress of British Civil Aviation, 1922-23. Aviation, vol. 15, no. 7, Aug. 13, 1923, pp. 184-186. Summary of annual report of Civil Air Department records satisfactory growth of civil flying.

B

BALANCING

THEORY AND TESTS. Theory and Experimental Testing of Balancing (Zur Theorie und experimentellen Prüfung des Auswuchtens), Eberhard v. Brauchitsch. Zeit. für angewandte Mathematik u. Mechanik, vol. 3, no. 2, Apr. 1923, pp. 81-92, 17 figs. Investigation of applicability of Lawaczek-Heymann balancing machine and method of balancing.

BATTERIES

DRY CELLS, SPECIFICATIONS FOR. United States Government Specifications for Dry Cells. Circular of Bur. of Standards, No. 139, June 15, 1923 (U. S. Govt. Standard Specifications No. 58), 9 pp. Specifications officially adopted by Federal Specifications Board for use of departments and independent establishments of government in purchase of dry cells, covering definitions, types and sizes of cells, carton, zinc can, sealing compound, terminals and cell connections, voltage, tests, and performance.

BEAMS

STEEL. Haunched Steel I-Beam Tests Analyzed. Can. Engr., vol. 45, no. 2, July 10, 1923, pp. 121-126, 5 figs. Tests carried out at plant of Dominion Bridge Co., Ltd., Lachine, Canada. Precautions taken in loading; measuring instruments employed; increase in live-lead capacity resulting from encasement, etc.

BEARINGS, BALL

ENDURANCE. The Endurance of Ball Bearings, with Particular Reference to Automobile Practice, A. W. Macaulay. Automobile Engr., vol. 13, no. 178, July 1923, pp. 213-223, 20 figs. Discusses ball bearing capacity, fatigue, combined radial and thrust loads, different types of bearings, commercial tests, and other points in connection with designing for endurance.

FINISH GRINDING. Abrasives Finish Steel Balls, K. H. Lansing. Abrasive Ind., vol. 4, no. 7, July 1923, pp. 207-210, 10 figs. Ball bearings rough-ground before hardening and finish-ground and polished after heat treating; inspection.

MANUFACTURE. How Ball Bearings Are Produced, Herbert R. Simonds. Abrasive Industry, vol. 4, no. 8, Aug. 1923, pp. 238-243, 14 figs. Extreme accuracy made possible by grinding machines equipped with direct-reading gages; assembly is an important operation.

BELTING

LEATHER. Leather Belt Formulae Combining Theory with Practice, Claude O. Streeter. Belting, vol. 23, no. 1, July 1923, pp. 44, 45 and 48, 1 fig. Rules for belt speed, arc of contact, effective tension, horsepower, and belt width.

BLAST FURNACES

LININGS, MONOLITHIC. Using Monolithic Linings for Hot Blast Stoves. Iron Trade Rev., vol. 73, no. 7, Aug. 16, 1923, p. 462, 2 figs. Applied in relining two-pass, side-combustion hot-blast stove at plant of Steel Co. of Can., Hamilton, Ont.; believed to be one of the largest one-piece linings ever installed. See also Iron & Steel of Can., vol. 6, no. 8, Aug. 1923, pp. 166-167, 3 figs.

MODERN THEORIES. The Practical Success of Newer Theories of the Blast Furnace (Ueber die praktischen Erfolge neuer Theorien des Hochofens), W. Mathesius. Stahl u. Eisen, vol. 43, nos. 27 and 28, July 5 and 12, 1923, pp. 873-879 and 907-910 (and discussion, 910-912), 12 figs. on supp. plate. Mathematical derivation of formula for practical results from fundamental working processes in blast-furnace; application to practical cases and development of charts of blast-furnace practice for gray and white pig iron, possible savings of coke; combustibility of coke.

BLASTING

QUARRY. How We Drill, Blast, And Keep Records, E. J. Streck. Explosives Engr., vol. 1, no. 5, July 1923, pp. 144-147, 10 figs. Superintendent of a large shale and limestone quarry describes a successful system of blasting.

BLOWERS

CENTRIFUGAL. Centrifugal Blast-Furnace Blower, Engineering, vol. 116, no. 3006, Aug. 10, 1923, pp. 170-171, 6 figs. Cable of compressing 40,000 cu. ft. of free air per min. to 25 or 30 lb. per sq. in. gage pressure.

GAS, MECHANICAL EFFICIENCY OF. The Mechanical Efficiency of Gas Blowers (Die mechanische Wirkungsgrad der Gasgebläsemaschinen), Fr. Kretzschmar. Archiv für Wärmewirtschafte, vol. 4, no. 7, July 1923, pp. 121-124, 6 figs. Theoretical testing of experimentally found curves; results of insufficient loading of blower; thermal utilization of blast-furnace gas in blower.

BOILER FIRING

COKE BREEZE. Coke Breeze as Fuel for Steam Boilers in Great Britain, C. H. S. Tupholme. Gas Age-Rec., vol. 52, no. 1, July 7, 1923, pp. 3-6. Definition of coke breeze; types of boilers adaptable to its use; flues and fraft; grafts and clinkering; dust from coke firing; etc.

BOILER FURNACES

OIL-BURNING. Oil Burning Furnaces, James A. Tyrrell. Nat. Engr., vol. 27, no. 8, Aug. 1923, pp. 359-360. Advantages and objections to use of preheated air in oil-burning furnaces.

BOILER PLANTS

INSTRUMENTS. Boiler and Turbine Room Instruments, W. A. Shondy. Combustion, vol. 9, no. 2, Aug. 1923, pp. 157-159, 5 figs. Instruments for station operators; indicating instruments; steam flowmeters; variation of CO_2 and temperature in furnaces and flues. Report relative to combustion accessories from N. E. L. A. Prime Movers Committee report.

Scientific Instruments in the Boiler House John B. C. Kershaw. Power Engr., vol. 18, nos. 207 and 208, June and July 1923, pp. 217-224 and 257-262, 24 figs. Describes instruments and apparatus which can be installed at moderate cost and operated without additions to boiler-house staff, as well as more elaborate types, including gas-sampling and testing apparatus, CO and CO_2 recorders, thermometers, draft gages, combined instruments, etc.

BOILER ROOMS

FEATURES. Boiler-Room Features of Northeast Station (Kansas City), Power, vol. 58, no. 7, Aug. 14, 1923, pp. 249-251, 4 figs. Special high-pressure piping; hydraulic operation of long valves; combination valve bypass and drain; station heat balance.

BOILERS

ELECTRICALLY HEATED. New Uses of Electric Steam Boilers, P. H. Falter. Indus. Engr., vol. 81, no. 8, Aug. 1923, pp. 403-405 and 422, 3 figs. Conditions under which electric steam boilers can be used economically; data regarding electric boiler installations, and results obtained in several plants.

The Generation of Steam by Electricity, Philip H. Falter. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 7, July 1923, pp. 211-238 and (discussion) 239-251. Review of development of electric steam boiler or generator; electrode or water-resistance method of heating electrically; designs of electric boilers or water heaters.

HIGH-EFFICIENCY. High-Power Boilers (Hochleistungs-Dampfkessel), F. Wilcke. Der praktische Maschinen-Konstrukteur, col. 56, no. 13, Apr. 13, 1923, pp. 115-124, 37 figs. partly on supp. plate. Notes on boilers for 60 atmos. pressure; inclined-tube boilers; locomobile and locomotive boilers; superheaters; flue-gas heaters and steam storage.

CAMS

WASTE-HEAT. Waste-Heat Boilers (Abhitzekessel), H. Frey. Archiv für Wärmewirtschaft, vol. 4, no. 4, Apr. 1923, pp. 67-69, 12 figs. Description of various German types.

BOILERS, WATER TUBE

AMERICAN. Critical Discussion of American Water-Tube Boilers (Kritische Betrachtungen amerikanischer Wasserrohrkessel), B. Marker. Wärme, vol. 46, no. 28, July 13, 1923, pp. 308-309, 5 figs. Thermotechnical calculation of American boilers; examination of American boiler designs on basis of German experiences, and conclusions therefrom.

BRAKES

AIR. Test of the Automatic Straight Air Brake on the Norfolk & Western Railway. Ry. & Locomotive Eng., vol. 36, no. 7, July 1923, pp. 232-234. Outline of proposed tests to demonstrate different points in connection with use of automatic straight air brake.

BRIDGES

DELAWARE RIVER. Anchorage Foundations for the Delaware River Bridge, S. G. Roberts. Compressed Air Mag., vol. 28, no. 7, July 1923, pp. 557-559, 6 figs. Description of methods employed in sinking the rectangular and circular caissons to bedrock.

BRIDGES, CONCRETE

BOWSTRING. Reinforced Concrete Bowstring Bridge at Nantes, W. L. Scott. Concrete & Constructional Eng., vol. 18, no. 7, July 1923, pp. 439-443, 5 figs. partly on supp. page. Design and construction of type of bridge containing many features not possessed by other classes.

HIGHWAY. Reinforced Concrete Bridge Over the River Vesubie, W. L. Scott. Engineering, vol. 116, no. 3003, July 20, 1923, pp. 70-71, 11 figs. on supp. plate. Bridge over river in South of France is said to be largest in world of its class, having total length of 344 ft. 6 in. and clear span of 315 ft.

BRIDGES, HIGHWAY

CONCRETE. Concrete Memorial Bridge Has Attractive Appearance. Eng. News-Rec., vol. 91, no. 3, July 19, 1923, pp. 96-97, 3 figs. Washington St. bridge at Wilmington designed as memorial to Delaware soldiers, is 720 ft. long and 72 ft. wide and consists of 5 reinforced-concrete arch spans.

STEEL. Specification for Steel Bridges. Can. Engr., vol. 45, no. 7, Aug. 14. 1923, pp. 235-236. Specifications of Am. Assn. of State Highway Officials. Logical clear widths specified for highway bridges; new impact formulas; new floor load distribution rules; departure in net section rule.

BRIDGES, LIFT

BASCULE. Strauss Bascule Bridge, Burlington, Ont., John A. McFarlane. Can. Engr., vol. 45, no. 4, July 24, 1923, pp. 161-164, 6 figs. Details of through rivetted truss type bascule bridge over Burlington channel; operates by electric motor with gasoline-engine standby; safety devices provided; concrete counterweight built in two separate monolithic blocks; erection features.

BUILDING CONSTRUCTION

CO-OPERATION BETWEEN ARCHITECT AND ENGINEER. Co-operation Between the Architect and the Electrical Engineer, Instn. Elec. Engrs.—Jl., vol. 61, no. 320, July 1923, pp. 726-735 and (discussion)736-748. First paper, by Francis Hooper, deals with present-day uses of electricity, lighting heating and cooking, ventilation and sound, etc. Second paper, by J. W. Beauchamp, offers suggestions as to work of architect in providing for use of electricity in buildings; influence of electricity on design and cost of buildings and probable developments in near future.

BUSBARS

STEEL. Reducing Substation Cost and Insulator Hazard by Steel Buses. Elec. World, vol. 82, no. 3, July 21, 1923, pp. 131-132, 4 figs. partly on p. 116. Southern Power Co. is converting many of its outdoor substanceon buses to structural steel (not pipe) and expects to adopt this construction as standard in future, claiming it is more economical and less hazardous than copper bus construction.

C

CABLES, ELECTRIC

CURRENT LOADING. The Current Loading of Cables, S. W. Melsom. Beama, vol. 13, nos. 63 and 64, July and Aug. 1923, pp. 30-36 and 109-112, 3 figs. Maximum permissible current loading is invariably based on current required to produce given rise of temperature in conductor, i.e., hottest part of cable. Limiting temperature; thermal resistivity of dielectric; emissivity constants; grouping of cables; time constant.

UNDERGROUND. Practical Installation of Underground Cables, Philip H. Torchio. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 8, Aug. 1923, pp. 269-302 and (discussion) 302-307, 21 figs. Laying out subway system; subway and manhole construction; ordering and installation of cable; cleaning and rodding duct; pulling cable; splicing; insulating tubes; fireproofing cables; safety devices; installation of submarine cables.

Summary of High Tension Underground Transmission Practice Development, G. B. Shanklin. Gen. Elec. Rev., vol. 26, no. 7, July 1923, pp. 516-523. Advances made; data concerning three- and single-conductor cables installed in America; comparison of development with that in Europe; comparison of relative merits of three-conductor and single-conductor cables, and discussion of joints, dielectric strength, internal ionization and heating of cables.

CABLES, HOISTING

STEEL, TESTING OF. Non-destructive Testing of Steel Hoisting Rope, Raymond L. Sanford. Min. & Met. vol. 4, no. 199, July 1923, pp. 333-336, 6 figs. Criteria for a satisfactory test; possible methods; magnetic analysis. Published with approval of Director of Bur. Mines.

CABLEWAYS

COAL MINES. Taking Coal by the Air Route to Coal Station, Charles K. Traber and Walter C. Richards. Coal Age, vol. 24, no. 5, Aug. 2, 1923, pp. 175-177, 6 figs. Aerial tramway at Williamson, W. Va., eliminates two bridges, much track and trestling, yet cuts hauling costs; lifting coal 85 ft., it easily handles 1000 tons in 8 hours.

CAMS

DESIGN. Design of Harmonic Cams, G. O. Rhys. Machy. (N.Y.), vol. 29, no. 12, Aug. 1923, pp. 934-935, 2 figs. Table of formulas to facilitate work of laying out cams.

CAISSONS

CONCRETE FLOATING. Concrete Caisson to Close Canal Against Floating Oil, R. Franklin Mundorff. Eng. News-Rec., vol. 91, no. 5, Aug. 2, 1923, p. 171, 1 fig. In Manchester ship canal, (England) floating barrier is provided as precautionary measure in case of fire.

CANALS

ST. LAWRENCE RIVER. St. Lawrence River and the Great Lakes, Henry Holgate. Can. Engr., vol. 45, nos. 6 and 7, Aug. 7 and 14, 1923, pp. 208-211 and 229-232. Deals with drainage area of Great Lakes and gives figures showing remarkable regularity of flow of St. Lawrence River; treaties which have been made between Great Britain and United States, showing how they affect any scheme of power development that may be proposed for St. Lawrence River; origin of International Joint Commission and development of canal systems; growth of canal navigation; economical size of ships; economic feature of St. Lawrence waterways project.

CAR WHEELS

HEATING ON GRADES. Heating of Car Wheels on Grades, Geo. L. Fowler, Ry. & Locomotive Eng., vol. 36, no. 8, Aug. 1923, pp. 245-246. Study by which tests of Bur. of Standards and University of Ill. are compared to corresponding work in service.

MANUFACTURE. The Manufacture of Railway Wheels and Axles. Machy. (Lond.), vol. 22, no. 564, July 19, 1923, pp. 494-497, 10 figs. Methods employed in forge and machine shops of Wm. Beardmore & Co., Ltd., Parkhead, Glasgow, Eng.

CARBURETORS

GRAETZIN. Heavy Oils for Automobile Engines, H. Frymark. Automobil-Rundschau, vol. 22, no. 5, May 1923, pp. 44-46, 4 figs. The Graetzin-heavy-oil carburetor.

KEROSENE. The Conner Paraffin Carburetor. Engineering, vol. 116, no. 3006, Aug. 10, 1923, pp. 185-186, 4 figs. Works on principle of vaporizing kerosene by direct contact with very hot gas or air instead of transmitting heat through metal walls or tubes in accordance with usual practice.

CARS

ORIGIN AND DEVELOPMENT. Railroad Cars, Their Origin and Development, E. F. Carry. Ry. Mech. Engr. vol. 97, no. 7, July 1923, pp. 445-450, 5 figs. What growth in capacity has meant to civilization and factors making it possible; freight and passenger car development and development of car equipment in relation to traffic.

CARS, COAL

HOPPERS. The Rejuvenation of the McAdoo Hoppers, Ry. Rev., vol. 73, no. 3, July 21, 1923, pp. 89-91, 6 figs. Norfolk & Ry. West rebuilds wooden -body hopper cars constructed during war with all-steel structures.

CARS, FREIGHT

BOX. New Box Cars of the Southern Pacific, W. E. Symons. Ry. & Locomotive Eng., vol. 36, no. 8, Aug. 1923, pp. 239-242, 6 figs. Important feature of new cars is cast-steel underframe or centre section all in one piece.

New Designs of Box Cars for the Santa Fe. Ry. Mech. Engr., vol. 97, no. 8, Aug. 1923, pp. 573-577, 8 figs. Construction embodies new arrangement of side posts, underframe bracing, and door opener and closer.

COMBINATION STOCK AND COAL. Design of Combination 40-Ton Stock and Coal Car. Ry. Rev., vol. 73, no. 5, Aug. 4, 1923, pp. 159-169, 10 figs. Details of combination stock and coal car, designed for C. M. & St. P. Ry. to reduce empty-car mileage and increase average tons per loaded car.

REINFORCED-CONCRETE. Reinforced-Concrete Railway Cars (Eisenbahnfahrzeuge aus Eisenbeton), A. Kleinlogel. Glasers Annalen, vol. 93, no. 3, Aug. 1, 1923, pp. 41-45, 8 figs. Types in use for transportation of coal, cement, ore, and wine.

STEEL. Reducing the Corrosion in Steel Cars, J. J. Tatum. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 413-416, 7 figs. Analysis for low-carbon steel generally used in freight-car work; steel containing small percentage of copper adopted to prevent rapid deterioration; specifications for copper-bearing miscellaneous sheets and structural steel.

CASE-HARDENING

PROPERTIES AND TREATMENT OF ARTICLES. Some Considerations About Case Hardening, Leslie Aitchison, Birmingham Met. Soc.—Jl., vol. 8, no. 5, 1923, pp. 183-190. Constituents of a case-hardened article; properties of case and core; heat treatment of case-hardened articles; mechanical treatment of case-hardened article.

CAST IRON

REFINING. The Refining of Cast Iron through Nickel Addition (Ueber die Veredelung des Gusseisens durch Nickelzusatz), E. Piwowarsky and K. Ebbefeld. Stahl u. Eisen, vol. 43, no. 30, July 26, 1923, pp. 967-968, 1 fig. New tests confirm observation on refining influence of nickel addition.

VANADIZING. Vanadium in Iron Foundry, J. Kent Smith. Foundry Trade Jl., vol. 28, no. 361, July 19, 1923, pp. 52-53. Vanadizing of cast iron; effect as shown by tensile testings; transverse results; compression tests; application to cupola metal; air-furnace procedure; vanadium and chilled rolls.

CASTING

BRASS AND BRONZE. Casting Brass and Bronze, Charles Vickers. Foundry, vol. 51, no. 14, July 15, 1923, pp. 578-581. Copper oxidized in metal treated with deoxidizers which reduce copper, forming other oxides; carbon monoxide gas protects metal from oxidation; zinc an active deoxidizer.

PRESSURE SYSTEM. Feeding Heads Not Necessary, Roy E. Paine. Foundry, vol. 51, no. 14, July 15, 1923. pp. 559-561 and 597, 9 figs. Practical application of pressure system of pouring in a non-ferrous foundry would seem to indicate that method is preferable to use of feeding heads.

CASTINGS

"BURNING-ON" TREATMENT. Salvaging Castings by "Burning-on", F. C. Edwards. Metal Industry (Lond.), vol. 23, no. 1, July 6, 1923, pp. 11-12, 5 figs. Process of heat treatment exerting an annealing influence, leaving castings stronger than they were originally.

CLEANING. New Regulations Proposed for the Cleaning of Castings. Foundry Trade Jl., vol. 28, no. 359, July 5, 1923, pp. 3-6, 1 fig. Abstract of report on Grinding of Metals and Cleaning of Castings issued by Home Office, England. Cleaning of castings, sand blasting, regulations for grinding and glazing of metals and cleaning of castings.

FAULTS. Causes of Faulty Castings, R. W. Muller. Metal Ind. (Lond.), vol. 23, no. 1, July 6, 1923, pp. 3-5. General causes of faulty castings which may be prevented. Warped patterns; unsuitable molding sand; defects in molds; etc. Translation from Die Giesserei.

MACHINE-SHOP. Castings from a Machine-Shop Point of View, C. R. Ormerod. Foundry Trade Jl., vol. 28, no. 362, July 26, 1923, pp. 80-81 and (discussion) (81-84. Faulty designing; cylinder castings in machine shops; valve-box castings; streaky castings; making jigs and frames; poor-quality malleable; rejected castings; etc.

CEMENT MILLS

PULVERIZED COAL IN. Pulverized Coal in the Cement Industry, Georgy S. Eaton. Cement & Eng. News, vol. 35, no. 7, July 1923, pp. 37-40, 7 figs. Use in kilns for burning raw materials into cement clinker, and in power houses for generating great amount of power needed to operate vast quantity of heavy equipment; other uses; coal pulverizing and handling equipment.

CENTRAL STATIONS

GENERATOR RATING, U. S. Central-Station Generator Ratings Total 17,715,484 Kva. Elec. World, vol. 82, no. 6, Aug. 11, 1923, p. 283, 1 fig. On Oct. 1, 1922 there were 5974 generating and transmission systems in United States, of which 66.3 per cent were privately operated.

CHIMNEYS

DRAFT CALCULATION. Influence of Sea Level and Atmospheric Conditions on Draft of a Chimney (Einflusse der Meereshohe und der Witterung auf die Zugstarke eines Kamins), E. Höhn. Schweizerische Bauzeitung, vol. 81, no. 25, June 23, 1923, pp. 308-311. Formulas for calculation of draft.

CITY PLANNING

AERIAL PHOTOGRAPHY. Aerial Photography — An Aid to the Municipal Engineer in City Planning, Jack D. Desha. Municipal Engrs. Jl. vol. 9, last quarterly issue, 1923, pp. 32-46 and (discussion) 46-56, 7 figs. Review of development of aerial photography and applications to city planning.

PROBLEMS. City Planning and Zoning, George P. Herrold. Can. Engr., vol. 45, no. 2, July 10, 1923, pp. 128-130. Problem in old cities, traffic studies in St. Paul, zoning. Paper before Munn. Federation of Architectural Societies.

CLAY

CANADA. Clay Industry in Saskatchewan, L. J. Cheanot. Eng. & Min. Jl. Press, vol. 116, no. 3, July 21, 1923, pp. 107-108, 2 figs. Canada has heretofore imported clay products, domestic deposits now being developed.

COAL

ASH, MELTING POINT OF. The Melting Point of Coal Ash, F. S. Sinnatt, A. B. Owles and N. Sumpkin. Chemistry and Industry (Jl. Soc. Chem. Industry), vol. 42, no. 25, June 22, 1923, pp. 266T-272T, 3 figs. Description of method of determining melting point of ash and examination of melting points of ashes of various ingredients which can be separated from coal seams.

CARBONIZATION, LOW TEMPERATURE. Low Temperature Carbonization, V. Z. Caracristi. Am. Gas J., vol. 119, no. 4, July 28, 1923, pp. 65-69 and 76-78, 4 figs. New process, difficulties in low-temperature processes, use of molten metal bath, thickness of coal charge important, methods of increasing heat transmission, use of thin layers of coal, character of coke produced, higher tar yields, installation at Ford Motor Co. plant, etc.

COAL

MEASUREMENT, VOLUMETRIC. Volumetric Measurement of Coal, James E. Lee. Nat. Engr., vol. 27, no. 8, Aug. 1923, pp. 353-354. Principles of coal measurement on a volumetric basis, equal volumes of same kind of coal weigh the same, irrespective of size. Paper read at N. A. E. S. Convention.

SPECIFICATIONS. Fuel Specifications. Combustion, vol. 9, no. 2, Aug. 1923, pp. 162-165. Specifications for coal applicable to conditions in various parts of United States. Report presented by N. E. L. A. Prime Movers Committee.

COAL HANDLING

BOILER PLANTS. Modern Coal and Ash Handling in Boiler Plants (Neuzeitige Kesselbekohlung undentaschung). Richard Hänchen. Archiv für Wärmewirtschaft, vol. 4, nos. 5 and 6, May and June, 1923, pp. 81-86 and 106-111, 38 figs. Unloading, storage, conveying to boiler house, and stoking of coal and other fuel, drawing ash under boilers, loading ashes and clinker, etc., apparatus used.

ECONOMICAL. Power Problems of Vital Interest to Executives, James T. Beard, 2nd. Indus. Management (N. Y.), vol. 66, no. 2, Aug. 1923, pp. 109-114, 8 figs. Economical storage and handling of coal.

CONVEYORS. Coal Conveyors for Small and Medium Sized Boiler Plants. Southern Engrs., vol. 39, no. 6, Aug. 1923, pp. 35-42, 19 figs. Some of the conveying systems that may be used to advantage, with operating data.

Steam Power Plant Management. Robert June. Gas Age-Rec., vol. 51, no. 23, and vol. 52, nos. 2, 3 and 4, June 9, July 7, 21 and 28, 1923, pp. 737-740, 9-11, 63-65 and 103-105, 20 figs. Principal factors which influence choice of ash and coal-handling systems; description of the various systems, including hand shoveling, conveyors, hoists, cranes, vacuum system, and combinations of above (so-called "silo" system, etc.)

COAL MINES

ECONOMIC LIFE OF. The Economic Life of a Coal Mine, Frank Haas. Coal Ind., vol. 6, no. 7, July 1923, pp. 326-328, 6 figs. Discusses effect of depletion, depreciation, cost per ton when mined, present value of earnings and other factors on life of mine.

SCREENS. New Coal Screens of Large Capacity, Fred A. Krehbiel. Coal Industry, vol. 6, no. 7, July 1923, pp. 317-319, 6 figs. Methods for making more intensive screen surfaces with resultant increase in capacity; protecting prepared sizes after being screened.

SIGNALING. Visible Signals for Collieries, W. B. Dale. Iron & Coal Trades Rev., vol. 107, no. 2889, July 13, 1923, pp. 42-43. Features of a satisfactory dial indicator; general operation: cancellation gear; electrical features. Paper read before Nat. Ass. Colliery Mgs.

COAL STORAGE

CABLE DRAG SCRAPER. Coal Storage at the Robert Gair Company Plant, J. A. Beck. Management & Administration, vol. 6, no. 2, Aug. 1923, pp. 200-202, 5 figs. Installation of cable drag scraper for storing and reclaiming coal; consists of steel scraper attached to endless steel cable, which is operated by double-drum winding machine and runs out across yard to steel posts planted around storage area.

COAL TAR

FUEL FOR HEAT AND POWER USES, AS. Coal Tar as a Source of Fuel for Heat and Power Uses, Wilbert J. Huff. Gas Age-Rec., vol. 52, no. 4, July 28, 1923, pp. 93-97, 1 fig. Koppers Co. laboratories at Mellon Inst. have demonstrated that powdered pitch is a possible fuel. Nature of coal tar; solid distillation products, including naphthalene removal of final coolers; mixing with gasoline; liquid oils obtained; crude tars; coal tar pitch; liquid pitch fuel; etc.

COMBUSTION

SURFACE, INCANDESCENT. Surface Combustion with Special Reference to Recent Developments in Radiophragm Heating, William A. Bone. Roy. Soc. Arts—Jl., vol. 71, no. 3686, July 13, 1923, pp. 596-608 and (discussion) 608-610, 6 figs. Principle of incandescent surface combustion; recent developments in manufacture of radiophragm appliances.

COMPRESSED AIR

APPLICATIONS. Compressed Air. Eng. Production, vol. 6, nos. 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129 and 130, Jan. 4, 11, 18, 25, Feb. 1, 8, 15, 22, Mar., Apr., May, June and July, 1923, pp. 13-20, 37-44, 51-55, 83-87, 113-116, 129-132, 152-155, 208-212, 186-212, 231-233, 276-278, 292-296 and 334-337, 176 figs. Application to modern engineering manufacture. Describes various types of compressors and their constructional features, pneumatic hammers, riveting machines, drills, scrapers, chucks, mandrels, fixtures for cash-register parts and surface grinding machines, machine-tool units, etc.

COMPRESSED AIR

CONSTRUCTION WORK. Compressed Air in Construction Work, F. A. McLean. Contract Rec., vol. 37, nos. 27, 28 and 29, July 4, 11 and 18, 1923, pp. 647-652, 675-677 and 699-703, 28 figs. Recent developments in use of pneumatic machinery.

CONCRETE

CEMENT CONTENTS EFFECTS. The Effects of Cement Contents on Concrete, Oscar Eabel. Concrete & Constructional Eng., vol. 18, no. 7, July 1923, pp. 471-486 and (discussion, 486-488, 7 figs. Results of tests made to determine how properties of concrete were effected by varying cement contents, in which cubes were made with from 10 per cent up to 100 per cent of cement, with careful measurements of weight of all ingredients sufficient to furnish data as to weight of concrete, shrinkage of materials, quantities of material required, crushing strength, etc. Abstract of paper read before Instn. Structural Engrs.

COMPRESSIVE STRENGTH. The Proper Proportioning of Concrete and Predetermination of Its Compressive Strength, at Place of Construction. Zweckmässige Zusammensetzung des Betons und Voraussbestimmung seiner Druckfestigkeit auf der Baustelle, etc., Graf. Gesundheits-Ingenieur, vol. 46, no. 26, June 30, 1923, pp. 244-247, 3 figs. Deals with influence of size of sand grains and additions, as also of water additives, etc.

RESEARCHES. Results of Some Researches in Concrete. Eng. News-Rec., vol. 91, no. 4, July 26, 1923, pp. 142-147, 2 figs. Abstracts of papers presented before Am. Soc. Testing Materials as follows: Effect of Accelerators on Concrete, Fatigue of Mortar, R. B. Cripps; Calcium Chloride as a Curing Agent and Accelerator, H. E. Clemmer and Fred Boisgerard; A New Test for the Workability of Concrete, J. C. Pearson and L. A. Hitchcock; Blast-Furnace Slag as an Aggregate in Concrete, Raymond Harsch.

CONCRETE, REINFORCED

ALCEMENT. The Strength of Alcement Reinforced Concrete, J. Bied. Concrete, vol. 23, no. 1, July 1923, pp. 22. Composition of alcement; setting; precautions essential in use of alcement; computations of strength. From Revue des Matériaux de Construction et des Travaux Publics.

CONDENSERS, STEAM

SURFACE. Heat Transmission in Surface Condensers between Steam and Water, C. H. Naylor. Beama, vol. 12, nos. 60 and 61, and vol. 13, nos. 63 and 64, Apr., May, July and Aug. 1923, pp. 206-214, 287-293, 37-44 and 104-108, 22 figs. Mathematical treatment of subject and experimental data.

CONDENSERS, ELECTRIC

SYNCHRONOUS. Synchronous Condensers for Voltage Regulation, Frank V. Smith. Elec. Jl., vol. 20, no. 8, Aug. 1923, pp. 281-285, 5 figs. Notes on proper application, and factors to be considered in selection of synchronous condenser and importance of voltage regulator in obtaining maximum capacity from machine.

TUBES. Condenser Tube Corrosion, R. Le Boysson. Mar. Engr. & Naval Architect, vol. 46, no. 550, July 1923, pp. 267-268 and 270. Résumé of English recommendations. Swiss experiments. Lasche's experiments; discussion of results. Abridged translation from Bulletin Technique du Bureau Veritas, June, 1923.

CONVERTERS

ROTARY. Rotary Converters. Beama, vol. 13, no. 64, Aug. 1923, pp. 125-130, 9 figs. Their advantages, construction and characteristics, general construction of Metropolitan-Vickers rotaries.

CONVEYORS

GRAVITY. Using Gravity to Solve Transportation Problems, Atthur L. Dahl. Indus. Management (N. Y.), vol. 66, no. 2, Aug. 1923, pp. 104-107, 8 figs. Advantages and economy of gravity conveyors.

TYPES. Mechanical Conveying. Nuove applicazioni nei trasportatori meccanici, Fernando Barbacini. Industria, vol. 37, no. 8, Apr. 30, 1923, p. 146-149, 10 figs. Describes belt, bucket, gravity, and other types of conveying, especially Simplex.

CORES

BINDERS. Oil-Sand Cores and Binders, A. Campion and J. McEachen. Foundry Trade Jl., vol. 27, no. 356, June 14, 1923, pp. 474-476, 1 fig. Describes experiments carried out with river sand; gives valuation and cost of core binders and results of practical trials in foundry.

CORROSION

IRON AND STEEL. Recent Progress in the Study of Corrosion, J. Newton Friend. Birmingham Met. Soc.—Jl., vol. 8, no. 6, 1923, pp. 243-246 and (discussion) 246-250. Notes on phenomena of corrosion of iron and steel; theories of corrosion.

WATER DEACTIVATION, CONTROL BY. Water Deactivation, F. N. Speller, Engrs. Soc. West. Pa.—Proc., vol. 39, no. 6, July 1923, pp. 189-201 and (discussion) 202-216, 8 figs. Describes development of means for control of corrosion by removal of free oxygen from water.

COUPLINGS

FLEXIBLE. A Flexible Coupling for Difficult Conditions. Power Engr., vol. 18, no. 208, July 1923, pp. 265-268, 9 figs. Describes Bibby steel coupling which provides solution to many difficult drives and is applicable to small and to very large transmissions.

TYPES. Couplings (Kupplungen). Maschinenbau, vol. 2, no. 19, June 30, 1923. Contains following articles: Spring-Band Friction Couplings for the Drive of large Rolling Mills, H. Asbeck, pp. G209-G210, 3 figs.; A New Split Coupling, Walter Patzke, pp. G210-G212, 5 figs.; Differential Coupling with Unlimited Regulation for Valve Regulation, H. Sondermann, pp. G212-G213, 3 figs.; Flexible Couplings, Max Pollak, 3 figs.

CRANES

BRIDGE, WIND PRESSURE ON. Wind Pressure Is Bridge Hazard, C. O. Burton. Mar. Rev., vol. 53, no. 8, Aug. 1923, pp. 294-297, 6 figs. Ore, coal and dock cranes often threatened with destruction during severe storms; new type of anemometer with recorder, which shows whether operation is safe or unsafe; automatic control developed.

CRANEWAY, CONCRETE. Concrete Craneway at Hamburg, Carl Comments. Concrete & Constructional Eng., vol. 18, no. 7, July 1923, pp. 469-473. 3 figs. Details of craneway of Reiherstieg-Schiffswerfte, Hamburg, for discharging and transporting ship plates and angles from railway wagons and barges.

GIANT. The Esthetic Design of Giant Cranes (Die asthetische Gestaltung der Schwerlastkrane, ein Beitrag zu ihrer Entwicklung), H. Benedict. Schiffbau, vol. 24, no. 840-41, July 4-11, 1923, pp. 630-633, 6 figs. Describes how good appearance and expediency are combined in design of several giant cranes.

CRUSHING

MEASUREMENT OF WORK IN. Measurement of the Work in Crushing, Ernest A. Hersam. Franklin Inst.—Jl., vol. 196, no. 1, July 1923, pp. 95-104. Establishing basis for measuring work accomplished in crushing.

CUPOLAS

AIR PREHEATING. Air Preheating for Cupola Practice. Die Windvorwarmung für den Kupolofenbetrieb), Carl Rein. Giesserei-Zeitung, vol. 20, nos. 15 and 16, July 1 and 15, 1923, pp. 279-283 and 301-305, 12 figs. Air preheating in front and in back of blower; critical discussion of cupola construction for preheated air during last 40 years, Schurmann cupola; author disbelieves in possibility of economy with preheated air in cupola.

HAMMELRATH. A New Cupola Design (Eine neue Kupolofen-Konstruktion), Zeit. für die gesamte Giesserepraxis, vol. 44, no. 2324, June 16, 1923, pp. 133-135, 2 figs. Details of Hammelrath cupola with closed top, designed with view to better utilization of heat of exhaust gases and improvement in quality of casting.

SCHURMANN. Practical Experiences with the Schurmann Cupolas (Betriebserfahrungen mit dem Schurmann-Ofen), Chr. Gilles. Giesserei-Zeitung, vol. 20, no. 14, June 15, 1923, pp. 260-262, 4 figs. Comparison of results with Schürmann cupola with those of other types in same plant, showing reduction in coke consumption, and in sulphur absorption, and increase in manganese and iron loss. See also discussion in no. 15, July 1, 1923, pp. 284-288, 1 fig.

CYLINDERS

REPAIRING CAST-IRON STEAM. Repair of Mammoth Vertical Compressor Engine Cast Iron Cylinder, A. M. Candy. Power, vol. 58, no. 7, Aug. 14, 1923, pp. 242-244, 9 figs. Two cracks, 3½ and 5 ft. long respectively, were successfully closed; welding operations cost about 10 per cent of price of new cylinder, besides eliminating long shutdown.

STEEL WATER JACKETS. Welded Steel Cylinder Water Jackets. Glenn D. Angle. Aviation, vol. 15, no. 6, Aug. 6, 1923, pp. 148-152, 8 figs. Aluminum block steel cylinder; foreign practice, types of sheet-metal welds, relative position of joints, experience of McCook Field; failures due to defective welding, cylinders that leaked.

D

DAMS

Core Walls. Reinforced Concrete Diaphragms as Core Walls for Earth Embankments, W. S. Lea. Contract Rec., vol. 37, no. 30, July 25, 1923, pp. 721-722. Cost of plain concrete core walls may be quite high while reinforced diaphram have cost as low as 10 per cent of cost of embankment; examples of successful thin walls.

Foundations, Grout Sealing of. The Use of Grout to Seal Permeable Foundations of Dams, W. S. Lea. Contract Rec., vol. 37, no. 30, July 25, 1923, pp. 719-721. Procedure adopted in construction of a dam on Jacques Cartier River at Pont Rouge, P.Q.; cut-off trench dispensed with and construction work expediated.

Masonry. Triangular Masonry Barrage Dams (Barrages triangulaires en maçonnerie), G. Pigeaud. Génie Civil, vol. 82, no. 25, June 23, 1923, pp. 581-596, 3 figs. Formulas and calculations.

Storage. $4,500,000 Water Supply and Irrigation Project Nearing Completion Near Wichita F alls, Texas. Excavating Engr., vol. 17, no. 7, July 1923, pp. 223-228, 13 figs. Construction of storage and diversion dams by gasoline draglines and revolving shovels, hydraulic dredge, tractors and teams on the Big Wichita River.

DIE CASTING

Dies for. Cores and Slides for Die-casting Dies, Charles Pack. Machy. (N.Y.), vol. 29, no. 12, Aug. 1923, pp. 956-958, 3 figs. Gives example of die construction using slides and long cores for central hole.

Methods. Producing Die Castings for Owen Sound Plant, Herbert Chase. Can. Foundryman, vol. 14, no. 7, July 1923, pp. 20-22, and 27, 3 figs. Also Can. Machy., vol. 30, no. 1, July 5, 1923, pp. 49-51 and 74. Description of methods followed, the various types of machines employed and characteristics of various alloys used.

DIESEL ENGINES

Bethlehem. The New Bethlehem Diesel. West. Machy, World, vol. 14, no. 7, July, 1923, pp. 215-217, 3 figs. Details of new type of two-cycle Diesel engine developed by Union plant of Bethlehem Shipbldg. Corp.; data on a three-cylinder 150-hp. engine, a single-cylinder engine, and a four-cylinder 50-hp. engine.

Geared. Geared Diesel Engine for Ship Propulsion. Steamship, vol. 34, no. 409, July 1923, pp. 21-23, 1 fig. Describes 2200-b. hp. heavy-oil engine, consisting of four engines operating one propeller shaft through reduction gear.

Low-Pressure. Description of Low Pressure Burner in Bethlehem's Unusual Diesel Engine, H. H. Dunn. Mar. News, vol. 10, no. 3, Aug. 1923, pp. 61-62, 1 fig. New type involves less weight per hp., lower-hp. units, from 5 to 300 b. hp.; less compression, and lower exhaust temperature than present types of Diesel engines. See also articles by A. J. Dickie in Pac. Mar. Rev., vol. 20, no. 8, Aug. 1923, ip. 385-386, 2 figs.

Maintenance. Regular Maintenance Schedules for Diesel Engines, J. L. Schneitter. Elec. World, vol. 82, no. 3, July 21, 1923, pp. 128-129. A maintenance outline, maintenance calendar and reports suggested; how such schedules should be developed.

DRILLING MACHINES

Multiple-Spindle. A New Multiple Spindle Drilling Machine. Eng. Production, vol. 6, no. 130, July 1923, pp. 324-326, 3 figs. Extreme simplicity and fact that it is designed for unit arrangement are features of new machine constructed by Messrs. Wilkins & Mitchell, Darlaston, England.

Railway-Disk-Wheel. The "Asquith" Duplex Disc Wheel Drilling Machine. Ry. Gaz., vol. 39, no. 2, July 13, 1923, pp. 60 and 63, 1 fig. Describes new tool, designed by William Asquith Ltd., of Halifax, for railway carriage and wagon shops.

DRYING

Time Tests. How Relative Drying Time May Be Approximated, Elliott B. Atwater and Roy A. Borkland. Chem. & Met. Eng., vol. 29, no. 6, Aug. 6, 1923, pp. 226-230, 7 figs. Derivation of set of useful curves that suggest method by which one of important problems of drying may be satisfactorily solved.

E

ECONOMIZERS

Cast-Iron Smooth-Tube. Cast-Iron Economizer with Smooth Tubes in Comparison with Those Made of Ribbed Tubes (Gusseiserne Ekonomiser mit glatten Rohren im Vergleich mit solchen, aus Rippenrohren hergestellt), M. R. Schulz. Wärme, vol. 46, no. 20, May 18, 1923, pp. 211-212, 1 fig. Points out that flue-gas feed heaters with ribbed tubes, whether vertically or horizontally arranged, offer no advantage over smooth cast-iron feed heaters.

EDUCATION, ENGINEERING

Modern Tendencies. Modern Tendencies in Engineering Education, H. W. McKiel. Eng. Jl., vol. 6, nos. 7 and 8, July and Aug. 1923, pp. 309-312 and 353-356. Historical review of engineering education, analyzing curricula of various engineering colleges.

EDUCATION, TECHNICAL

Paper Industry. Training Technical Men for the Paper Industry, C. E. Libby. Paper Trade Jl., vol. 77, no. 4, July 26, 1923, pp. 49-52, 6 figs. Laboratories and equipment, library facilities, plan and scope of curriculum, pulp and paper courses, and summer employment, at New York State College of Forestry, Syracuse.

Refractories Industry. Technical Education in Relation to the Refractories Industry, G. W. Hefford. Ceramic Soc. Trans., vol. 22, Part 2, Session 1922-23, pp. 205-210 and (discussion) 210-211. Necessity of education of workers; work that may be done by educational institution, and suggestions about parts industry may play.

ELECTRIC CONDUCTORS

Calculation. New Basis for Calculating Aerial Conductors From the Mechanical Point of View, (Nouvelle base de calcul des conducteurs aériens au point de vue mécanique), Abel John. Schweiz. Elektrotechnischer Verein, vol. 14, no. 5, May 1923, pp. 237-245, 5 figs. Proposes amendment to Swiss Federal High-tension regulations of 1908, as to factor of safety, safe load, snow load, etc.

Skin Effect in Isolated Tubes. A Precise method of Calculation of Skin Effect in Isolated Tubes, Herbert B. Dwight. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 827-831, 1 fig. Method of determining skin effect in isolated tubular conductors, which may be used where more accurate results are desired than are given by curves and approximate methods of calculation previously published by writer.

ELECTRIC DISTRIBUTION SYSTEMS

A.C. Network Protector. The Automatic Alternating Current Network Protector, G. G. Grissinger. Elec. Jl., vol. 20, no. 8, Aug. 1923, pp. 285-288, 5 figs. Consists essentially of electrically closed and tripped carbon circuit breaker, and group of relays; advantages of apparatus.

Operation. The Operation of an Electrical Distribution System, C. A. Clendening and H. G. Michell. Eng. Jl., vol. 6, no. 8, Aug. 1923, pp. 349-353, 4 figs. Problems encountered in large systems with particular reference to distribution system of City of Winnipeg hydro-electric system.

ELECTRIC FURNACES

Ferro-Alloy. Improvements in Ferro-Alloy Electric Furnaces of High Power Input, B. D. Saklatwalla and A. N. Anderson. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 775-780, 3 figs. Deals with efficiency of power input in ferro-alloy furnaces and discusses electrical factors to be considered in design of leads for achieving such efficiency; describes new system of regulation, whereby furnace temperature is kept constant by keeping energy input constant by means of true watt regulation.

Induction. High Prequency Induction Furnaces, Dudley Willcox. Fuels and Furnaces, vol. 1, no. 3, July 1923, pp. 159-162, 1 fig. Present status of the development of direct induction melting of small charges, one of melting in semi-conducting and conducting containers.

Non-Ferrous. Electric Furnaces for Melting Brass and other Non-Ferrous Metals and Alloys, Verdon O. Cutts. Birmingham Met. Soc.—Jl., vol. 8, no. 1, 1923; pp. 16-30, 11 figs. Various methods of generating heat electrically; discussion of arc and induction types of furnaces, including resistance type; tables giving data of tests.

Steel. Electric Furnaces Extensively Employed in Germany, Godfrey L. Carden. Elec. World, vol. 82, no. 4, July 28, 1923, pp. 179-181, 3 figs. 70 per cent of steel works use them for high-grade steel; induction furnaces find wide application; results obtained from several installations.

ELECTRIC LAMPS, INCANDESCENT

Improvements. The Quality of Incandescent Lamps, John W. Howell and Henry Schroider. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 809-814, 4 figs. Shows improvements which have been made in incandescent lamps since they first became commercially available. See also article by Electrical Testing Laboratories on Incandescent Lamp Life Tests (p. 814, 2 figs.).

Three-Wire System. Sources of Power for Three-Wire Direct-Current Systems, M. S. Hancock. Elec. Jl., vol. 20, no. 7, July 1923, pp. 267-269, 2 figs. Three-wire generators; balancer sets; two-wire generators in series; costs.

ELECTRIC LOCOMOTIVES

Construction. Railway Electrification (A proposito dell'electrificazione delle ferrovie), E. Stassano. Elettrotecnica, vol. 10, no. 13, May 5, 1923, pp. 275-279. Describes construction of a special locomotive in which motor is directly coupled to generator according to Heilmann system.

Single-Phase. A Modern Swiss Electric Locomotive. Electrician, vol. 90, no. 2343, Apr, 13, 1923, pp. 387-390, 4 figs. Details of latest single-phase locomotive on Rhaetian Railway; maximum tractive effort 13,000 kg. at starting; maximum speed 45 km. p.h.

Twin Motors for Single-Phase. Twin vs. Separate Motors for Trunk Line Locomotives, with Special Reference to Single-Phase Locomotive with Separate Axle Drive (zwillingsmotor oder Einzelmotor für Vollbahnlokomotiven, insbesondere Einphasenlokomotiven mit Einzelachsantrieb), J. Werz. Elektrotechnische Zeit., vol. 44, no. 28, July 12, 1923, pp. 660-664, 5 figs. Describes express locomotive of Swiss Federal Ry. equipped with twin motors and gives comparative data showing favorable weight conditions as compared with other single-phase locomotives.

ELECTRIC MOTORS, A.C.

Induction. Induction Motors Used as Synchronous Machines, S. V. Ganapati and R. G. Parikh. Instn. Elec. Engrs.—Jl., vol. 61, no. 320, July 1923, pp. 795-799, 7 figs. Determination of overload capacity of induction motor when operated synchronously, and pulling-in capacity at synchronism; it is concluded that advantages of synchronous operation of induction motors are most pronounced when method is utilized at times of light load and up to about 70 per cent of full load.

Squirrel-Cage. Squirrel Cage Induction Motors with High Starting Torque and Reduced Starting Current, T. F. Wall. Engineering, vol. 116, no. 3006, Aug. 10, 1923, pp. 164-166, 6 figs. Shows how to predetermine performance of Boucherot motors when constants of windings are known; treatment also permits determination of effect on characteristics of motor of altering one or more of constants of electric or magnetic circuit.

Testing. Directions for Making Motor Tests, J. Elmer Housley. Indus. Engr., vol. 81, no. 7, July 1923, pp. 331-334 and 371, 6 figs. How and when a.c. motors should be tested, in order to detect loss of power by low power factor or by use of obsolete, defective or misapplied equipment.

ELECTRIC RAILWAYS

Overhead Trolley Suspension. Collecting 5,400 Amp. at 58 M. P. H. Elec. Ry. Jl., vol. 62, no. 4, July 28, 1923, pp. 125-127, 4 figs. Describes new form of overhead trolley suspension used in recent tests carried out by Gen. Elec. Co. on its experimental track at Erie Pa.; with a pantograph collector large amounts of current are drawn without difficulty; new type is modification of usual catenary construction.

Handling Heaviest Future Traffic Electrically. Ry, Rev., vol. 73, no. 3, July 21, 1923, pp. 94-96, 3 figs. New type of overhead trolley construction for electric locomotives which has greater capacity for current collection than any type now in use. Developed by General Electric Co.

ELECTRIC SWITCHES

Disconnecting. High-Tension Disconnecting Switches, H. J. Crabbs. Elec. Jl., vol. 20, no. 8, Aug. 1923, pp. 276-281, 17 figs. Notes no indoor and outdoor switches.

ELECTRIC TRANSMISSION LINES

Arcing Ground. Voltages Induced by Arcing Grounds, J. F. Peters and J. Slepian. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 781-792, [illegible] figs. Notes on transient conditions in electrical systems, three theories of arcing grounds; property of arc required by theories; apparatus used; tests; grounded vs. ungrounded systems, traveling waves set up by grounding phase.

HIGH TENSION

High-Tension. The Comparison of Power Transmissions with High-Tension Direct and Alternating Current (Gesichtspunkte für den Vergleich von Energieübertragungen mit Hochspannungs-Gleichstrom und Wechselstrom), A. Scherbius. Elektrotechnische Zeit., vol. 44, no. 28, July 12, 1923, pp. [illegible]. In author's opinion d.c. high tension lines are advantageous only when they operate with voltages higher than those which have heretofore been used for alternating and 3-phase current, and it is shown that with low [illegible] d.c. transmission offers greater advantages than a.c. transmission [illegible] difficulties in development of d.c. high tension problem.

Steel Tower. Design Methods Used in Building a Kansas Transmission System. Elec. World, vol. 82, no. 6, Aug. 11, pp. 273-276, [illegible] figs. [illegible] erection of towers on 132-kv. line of Kansas Gas & Elec. Co.; types of towers used, design of angle construction.

Supporting Structures. Spacing and Wire Stresses of Catenary Supporting Structures, P. A. McGee. Elec. Jl., vol. 20, no. 7, July 1923, pp. 248-252, 3 figs. Pro[illegible] general design of catenary supporting structures, loading conditions, wind and effects on the complete catenary system, simple catenary wind deflection chart.

ELECTRIC WELDING

Car, for. An Electric Welding Car in St. John, N. B., C. L. Boxter. Elec. Ry. Jl., vol. 62, no. 3, July 21, 1923, pp. 85-87, 6 figs. Standard welding equipment has been mounted in a motor car to provide a portable unit suitable for track or shop use.

Metal Working Industry. Electric Welding Used Widely in Metal Working Industry, P. P. Pipes. Iron Trade Rev., vol. 73, no. 6, Aug. 9, 1923, pp. 379-384, 8 figs. What is being done to make electric welding more reliable; description of resistance and arc welding and applications of each, examples and results of tests.

ELECTRIC WELDING, ARC

Cast Iron Enameled Ware. Arc Welded Cast Iron Enameled Ware, O. H. Eschholz. Am. Welding Soc.—Jl., vol. 2, no. 7, July 1923, pp. 5-8, 5 figs. Cast-iron electrode welding, steel electrode welding, development.

Cylinders. Arc Welding Cylinders, B. K. Smith. Welding Engr., vol. 8, no. 7, July 1923, pp. 36 and 38, 3 figs. Use of special nickel-alloy electrode for first layer results in successful weld on iron casting.

Merits of System. Electric Arc Welding, Royal Mattice. Engrs. & Eng., vol. 40, no. 4, 1923, pp. 91-98, 10 figs. Economy of electric arc welding; stresses and strains, application of system, causes of failure.

Non-Ferrous Metals. Welding Non-Ferrous Metals, C. J. Holslag. Am. Welding Soc.—Jl., vol. 2, no. 7, July 1923, pp. 22-27, 1 fig. Detail of various methods of arc welding various non-ferrous metals.

ELECTRIC WELDING, RESISTANCE

Apparatus. Recent Developments in Resistance Welding Field. Am. Weld Soc.—Jl., vol. 2, no. 6, June 1923, pp. 17-34, 9 figs. Series of reports on progress in electric-resistance-welding field during the past year. Utilization of apparatus already developed.

ELECTRICAL APPARATUS

Temperature Measurement. The Control of Heat Economy in Power Plants (Die Ueberwachung der Wamewirtschaft in Kraftwerken). Siemens-Zeit., vol. 3, no. 6, June 1923, pp. 251-257, 5 figs. Description of electrical measurement instruments with special regard to electric resistance thermometers and thermoelectrical pyrometers.

ELECTRICAL MACHINERY

Temperature Rise. Temperature Rise of Electrical Machinery, and Comparison between Single and Double Ratings, J. T. Takeuchi. Denki Gakkwai Zasshi, (Jl. Inst. Elec. Engrs. of Japan), no. 420, July 1923, pp. 617-637, 12 figs. Relation between efficiency and temperature rise; simple new method for calculation of relation between temperature rise and capacity according to ratio of both losses; experimental results, shows that single rating is preferable to double rating in all points. (In Japanese).

ELECTRICAL MEASUREMENT

Single-Phase Loads. Measurement of a Single-Phase Load at a Low Power-Factor, A. Dovjikvo. Elec. Jl., vol. 20, no. 7, July 1923, pp. 258-261, 7 figs. Difficulty of measuring single-phase loads at power-factors below 5 per cent; error due to inductance of voltage coil; eddy currents in wattmeter; ohmic drop of voltage in current circuit of wattmeter.

ELECTROLYSIS

Water Mains. Stray Current Electrolysis, E. R. Sjepard. Am. Water Works Assn.—Jl., vol. 10, no. 4, July 1923, pp. 603-611 (includes discussion). Work of American Committee of Electrolysis; investigation concerning soil corrosion; improved methods of electrolysis testing; insulating joints in service pipes.

ELECTRONS

Chemistry. The Electron in Chemistry, Joseph John Thomson. Franklin Inst.—Jl., vol. 195, nos. 5 and 6 and vol. 196, nos. 1 and 2, May, June, July and Aug., 1923, pp. 593-620, 737-785, 1-29 and 145-180, 40 figs. Arrangement of electrons in atom; configuration when number of electrons is greater than eight; configuration of electrons in atom; size of atoms; combination of atoms to form molecules; combination of different elements; polar molecules; chemical constitution and properties; mechanism of chemical combination; active molecules; Thieles' theory of partial valencies; diagmetism; electron theory of solids; intermetallic compounds, etc.

ELEVATORS

Cable-Operation Records. Records of Elevator Cable Operation Show Wide Differences in Life of Cables, G. B. Garrison. Power, vol. 58, no. 4, July 24, 1923, pp. 124-127. Careful records kept of cable operation over period of 9 years; tests made on number of cables removed to determine their condition.

Operation. Vertical Transportation, H. D. James. Engrs. Soc. West. Pa.—Proc., vol. 39, no. 3, Apr. 1923, pp. 79-89 and (discussion) 90-98. The elevator problem; machinery used for operating elevator car.

EMPLOYEES

Selection of Technical Graduates. Selecting and Placing Technical Graduates in the Westinghouse Organization, E. B. Roberts. Management & Administration, vol. 6, no. 2, Aug. 1923, pp. 207-211, 4 figs. How selection is made; plan followed in applying psychological tests.

EMPLOYEES' REPRESENTATION

Plans. Employee Representation Plans in Cleveland. Monthly Labor Rev., vol. 17, no. 1, July 1923, pp. 47-50. Abstracted from report of Cleveland Chamber of Commerce based on study conducted by its committee on labor relations through its research department.

ENGINEERS

Licensing. Pro and Con Licensing. Min & Met., vol. 4, no. 199, July 1923, pp. 351-355. Two articles: Mining Engineers Should Be Registered, by G. M. Butler; Registration not Burdensome to Mining Engineers, by George E. Taylor. Abstract of report of a canvass made by Min. & Met. Soc. of Am. of its membership during winter of 1920-1921, showing that licensing is distasteful to mining engineers.

EXCAVATION, EARTH

Methods and Costs. Earth Moving Methods and Costs, Bronx Parkway, Gilmore D. Clarke. Eng. News-Rec., vol. 91, no. 5, Aug. 2, 1923, pp. 186-188, 3 figs. Record of dragline, steam-shovel and heavy-tractor operations covering four years of miscellaneous earth moving.

F

FIRE PROTECTION

Hydrants and Valves. Report of Committee on Hydrants and Valves. Nat. Fire Protection Assn.—Proc., May 8-10, 1923, pp. 145-148 and (discussion) 149-151, 3 figs. Tentative regulations for fire-department hose connections for sprinkler and standpipe systems.

Sprinklers. Report of Committee on Automatic Sprinklers. Nat. Fire Protection Assn.—Proc., May 8-10, 1923, pp. 111-122 and discussion 122-125, 3 figs. Proposed changes in sprinkler regulations, regulations for outside protection.

FIRECLAYS

Changes from Low-Temperature Burning. Some Changes Taking Place in the Low-Temperature Burning of Stourbridge Fire Clays, C. I. Moore. Ceramic Soc.—Trans., vol. 22, Part 2, Session 1922-23, pp. 138-158 and (discussion) 158-168, 10 figs. Results of experiments, dealing with contraction, porosity, specific gravity, hygroscopicity, solubility in acids, heating curves, and dehydration.

FLAME PROPAGATION

Explosives. The Propagation of Flame from a Spark in a Closed Tube through a Homogeneous Inflammable Mixture, Oliver Coligny de Champfleur Ellis. Chem. Soc.—Jl., vol. 123-124, no. 728, June 1923, pp. 1435-1452, 13 figs. partly on supp. plates. Details of experiments conducted with object of studying progress of flame through an inflammable mixture as it is propagated from a spark near to closed end of a tube, other or "distal" end of which is open.

FLIGHT

Gliding. An Example of Static Gliding Flight (Ein Beispiel zum statischen Segelflug), J. Ackeret. Zeit für Flugtechnik u. Motorluftschiffahrt, vol. 14, nos. 11-12, June 26, 1923, pp. 86-89, 8 figs. Deals with static gliding flight on a steep coast. Simple relations are obtained for ceiling under given wind intensity, and it is shown that areas of possible static flight vary considerably with different wind intensities.

The Development of Soaring Flight in Germany. Aeroplane, vol. 25, no. 3, July 18, 1923, p. 76. Salient points from article by Gustav Lachmann on development of gliding and soaring in Germany.

Wind Factor. The Wind Factor in Flight: An Analysis of One Year's Record of the Air Mail, Willis R. Gregg and J. Parker Van Zandt. U. S. Dept. Agriculture, Weather Bureau. Reprinted from Monthly Weather Review, Mar. 1923, 51: 111-125, 7 figs. Study of records shows that an allowance of 7 m.p.h. for wind must be made on westward flights; factors of safety; schedules; application to aircraft to different speeds.

FLOOD CONTROL

Problems. The Problems Arising in Flood Control. Harry Taylor. Military Engr., vol. 15, no. 81, May-June 1923, pp. 197-202, 8 figs. Control of floods, reforestation, reservoirs, levees. Paper before Am. Assn. for the Advance of Science.

Red River of the North. Flood Relief Plans for Red River of the North. Eng. News-Rec., vol. 91, no. 4, July 26, 1923, pp. 133-136, 3 figs. River forms boundary between Minnesota and Dakotas; interestate relations complicate $6,000,000 plans for detention lake and improving 400 mi.

FLOW OF AIR

Pipes. Air-Pressure Losses in Piping of Activated-Sludge Plants, H. L. McMillan. Eng. News-Rec., vol. 91, no. 5, Aug. 2, 1923, pp. 178-180,,1fig. Comparative study of seven formulas with particular reference to pipe layout of large plant for Chicago Sanitary District; relation of pressure to pipe capacity.

FLOW OF FLUIDS

Viscous Fluids. The Resistance of a Cylinder Moving in a Viscous Fluid, L. Bairstow, B. M. Cave and E. D. Lang. Royal Soc. Lond.—Philosophical Trans., vol. 223, A614, 1923, pp. 383-432, 8 figs. Lamb's solution, and extension of same; evaluation of u, v, and x_i; calculation of resistance; comparison of calculated and observed resistances; resistance of a flat plate.

FLOW OF GAS

Pipes. Flow of Gas in Pipes, Stephen Lacey. Gas Jl., vol. 63, no. 3138, July 4, 1923, pp. 119-131 and (discussion) 131-133, 15 figs. Summarizes theoretical ground work of subject; results of experiments made on resistance to flow in gas pipes of small diameter; draws attention to research work carried out in Nat. Physical Laboratory about ten years ago, which throws new light on all problems connected with surface friction of fluids, and incidently provides means of dealing with experimental data in such a way as to render them readily available for guidance in future. Paper presented at annual meeting of Instn. Gas Engrs.

FLOW OF GASES

Meters for. Accurate Bubble Meters for Very Small Rates of Gas Flow, Tyler Fuwa and G. A. Shattuck. Mass. Inst. Tech.—Bul., vol. 58, no. 73, May 1923. 4 pp., 3 figs. Tests performed and experimental results.

FLOW OF WATER

Open Channels. Experiments on the Effect of Upper Channel Improvements upon the Downstream Blood Heights, LeRoy K. Sherman. West Soc Engrs.—Jl., vol. 28, no. 8, Aug. 1923, pp. 293-303 and (discussion) 303-318, 23 figs. Account of studies of hydraulics of non-uniform flow and wave movements in open channels, supplemented by laboratory experiments to verify correctness of some of theoretical or mathematical analyses; conclusions.

Pipes. The Flow Resistance of Pipes with Different Cross Section and Roughness Factor (Ueber den Stromungswiderstand von Rohren verschiedenen Querschnitts und Rauhigkeitsgrades), L. Schiller. Zeit fur angewandte Mathematik u. Mechanik, vol. 3, no. 1, Feb. 1923, pp. 2-13, 10 figs. Results of measurements of resistances.

FLUE-GAS ANALYSIS

CO_2 Determination. Determination of CO_2 Electrically. Fuels & Furnaces, vol. 1, no. 4, Aug. 1923, pp. 266-270, 6 figs. Operation of new meter dependent on fact that carbon dioxide has 40 per cent less heat conductivity than other constituents of flue gases.

FOUNDATIONS

Soil Carrying Capacity of. The Carrying Capacity of Soil (Bodentragfänigkeit), Joachin Schultze. Zeit. für angewandte Mathematik u. Mechanik, vol. 3, no. 1, Feb. 1923, pp. 19-34 17 figs. Theoretical principles for explanation and mathmatical comprehension of carrying capacity of soil; results of tests and practical experience.

FOUNDRIES

Cost Systems. Simplifying Foundry Costs, Alfred Baruch. Foundry vol. 51, nos. 12, 13 and 14, June 15, July 1 and 15, 1923, pp. 479-481, 532-535 and 565-567, 5 figs. June 15: Functions and needs of cost finding shown and evils of price cutting based on ignorance of costs are pointed out; basic terms defined. July 1: Explains order routine; production orders. July 15: Method of determining cost of metal at spout and keeping records of supplies that are necessary in operating a castings plant.

PITS AND CASES. Foundry Pits and Cases, James Edgar. Metal Industry (Lond.), vol. 23, no. 4, July 27, 1923, pp. 71-72, 5 figs. Describes pits or cases which are sunk to a level with foundry floor, for molding and casting large castings, of about 15 to 20 tons.

STEEL. New Steel Foundry Is Operating, John D. Knox. Iron Trade Rev., vol. 73, no. 7, Aug. 16, 1923, pp. 455-459 and 466, 9 figs. Electric steel foundry erected by Blackwood Electric Steel Corp. at Parkersburg, W. Va.; layout permits rapid progression of work through various stages of production; heavy machinery is direct-driven; steel castings annealed continuously.

FUEL ECONOMY

ASPECTS. Some Practical Aspects of Fuel Economy, C. W. Mitman. Smithsonian Instn., vol. 76, no. 1, June 2, 1923, 19 pp., 2 figs. Domestic and industrial application of effective combustion: flue-gas analysis; air control; flue-gas temperature; limitations, costs, and advantages of furnace control; quality of coal.

FUELS

UTILIZATION OF. Interministerial Committee of Fuel Utilization—Ninth Report (Commission interministérielle d'utilisation du combustible—Neuvième rapport), J. Loiret. Revue de l'Industrie Minérale, no. 60, June 15. 1923, pp. 360-372. Technical and commercial questions on preparation of coal. From Journal officiel, Apr. 1, 1923.

See also Coal; Oil Fuel; Pulverized Coal.

FURNACES, CRUCIBLE

GAS-FIRED. Gas-Heated Crucible and Oven Furnaces, Arthur Forshaw. Birmingham Met. Soc.—Jl., vol. 8, no. 3, 1923, pp. 65-85 and (discussion) 85-90, 1 fig. History of gas furnaces; points in construction and working of crucible furnaces, namely, linings shape, composition and life of linings, annealing of crucibles and influence of flame quality, corrosion of fluxes as cause of short pot life, output, metal and air preheating, gas consumption, and metal losses; consideration of oven furnaces, including description of various types, recuperation and regeneration, preheating and flame temperature, gas consumption, influence of quick heating and of loading before heating, care and manipulation.

FURNACES, HEATING

CONTINUOUS. Continuous Furnaces for Local Heating. Fuels and Furnaces, vol. 1, no. 4, Aug. 1923, pp. 250-252, 5 figs. To heat ends of set screws, bolts, valve stems, chisels and special sections, continuous furnaces with special conveyors are used to advantage.

G

GARAGES

VENTILATION. Ventilation of Garages, G. W. Jones, and S. H. Katz. Am. Soc. of Heat. & Vent. Engrs., Jl., vol. 29, no. 5, July 1923, pp. 423-428. Tests show need for exhausting fumes from gasoline engines running in enclosed spaces.

GAS ENGINES

CENTRAL-STATION. The Efficiency of Gas Engines for Central Stations, M. S. Mason. Elec. Rev., vol. 92, no. 2379, June 29, 1923, pp. 1006-1007, 1 fig. Addenda to previous articles on same subject, printed in Elec. Rev. Feb. 16, 1923, p. 244.

GAS MANUFACTURING

VERTICAL RETORTS. Steaming in Vertical Retorts. Engineering, vol. 115, nos. 2998 and 2999, June 15 and 22, 1923, pp. 734-736 and 761. Investigations of H. M. Fuel Research Board. Methods of experiment; plant and working; application of test results to other conditions. June 22: Collation and expression of results.

GAS PRODUCERS

HEAT BALANCE. Heat Balance of Average Gas obtained in Test of Twelve Different Installations of Mechanical Producers, W. B. Chapman. Glass Industry, vol. 4, no. 7, July 1923, pp. 125-126. Suggestion for standard method of making heat balances.

GASOLINE

MOTOR, SURVEYS OF. The Motor Gasoline Surveys of 1920 and 1921, N. A. C. Smith. U. S. Bur. of Mines—Tech. Paper, no. 328, 1923, 41 pp., 4 figs. Includes complete details of analyses of each sample collected in four surveys made in 1920 and 1921, tables and charts showing comparative results, and brief discussion of variations in quality developed by surveys.

GEAR CUTTING

SHAPERS. Mounting Gear Blanks on the Gear Shaper, A. Wilford. Eng. Production, vol. 6, no. 130, July 1923, pp. 314-317, 12 figs. Details of work-holding arrangements; holding hubless steel gears; methods for cutting internal and external plate-clutch disks; holding transmission gears; holding disk-clutch driving drum; etc.

GEARS

TEETH, STRENGTH OF. Factors Governing the Strength of Gear Teeth, Douglas T. Hamilton. Am. Mach., vol. 58, nos. 19, 22 and 25, May 10, 31 and June 21, 1923, pp. 681-685, 787-791 and 907-911, 22 figs. May 10: Materials and treatment for safe stress, selecting diametral pitch, how form and shape of gear tooth affect its strength. May 31: Inclination of tooth bearing to axis of gear, strength of helical gear teeth. June 21: Number of teeth and tooth ratio of gears in mesh; increasing strength of pinions having small number of teeth.

Method for Finding Lewis Factors, M. A. Durland. Machy. (N. Y.), vol. 29, no. 12, Aug. 1923, p. 958, 2 figs. Describes method which is believed to distinct improvement over other methods referred to

TESTING. Gear-testing Machine at the National Physical Laboratory. Machy. (Lond.), vol. 22, no. 566, Aug. 2, 1923, pp. 579-583, 8 figs. Elements in gear teeth; wheel clamps; use of machine for straight spur gears; helical and bevel gears.

GRANITES

NEW ENGLAND. The Commercial Granites of New England, T. Nelson Dale. U. S. Geol Survey, Bul. 738, 1923, 171 pp. 152 figs. partly on supp. plates. Origin, mineral and chemical composition, texture, color, physical properties, classification and structure of granite proper; modifications of granite; special features of granite proper; black granites; tests of granite; geographic distribution of New England granite proper; black granites; tests of granite; geographic distribution of New England granite quarries; description of quarries, granites and product.

GRINDING

METAL, DUST IN. The Dangers of Dust in Metal Grinding. Engineering, vol. 116, no. 3004, July 27, 1923, p. 104. Review of report on grinding of metals and cleaning of castings with special reference to effects of dust inhalation upon workers, issued by British Home Office.

H

HANDLING MATERIALS

EFFICIENT, PLANT LAYOUT FOR. Here Is an Instance Where Material Moves with Production, G. A. Van Brunt. Indus. Engr., vol. 81, no. 7, July 1923, pp. 345-347 and 372, 5 figs. Describes layout of plant of Bates Expanded Steel Truss Co. at East Chicago, Ind., wherein material-handling devices tie production processes together so that entire plant functions as a complete unit.

HARDNESS

TESTING, INSTRUMENTS FOR. A New Hardness Tester. Iron & Steel of Canada, vol. 6, no. 7, July 1923, pp. 145-148, 5 figs. Describes Herbert pendulum hardness tester, a new instrument for testing hardness of substances ranging from lead to sapphire, and especially applicable to hardened steels; dispenses with all microscopic measurements and all difficult readings. See also Can. Machy., vol. 30, no. 2, July 12, 1923, pp. 14-15 and 36, 3 figs.

HEAT TRANSMISSION

NUSSELT'S COEFFICIENTS. Nusselt's Heat-Transmission Coefficients and the Scope of their Validity (Ueber die Wärmeübergangszahlen Nusselts und ihren Geltungsbereich), Alfred Schack. Stahl u. Eisen, vol. 43, no. 29, July 19, pp. 942-946. Mean cross-section temperature and mean true temperature of a liquid and gas current; accuracy of Nusselt's tests; measurement of heat volume; validity of Nusselt's formulas; gas radiation.

PIPES. Heat Transmission in Pipe with Variable Wall Temperature (Der Wärmeübergang im Rohr bei veränderlicher Wandtemperatur), Heinrich Gröber. Gesundheits-Ingenieur, vol. 46, no. 26, June 30, 1923, pp. 241-243, 5 figs. Calculation based on assumption that wall temperature along pipe varies according to a known law.

HEATING

RAILWAY BUILDINGS. Securing Economy in the Heating of Stations and Buildings, R. W. Noland. Ry. Eng. & Maintenance, vol. 19, no. 7, July 1923. pp. 278-280, 3 figs. Fundamental principles involved in various types of systems. Data collected by means of questionnaire sent to 100 representative railways of the country.

HEATING AND VENTILATION

AUDITORIUMS. Modern Method of Heating and Ventilating a Large Auditorium. Plumbers' Trade Jl., vol. 75, no. 1, July 1, 1923, pp. 22-24, 7 figs. Description of system of New York City Town Hall, on West 43d Street; heating and ventilating system with interesting recirculating; excellent fan blower.

COST ANALYSIS. How to Determine in Advance the Cost of a Heating and Ventilating System, James J. Maher. Heating and Vent. Mag., vol. 20, no. 7, July 1923, pp. 37-39. Emphasizes importance and necessity of a minute analysis of cost of a heating and ventilating system in a school building, suggests method by which such an analysis can be made, and gives practical application. From paper read brfore Nat. Assn. Pub. School Business Officials.

LARGE BUILDINGS. Heating and Ventilation of a Large Building. Chas. L. Hubbard. Domestic Eng. (Chicago), vol. 104, no. 2, July 14, 1923, pp. 70-74, 7 figs. Describes system of John Hancock building in Boston.

HEATING, HOT-AIR

UNIT BLAST HEATERS. The Unit Heater, Charles L. Hubbard. Power, vol. 58, no. 4, July 24, 1923, pp. 129-132, 6 figs. Discusses use of unit heater for warming large spaces.

Unit Blast Heaters, Charles L. Hubbard. Nat. Engr., vol. 17, no. 8, Aug. 1923, pp. 355-359, 12 figs. A recent development in heating equipment that has a number of advantages for certain classes of service; description of the various types, discussion of services to which they are adapted and points to be considered in their installation.

WALL STACKS AND HEATING EFFECT AT REGISTER. Wall Stack Size and Heating Effect at the Register, V. S. Day. Am. Soc. of Heat. & Vent. Engrs.—Jl., vol. 29, no. 5, July 1923, pp. 407-412, 6 figs. Tests at Univ. of Ill. show interesting relation between wall stack size and heating effect at register in gravity warm-air furnace heating.

HEATING, HOT-WATER

FORCED-CIRCULATION. Heating with Condenser Circulating Water, John E. Williams Am. Soc. of Heat. & Vent. Engrs.—Jl., vol. 29, no. 5, July 1923, pp. 399-405, 6 figs. Description of system at Chase Metal Works plants. Over 78 miles of pipe connected onto condensers in power house; hot water pumped through mill, returned to condenser, reheated and recirculated.

FORCED DISTRIBUTING MAINS. Designing and Installing Distributing Mains for a Forced Hot Water Heating System. Plumbers' Trade Jl., vol. 75, no. 1, July 1, 1923, pp. 25, 28-29 and 31, 6 figs. Layout of underground piping; methods for insuring equal distribution of hot water to all buildings; sizes of forced hot-water mains..

HEATING, STEAM

CENTRAL-STATION. The Problem of the Most Economical Operation of Central Heating Plants (Beitrag zur Frage des wirtschaftlichsten Betriebs der Zentralheizungsanlagen), Paul Beck. Gesundheits-Ingenieur, vol. 46, no. 27, July 7, 1923, pp. 249-254, 4 figs. Results of tests show that interrupted operation offers considerable advantages over continuous operations; suggestions are made for obtaining good results continually; table is given showing coke savings with greater or lesser CO_2 content than 8 per cent in flue gases.

HOISTS

INTRA-FACTORY TRANSPORTATION. Hoists—an Important Link in Intra-factory Transportation, W. T. Spivey. Factory, vol. 31, no. 1, July 1923, pp. 24-27, 56-58, 60-62 and 64, 12 figs. Importance of hoists in factory; combination hoists and monorails; field of small portable hoist; using hoists as tiering machines; heavy, clumsy hoists not most economical

HYDRAULIC TURBINES

CALCULATION. Calculation of Hydraulic Turbines (Sul Calcolo delle turbine idrauliche). A. Cita. Industria, vol. 37, no. 10, May 31, 1923, pp. 186-188, 2 figs. Reaction curves and coefficients of peripheral velosity; formulas and calculations

DRAFT TUBES. Tests of Five Models of Draft Tubes for Turbines, Eng. News Rec., vol. 91, no. 5, Aug. 2, 1923, pp. 182-184, 5 figs. Made with turbine and tubes geometrically similar to full-sized ones; new symmetrical type superior to older forms

PELTON WHEELS. The Evolution of the Tangential Impulsive Turbine. Engineering, vol. 116, no. 3006, Aug. 10, 1923, pp. 163-164. Review of development.

HYDRO-ELECTRIC PLANTS

BRITISH COLUMBIA. A Brief Description of the Plant of the B. C. E. R. Company. Elec. News, vol. 32, no. 14, July 15, 1923, pp. 59-63, 10 figs. Details of Lake Buntzen, Stave Falls, and Jordan River hydro-electric plants operated by British Columbia Elec. Ry. Co.

CALIFORNIA. The Don Pedro Hydro-electric Current. Charles W. Geiger. Power Plant Eng., vol. 27, no. 15, Aug. 1, 1923, pp. 770-773, 6 figs. Novel feature of plant in Stanislaus County, Cal., is that it is designed to operate on head varying from 120 to 240 ft.

I

ICE PLANTS

ELECTRIFICATION. Ice Plant Electrification, H. L. Lincoln. Jl., of Elec., vol. 51, no. 2, July 15, 1923, pp. 45-48, 3 figs. Development in ice-plant electrification, and advantages of this type of load to central station, estimates that proposed new construction will require an additional 12,000,000 kw.-hr. during 1923.

IMPACT TESTING

NOTCHED-BAR TESTS. The Notched-Bar Test (Was haben wir an der Kerbschlagprobe?), M. Moser. Stahl u. Eisen, vol. 43, no. 29, July 19, 1923, pp. 935-942, 18 figs. Notched-bar test is said to be a working test. Working constants of unit of volume, speed of impact and working speed, shortened testing method; influence of different heat treatments on working constants and working speed, relations to tensile test.

INDUSTRIAL MANAGEMENT

COST CONTROL. The Province of the Controller, John B. Guernsey. Management and Administration, vol. 6, no. 2, Aug. 1923, pp. 197-200. Specific functions, duties, and relations.

EXECUTIVES, SELECTION OF. How Shall We Select Our Executives? E. H. Fish. Management and Administration, vol. 6, no. 2, Aug. 1923, pp. 183-184. Present method of selecting managers; sources from which to recruit executives; criteria for executive material.

MAINTENANCE AND REPAIRS. The Planning, Scheduling, and Dispatching of Maintenance and Repairs, Paul M. Atkins. Indus. Management (N. Y.), vol. 66, no. 2, Aug. 1923, pp. 78-83, 4 figs. How to avoid loss in maintenance and repair work.

MEASUREMENT OF. The Measurement of Management, Frederick J. Schlink. Management and Administration, vol. 6, no. 2, Aug. 1923, pp. 173-178, 1 fig. Concrete possibilities from engineer's viewpoint.

PLANNING. A Production Plant That Prepares Ahead for Emergencies, M. Chapman. Factory, vol. 31, no. 1, July 1923, pp. 27-29, 1 fig. Regulating rushes and slumps in factory often overlooked; best practice is to plan for and meet emergencies systematically.

Practical Methods for Planning Work, William B. Ferguson. Management and Administration, vol. 6, no. 2, Aug. 1923, pp. 185-190, 10 figs. Repairing locomotives and freight cars in quantities.

PROFITABLE. Working Methods for Profitable Management, C. E. Knoeppel. Management Eng., vol. 4, nos. 1, 2, 3, 4, 5 and 6, Jan., Feb., Mar., Apr., May and June 1923, pp. 9-14, 93-100, 157-164, 245-250, 321-328 and 409-416, 14 figs. Jan.: General policies. Feb.: Organizing executives. Mar.: Co-ordinating sales, purchasing and manufacturing. Apr.: Costing the product. May: Controlling production. June: Sumplifying conditions and operations. Concluded in Management and Administration, vol. 6, nos. 1 and 2, July and Aug. 1923, pp. 59-66 and 213-218, 3 figs. July: Rewarding workers. Aug.: Administering business.

RAILWAY SHOPS. Shop Management Problems Are Discussed. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 490-494. Review of papers by H. T. Bentley, D. J. Mullen, and T. W. Demarest, before Am. Ry. Assn., dealing with men and management, handling materials, materials and manufacturing, depreciation cost accounting, wages and working conditions, constructive analysis of shop operation, establishing a production unit, importance of human factor, supervision, stabilizing employment, etc.

ROUTING. A Complete Plan for Simplifying Routing of Material in Process, C. B. Tyson. Factory, vol. 31, no. 2, Aug. 1923, pp. 180-182, 222, 224, 226, 228, 230, 232, 234, 236, and 238, 3 figs. Describes inter-department shipping manifest plan which, it is claimed, saved large losses of parts and brought about better material control, improved scheduling, and greatly increased production in shipbuilding plant, where it was employed.

INDUSTRIAL TRUCKS

LIFT TYPE. Each Handling Is a Non-Productive Expense, Matthew W. Potts. Indus. Management (N. Y.), vol. 66, no. 2, Aug. 1923, pp. 69-75, 11 figs. Use of platforms and skids for various types of lift trucks.

INSULATING MATERIALS, ELECTRIC

PROPERTIES, MEASUREMENT OF. Methods of Measurement of Properties of Electrical Insulating Materials, J. H. Dellinger and J. L. Preston. Sci. Papers of Bur. of Standards, No. 471, May 2, 1923, pp. 39-72, 29 figs. partly on supp. plates. Description of the various methods. Phase difference and dielectric constant; voltage effects at radio frequencies; electrical resistivities; mechanical properties; thermal expansivity; effects of chemicals.

INSULATORS, ELECTRIC

HIGH-TENSION. New Type of Insulator for High-Tension Lines (Nuovo tipo isolatore per linee ad alta tensione), Luigi Berotto. Elettrotecnica, vol. 10, no. 15, May 25, 1923, pp. 333-344, 4 figs. Conditions to be fulfilled by high-tension insulators; describes B. D. P. (Bergeon, Dusaugey, Perotto) type insulator for 120,000 to 220,000 volt lines.

INTERNAL-COMBUSTION ENGINES

IGNITION TROUBLES. Ignition Troubles in Explosion Engines (Zündungsstörungen an Verpuffungsmotoren), H. Mertz. Motorwagen, vol. 26, no. 16, June 10, 1923, pp. 250-256, 15 figs. Suggestions for locating and remedying troubles.

VIBRATIONS. Vibrations of Stationary Engines, Particularly Internal-Combustion Engines (Störende Fernwirkungen von ortfesten Kraftmaschinen, insbesondere Verbrennungsmaschinen), J. Geiger. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 30, July 28, 1923, pp. 736-739, 5 figs. Discusses disagreeable effects due to shaking of houses, shocks to nervous system, etc.; investigation and measures for prevention of disagreeable vibrations; remedies for existing installations.

See also Aeroplane engines; Diesel engines, Gas engines, Oil engines.

IRON

SEPARATION OF NICKEL AND COPPER FROM. A Simple, Rapid and Economical Method of Separating Nickel and Copper from Iron, E. G. R. Ardagh and G. M. Broughall. Can. Chem. and Met., vol. 7, no. 8, Aug. 1923, pp. 198-200. Description of method worked out which has been shown to give excellent results on typical nickel ores from Sudbury District, method by which ferric hydroxide can be precipitated in a dense form, easy to filter and wash.

IRRIGATION

PUMPING. Pumping for Irrigation, L. N. McClellan. Reclamation Rec., vol. 14, no. 6, June 1923, pp. 202-208, 4 figs. Use of pumping in areas too high for gravity canal system, centrifugal pumps; pumping from wells, air lift and direct pumping.

L

LABOR

WAGES AND HOURS. Wages and Hours of Labor, Monthly Labor Rev., vol. 17, no. July 1923, pp. 92-111. Report of American Iron and Steel Inst. committee on 12-hour day, effect of 8-hour law in France, wages and hours of labor in specified industries in Japan, 1920 and 1921, wages and hours in New Zealand, 1909 to 1922.

LATHES

BRITISH DESIGN. Present-Day British Lathe Design, Hubert Bentley. Am. Mach., vol. 59, no. 7, Aug. 16, 1923, pp. 245-246. Cause for embodying new features; three types of headstock in use; improvements in tailstock, provisions for feed changes and reverse motions.

LIGHTING

INDUSTRIAL. Industrial Lighting and the Prevention of Accidents, Leon Gaster. Royal Soc. Arts Jl., vol. 71, no. 3687, July 29, 1923, pp. 613-624 and discussion 624-627. Their relation, inadequate lighting as a cause of industrial fatigue; relation between lighting and output, home office recommendations on factory lighting, instruments for measuring illumination, daylight illumination, idea requirements and practical solutions.

LIME

KILNS. Lime-Kiln Thermal Efficiency, Victor J. Azbe. Rock Products, vol. 26, no. 16, Aug. 11, 1923, pp. 35-38, 6 figs. Right method for getting combustion efficiency; how to find percentage of escaping carbon dioxide, necessity for analyzing apparatus; determining important heat losses, harm done by inleakage of excess air; other losses encountered. Paper read at Nat. Lime Assn. convention.

LOCOMOTIVES

BOOSTERS. Tender Booster Increases Tonnage 31 Per Cent. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 409-412, 8 figs. See also Ry. and Locomotive Eng., vol. 36, no. 7, July 1923, pp. 205-211, 10 figs. Details of demonstration by Delaware & Hudson of hauling capacity of Consolidation locomotive equipped with this device; design and construction of M. & L. type B booster.

The First Locomotive "Booster" in England. Ry. Gaz., vol. 39, no. 4, July 27, 1923, pp. 116 and 122, 6 figs. partly on pp. 117-119. Details of Doncasterbuilt "Atlantic" type locomotive No. 1419 which has recently left shops and is now running in regular service hauling heavy express trains and booster with which it is equipped.

EFFICIENCY. Increasing Efficiency of Modern Locomotives. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 523-525, 1 fig. Abstract of paper by Baltasar Martinez read before Am. Ry. Assn. on Draft Regulator and Low Degree Superheater, describing a new device that is being applied to Mexican locomotives, and discussion which follow.

MILEAGE, INCREASING OF. Increasing the Average Mileage of Locomotives, D. F. Giles. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 513-518, Review of paper before Am. Ry. Assn., dealing with pooling and distribution of power, daily situation and report showing time in enginehouse, notification of dispatchers when engines will be ready, tresponsibility for utilization of power, prompt handling at enginehouses and terminals, accounting for mileage, heavy grades on New Mexico division, limiting factor in long runs, varying boiler waters, etc., including discussion by J. N. Nicholson and O. S. Jackson.

MIKADO. Mikado Type Locomotives for the D. & I. R. R. Ry. & Locomotive Eng., vol. 36, no. 8, Aug. 1923, p. 247, 1 fig. With aid of booster, tractive force is increased to 70,000 lb.

MOUNTAIN TYPE. Modern Passenger Locomotive Weighs 577,000 lbs., C. E. Brooks. Can. Machy., vol. 30, no. 3, July 19, 1923, pp. 18-19, 1 fig. Details of mountain-type locomotives being built at Kingston, Ont., for Can. Nat. Rys., known as U-1-2 class; many improvements in design; safety features preclude possibility of boiler explosion.

SATURATED-STEAM-OPERATED. 0-12-0 Type Locomotives for Bulgarian State Rys., Desider Ledacs Kiss. Ry. Rev., vol. 73, no. 4, July 28, 1923, pp. 126-127, 2 figs. Describes freight locomotive capable of hauling a 336-ton train up a 3.57 per cent grade at 11 m.p.hr., using staturated steam in cross-compound cylinders.

VALVE GEARS. Approximate Determination of Mass Pressures in Locomotive Valve Gears (Angenaherte Ermittlung von Massendrucken in Lokomotiv-Steuerungsgetrieben), Kurt Ewald. Der praktische Maschienn-Konstrukteur, vol. 56, no. 17, May 10, 1923, 8 pp., 18 figs. Graphic and numerical methods of calculation.

LUBRICATION

RING. New Ring Lubrication for Free Axles of Railway Cars (Die neue Ringschmierung für Laufachsen von Bahnwagen), H. Duffing. Verkehrstechnik, vol. 40, no. 27, July 6, 1923, pp. 232-233, 1 fig. Describes Ossag ring lubrication and its use in application of lubricant known as Ossagol, a colloidal liquid grease made from specially prepared materials.

M

MACHINE SHOPS

BRITISH. Heavy Engineering Shop Practice. Machy. (Lond.), vol. 22, no. 566, Aug. 2, 1923, pp. 557-563, 11 figs. Darnall works of Davy Bros., Sheffield, England, makers of plant and equipment used in production of steel and heaviest class of manufactures; work-planning system; works-control board; standard tool data sheets; machine-tool equipment.

MACHINE TOOLS

DEVELOPMENTS 1923. Principal Developments of the Present Year, J. C. Morrow. Am. Mach., vol. 59 no. 3, July 19, 1923, pp. 83-122. Semi-annual résumé of machines, tools and accessories described in Shop Equipment News of journal during first six months of 1923. Index of manufacturers.

STANDARDIZING FIXTURE TRACK SYSTEMS. Standardizing Parts for Fixture Track Systems, W. F. Sandmann. Am. Mach., vol. 59, no. 4, July 26, 1923, pp. 127-130, 8 figs. Problem of standardizing track fixtures, usefulness in progressive multiple drilling, boring, tapping and reaming, predominating type of fixture; methods of indexing.

MALLEABLE IRON

MALLEABLIZING PROCESS. Some Experiments on the Malleablizing of Cast Iron, Foundry Trade Jl., vol. 28, nos. 361 and 362, July 19 and 26, 1923, pp. 59-61 and 76-79, 27 figs. From article in Stahl u. Eisen by P. Oberhoffer and J. Welter describing investigations carried out to determine part played by sulphur in malleablizing process. Results of tests, influence of temperature, manganese, and packing media, behavior of sulphur, iron and manganese sulphides, balling up of sulphide areas, etc.

MATERIAL HANDLING

PLANT TRANSPORTATION SURVEY. How to Make a Plant Transportation Survey, William Greaves. Indus. Management (N. Y.), vol. 66, no. 2, Aug. 1923, pp. 115-120, 3 figs. Detailed reports which materially assist in getting quick action.

MEASURING INSTRUMENTS

SHORT-TIME-INTERVALS Measurement. A Method for the Accurate Measurement of Short-Time-Intervals, Harvey L. Curtis and Robert C. Duncan. Sci. Papers of Bur. of Standards (U. S.), No. 470. Apr. 26, 1923, pp. 17-38, 11 figs. Describes method whereby time between two events which occur less than a second apart can be determined with a high degree of accuracy; complete discussion of necessary conditions for best results, sources of error inherent in method, and accuracy which may be expected.

METALS

CALORIZING. Calorizing and Oil Refining, E. M. Long. Oil Trade Jl., vol. 14, no. 8, Aug. 1923, pp. 54, 56, 58, 60, 62, 64, 66 and 68, 14 figs. What calorizing is and claims made for it; selection of metal to use for oil-refining apparatus that is subjected to heat; heat action of calorizing, oxidation, comparative coke deposit in pressure-still tubes, carburization, etc.

COLOURING. The Colouring of Metals, Alex. E. Tucker. Chem. & Industry (Soc. Chem. Industry—Jl.), vol. 42, no. 28, July 13, 1923, pp. 299T-302T. Describes process invented by T. Rondelli and Q. Sestini for colouring iron and copper work, in which no reagents containing metallic salts are employed.

ELASTIC LIMIT. Some Thoughts on Elastic Limit, T. Baker. Birmingham Met, Soc.—Jl. vol. 8, no. 1, 1923, pp. 1-11 and (discussion) 11-15. Definitions of "elastic limit" and "limit of proportionality;" emphasizes effect of internal strain on form of load-strain diagram; results of experiments.

HARDNESS, TEMPERATURE EFFECT. The Hardness of Metals as Affected by Temperature, Kiyosi Itô. Tôhoku Imperial Univ.—Science Reports, vol. 12, no. 2, Apr. 1923, pp. 137-148, 6 figs. partly on supp. plates. Details of Brinell hardness tests made on about 20 metals at different temperatures lying between —50 deg. to +150 deg. cent., and results obtained. 75th report of Research Inst. for Iron, Steel and Other Metals.

HARDNESS TESTER. New and Simple Tester for Metals. Automotive Mfr., vol. 65, no. 3, June 1923, pp. 7-9, 2 figs. English device having advantages of simplicity, portability, accuracy and quick action. used to test hardness of substances ranging from lead to sapphire, especially applicable to hardened steels.

METALS

STRESS, EFFECT ON. A Physico-Chemical Interpretation of the Effects of Stress upon Metals, C. W. Yearsley. Birmingham Met. Soc.—Jl., vol. 8, no. 4, 1923, pp. 129-143, 1 fig. Relation between structure and strength; phenomena connected with permanent deformation; different causes of fracture; etc.

TESTING. Some Observations on the Physical Testing of Metals, J. E. Malam. Birmingham Met. Soc.—Jl., vol. 8, no. 5, 1923, pp. 163-182, 9 figs. Observation on tensile, hardness (ball, cone and sclerescope) Erichsen, and machinability tests, especially as applied to examination of non-ferrous metals.

The Physical Properties and Testing of Thin Metal Strip. H. W. Brownsdon. British Non-Ferrous Metals Research Assn.—Bul., no. 9, July 1923, pp. 4-12, 5 figs. Details of method of conducting the various tests for determining physical properties of thin metal strip.

X-RAY INVESTIGATION. Röntgenographic Investigations of Worked Metals (Röntgenographische Untersuchungen an berbeiteten Metallen), M. Polanyi, and K. Weissenberg. Zeit. für technische Physik, vol. 4, no. 5, 1923, pp. 199-208, 15 figs. Investigation of crystal structure in metals to determine relative orientation of crystallites in relation to specific external parameter of aggregate.

MINE-RESCUE APPARATUS

STANDARDS. Mine Rescue Standards—A Tentative Study. U. S. Bur. Mines, Technical Paper 334, 1923, 43 pp. Prepared by a committee appointed at Int. Mine Rescue Standardization conference, Sept. 1921. Subcommittee reports on rescue apparatus requirements and tests for permissibility, physiological effects in use of mine-rescue apparatus and methods for detecting dangerous gases, use of mine-rescue apparatus in coal mines and regulations for use of mine-rescue apparatus in metal mines.

TYPES. Two New Forms of Rescue Apparatus. Colliery Guardian, vol. 126, no 3266, Aug. 3, 1923, pp. 271-272, 6 figs. Describes French design known as Fenzy apparatus, and Audos regenerative rescue apparatus of German design.

MINES

APPRAISAL. Graphic Appraisal of Mining Property, Alexander B. Morris. Eng. and Min. Jl., Press, vol. 116, no. 6, Aug. 11, 1923, pp. 241-242, 1 fig. Simple way to determine present worth with minimum of computation.

MEASUREMENTS

LENGTH, STANDARDIZATION OF. Standardizing Length Measures, W. C. Way. Can. Engr., vol. 45, no. 7, Aug. 14, 1923, pp. 233-235, 3 figs. International standard units; standards used in Canada; apparatus for standardizing precise and ordinary surveying tapes.

MOLDING METHODS

SAND-THROWING METHOD. The Sand-Throwing Method of Moulding Daniel Sharpe. Foundry Trade Jl., vol. 28, no. 362, July 26, 1923, pp. 69-72, 9 figs. Early attempts; underlying principles; working details; transport considerations; jobbing work.

MOLYBDENUM

ILSEMANNITE DEPOSITS, UTAH. Ilsemannite at Ouray, Utah, Frank L. Hess. U. S. Geol. Survey, Bul. 750-A, (Contributions to Economic Geology, 1923, Part I.) June 28, 1923, 16 pp., 3 figs. partly on supp. plates. Location and geologic conditions; discovery of deposit; character of rocks; molybdenum minerals in sandstone source of molybdenum, known occurrences of Ilsemannite. The name Ilsemannite was proposed by Hans Hofer in 1871 in honor of J. C. Ilsemann who published results of a study of molybdenite in 1787.

MOTOR BUSES

DESIGN AND MAINTENANCE. Buses Need Better Brakes and Universal Joints, F. B. Atchley. Automotive Industries, vol. 49, no. 6, Aug. 9, 1923, p. 281. Author, who is street-railway executive, suggests changes in design needed to make vehicles entirely suitable for use as adjuncts to electric lines.

Design and Maintenance of Buses, G. J. Shaw. Power Wagon, vol. 31, no. 224, July 1923, pp. 33-44. Features to be considered in design, examples of efficient design.

What Are Fundamental Factors Which Govern Motor Bus Design?, Alfred F. Masury. Automotive Industries, vol. 49, no. 3 and 4, July 19 and 26, 1923, pp. 112-116 and 164-165, 3 figs. July 19. Considerations which govern general nature of chassis, size and character of engine, type of final drive, frame height, optimum design and arrangement of brakes and most favorable type of tire and wheel equipment. July 26. spring design, dimensions for track and wheelbase, use of Hotchkiss drive, and body construction.

STEAM. Q. E. D. Steam Motor Bus Uses Winslow Boiler. Automotive Industries, vol. 49, no. 3, July 19, 1923, p. 121, 2 figs. Data on new product developed by Steam Bus Syndicate of Chicago, having 2-cylinder compound engine; burner automatically controlled; air delivered by motor-driven blower; rapid acceleration and low fuel cost per mile claimed.

TYPES. Green Develops Type Z Bus. Motor Transport (N. Y.), vol. 29, no. 1, Aug. 1, 1923, pp. 8-9. Description of new bus of Yellow Coach Mfg. Co.; four-wheel brakes; high-speed engine; positively rigid frame; unusual spring suspension; special steering; polished radiator.

MOTOR TRUCKS

REAR AXLES. Rear Axles for Trucks, E. Favary, Soc. Automotive Engrs.—Jl., vol. 13, no. 2, Aug. 1923, pp. 151-166, 34 figs. Five types of final drive now in use on motor vehicles are stated to be (1) chain-and-sprocket, (2) befel-gear, (3) worm-gear, (4) double-reduction and (5) internal-gear; advantages of each type as emphasized by its maker are presented and commented upon, and same procedure is followed with reference to their disadvantages; bearing loads and shaft stresses of typical semi-floating and full floating axles are calculated; various types of rear axle.

N

NICKEL STEEL

LOW-NICKEL. The Construction and Properties of Low Nickel Steels, J. Neill Greenwood. Birmingham Met. Soc.—Jl., vol. 8, no. 7, 1923, pp. 269-292 and (discussion) 293-297, 21 figs. Summarizes work done in recent years on nickel-carbon-iron alloys, and applies it to heat treatemnt of commercial nickel steels.

PROPERTIES. Invar and Related Nickel Steels. U. S. Bur. of Standards—Circular, no. 58, June 22, 1923, 93 pp., 48 figs. Compliation of data obtained during last 30 years by various investigators on different properties of nickel steels, with particular attention to invar, and reference to elinvar; results of investigations are presented in diagrammatic and tabular form. Bibliography.

NON-FERROUS METALS

TESTING. Laboratory Control of the Manufacture of Water Works Plumbing and Gas Brass Goods, W. Everett Mueller. Am. Water Works Assn.—Jl., vol. 10, no. 4, July 1923, pp. 686-694, 5 figs. Deals with non-ferrous products; notes on experimental and control work done in laboratory of H. Mueller Mfg. Co., of Decatur, Ill., principally metal testing.

O

OIL ENGINES

AIRLESS FUEL INJECTION. High-Pressure Oil Engine with Airless Fuel Injection (Hoch druckölmotor mit Einspritzung des Brennstoffes ohne Druckluft), K. J. E. Hesselman. Zeit. des Vereines deutscher Ingenieure vol. 67, no. 27, July 7, 1923, pp. 658-662, 16 figs. Notes on fuel pump and fuel valve; actual process of spraying.

OIL FUEL

BURNERS. The "Rotamisor" Liquid Fuel Burner, Petroleum Times, vol. 10, no. 236, July 14, 1923, pp. 57-58, 1 fig. Placed on market by Combustions Ltd., furnace designers and heat specialists.

FUEL HEATERS. The Efficient Heating of Oil Fuel, Allen F. Brewer. Indus. Management (N. Y.), vol. 66, no. 1, July 1923, pp. 35-43, 16 figs. Advantages of efficiency and economy; factors to be considered in adopting method; prevalent types of oil-fuel heaters.

OIL TANKS

CONCRETE. Construction of Concrete Fuel Oil Tanks. Can. Engr., vol. 45, no. 2, July 10, 1923, pp. 131-133. Recommendations contained in report presented at annual meeting of Am. Concrete Inst. Points to be considered in design of tanks. Proposed specification for mixing and depositing concrete.

OIL WELLS

PRODUCTION DECLINE CURVES DETERMINATION OF. Mathematical Determination of Production Decline Curves, Charles S. Larkey. Min. and Met., vol. 4, no. 199, July 1923, pp. 343-344, 5 figs. Method of working out mathematically curves used in estimating decline of oil wells, which will conform most closely to production data under consideration in any given instance; examples of how application can be made.

OPEN-HEARTH FURNACES

GUN-STEEL IN BASIC. Gun Steel in Basic Open-Hearth Furnaces. Engineering, vol. 116, no. 3004, July 27, 1923, pp. 119-120. Review of lecture by F. N. Pickett, giving account of work done by his firm in disposing of vast quantities of Allied and German ammunition left on dumps in Northern France and Belgium after termination of war; some 350,000 tons of material, consisting mainly of steel and other metals, has been rendered available for industrial purposes, methods employed.

ORE DRESSING

STEEL BALLS, WEIGHT OF. Weight of Steel Balls. Donald H. Fairchild. Eng. and Min. Jl.—Press, vol. 116, no. 5, Aug. 4, 1923, p. 197, 4 figs. Incorrectly given as 256 lb. per cu. ft. in published data; should be 363.

OSCILLOSCOPES

ELVERSON. Studying Mechanisms in Motion, Peter Davery. Machy. (N. Y.), vol. 29, no. 12, Aug. 1923, pp. 927-932, 6 figs. Application of optical mechanical apparatus, known as oscilloscope, for studying action of rapidly moving parts.

OXY-ACETYLENE CUTTING

STEEL PILING BELOW WATER. Cutting Steel Piling Below Low Water Level, James Mitchell. Engineering, vol. 116, no. 3004, July 27, 1923, pp. 101-104. 6 figs. Describes cutting of steel piling by means of oxy-acetylene torch operated from interior of cofferdam in which construction of pumping station is being carried out.

OXY-ACETYLENE WELDING

OIL TANKS. Proposed Method for Oxy-Acetylene Welding of Oil Storage Tank. Am. Weld. Soc.—Jl., vol. 2, no. 6, June 1923, pp. 10-16, 6 figs. Recommendations and specifications for welding of a 5000-bbl. tank by oxy-welding process. Report of Comm. on Welding of Storage Tanks of Am. Bur. of Welding, Am. Welding Soc.

SHEET STEEL. Production Welding of Sheet Steel by the Oxy-Acetylene Process, J. F. Anderson. Am. Welding Soc.—Jl., vol. 2, no. 7, July 1923, pp. 9-21, 8 figs. Details of design and strength, methods.

Tanks Tacking Welding. Welding Engr., vol. 8, no. 7, July 1923, pp. 24-25, 28-29 and 46-49 to 52. Welded tanks eliminate leakage losses; selection of material; welding practices; preparation of material for welding, examples of tank welding.

P

PAINTS

Driers for. Efficiency of Driers for Various White Pigment Paints. H. A. Gardner and H. C. Lanes. Paint Mfrs' Assn. of U. S., Circular No. 158, Feb. 1923, 19 pp. Description of work carried out to determine action of each of three widely used driers—lead, manganese, and cobalt—in various percentages when ground with the various opaque white pigments used in paint; table for determining exact quantity of any commercial drier to add to various paints to secure requisite percentage of metal based on oil content.

PAPER

Drying. Figures on the Cost of Paper Drying. John E. Alexander. Paper Trade Jl., vol. 77, no. 1, July 26, 1923, pp. 47-48. Comparative figures showing cost of drying one pound of paper with electricity by steam generated from electric boiler as compared to drying by direct radiation.

PAPER MANUFACTURE

Ligno-Cellulose, Bleaching of. The Bleaching of Ligno-Cellulose, Carl G. Schwalbe and Herman Wenzyl. Paper, vol. 32, no. 10, June 27, 1923, pp. 9-10 and 21. Acid and alkaline bleaching, theory of bleaching action in its relation to artificial increase of acidity of bleaching bath; treatment with carbonic acid. Translated from Papierfabrikant, 1923, pp. 272-279.

Pulp Manufacture. Alkaline Wood Pulp Process. S. D. Wells, R. H. Grabow, J. A. Staidl and M. W. Bray. Paper, vol. 32, no. 9, July 20, 1923, pp. 5-14, 7 figs. Chemistry of making of pulp by soda process from aspen, loblolly pine and jack pine as shown by intensive studies in forest products laboratory at Madison, Wis. Paper read before Techincal Assn. Pulp and Paper Industry.

Pulp Manufacture. Sulphur in the Sulphate Process. Sidney D. Wells. Paper, vol. 32, no. 10, June 27, 1923, pp. 5-8, 4 figs. Influence of sulphur in cooking of jack pine by sulphate process as analyzed by Forest Products laboratory; cooking time shortened; marked increase in bursting strength and tensile strength.

PAPER MILLS

Electric Drive. Electric Drive for Selectional Paper Machines. O. C. Cordes. Elec. Jl., vol. 20, no. 7, July 1923, pp. 236-241, 9 figs. Requirements for control of motors; types of driving motors; speed-control system; rotary contractors.

PATTERNMAKING

Twisted Pipe. Layout of a Twisted Pipe, George A. Jones. Boiler Maker, vol. 23, no. 7, July 1923, pp. 196-198, 5 figs. Method of obtaining true lengths, correct angle and miter of line elbow.

PAVEMENTS, CONCRETE

Thickened-Edges. Pavements with Thickened Edges. Cement and Eng. News, vol. 35, no. 7, July 1923, pp. 27-28, 7 figs. Details of design and data on roads of this type that have been built. From Concrete Highway Mag.

PIGMENTS

White-Paint. A Relation Between the Brightness and Hiding-Power of White Paint-Pigments, A. H. Pfund. Franklin Inst.—Jl., vol. 196, no. 1, July 1923, pp. 69-78, 6 figs. Measurement of hiding power and brightness of given paints; describes a modified cryptometer, results of experiments.

PILES

Driving. Hammer Rigged to Follow Pile Down Under Water. Eng. News-Rec., vol. 91, no. 6, Aug. 9, 1923, pp. 225-226, 2 figs. Lumber saved and submarine sawing minimized on foundations for Brooklyn Edison power-plant construction.

Reinforced-Concrete Sheet. The Ravier System of Sheet Piling. Engineer, vol. 136, no. 3527, Aug. 3, 1923, pp. 132-133, 9 figs. Main difference between Ravier wing piles and other types of reinforced-concrete sheet piles is that pile, instead of being of uniform section throughout is, for major portion of its length, given, form of a T.

PIPE, CONCRETE

Water-Supply. Reinforced Concrete Pipes for Water Supply, W. G. Chance. West. Soc. Engrs.—Jl., vol. 28, no. 8, Aug. 1923, pp. 345-354 and (discussion) 354-366, 8 figs. Characteristics of reinforced-concrete pipe for water under pressure; process of manufacture.

PIPES

Stresses in. The Stresses in Walls of Straight and Curved Pipes with Circular Cross Section and with Constant Bearing at Botton of Pipe (Rohrwandbeanspruchung gerader und gekrümmter Flüssigkeitsleitungen mit kreisförmigem Querschnitt und stetiger Auflagerung auf der Rohrsohle), Wihelm A. Stark. Bauingenieur, vol. 4, no. 13, July 15, 1923, pp. 398-401, 1 fig. Lateral strength in pipe bends; method of static investigation employed.

PLATES

Elliptical Deflection of. Calculation of the Bending of Freely Supported Elliptical Plates (Berechnung. der frei gelagerten elliptischen Platte auf Biegung), B. G. Galerkin. Zeit. für Mathematik u. Mechanik, vol. 2, no. 2, Apr. 1923, pp. 113-117. Equation for bending in elliptical co-ordinates; equation of centre surface; deflection in centre; shearing force in crown.

Rectangular, Stress in. The Stress on Rectangular Plates, K. Sezawa. Engineering, vol. 116, no. 3006, Aug. 10, 1923, pp. 188-191, 10 figs. Calculation of distribution of stress worked out from author's own formula; results of experiments. Paper read before Japanese Soc. Naval Architects.

PORTS

London. Port of London Improvements. Engineer, vol. 136, no. 3527, Aug. 3, 1923, pp. 130-131, 3 figs. Describes dock-improvement schemes at Tilbury and elsewhere at cost of $5,000,000; details of new dock at Tilbury; passenger landing stage; Surrey dock extension; new frozen-meat discharging arrangements.

POWER FACTOR

Correction. Power Factor Correction by the Use of Synchronous Condensers, Clifford W. Bates. Elec. World, vol. 82, no. 3, July 21, 1923, pp. 117-119, 8 figs. Analysis of operation of unloaded synchronous motors for correction of power factor considering both constant-load conditions and constant-current conditions.

POWER GENERATION

Economic. Economic Generation of Power, L. L. Bowen. Power Plant Eng., vol. 27, no. 15, Aug. 1, 1923, pp. 767-769, 1 fig. Modern methods of obtaining greatest thermal efficiency in operation of power plants.

PROFIT SHARING

Plans. New Profit Sharing Plan. Iron Age, vol. 112, no. 5, Aug. 2, 1923, pp. 259. United Alloy Steel Corp. adopts. Also elements suggested by experience.

Sharing Gains With Employees. W. L. Churchill. Management & Administration, vol. 6, no. 2, Aug. 1923, pp. 203-206. Examples of practical incentive plan.

PROTECTIVE COATINGS

Steel Nets. Protective Coating for Steel Parts (Including Zinc Plating). U. S. Army Air Service Specification, No. 98-24, III C, June 20, 1923, 4 pp. Specification covering general requirements for zinc coating and other approved methods for protection of steel parts against corrosion.

PUBLIC UTILITIES

Location in Streets. Location of Utilities in the Street. R. C. Cram. Engrs and Eng., vol. 40, no. 1, Jan. 1923, pp. 12-14. Location of sewers, water, electric light, gas, telephone, steam mains; location of street railway tracks, side and centre location.

PULVERIZED COAL

Combustion. The Propagation of a Zone of Combustion in Powdered Coal. F. S. Sinnatt and L. Slater. Fuel in Sci. and Practice, vol. 2, no. 7, Aug. 1923, pp. 211-216, 3 figs. Describes researches having important bearing on problem of spontaneous combustion of coal.

Furnaces. A New Furnace for Pulverized Coal (Eine neue Kohlenstaubfeuerung). G. Petri. Archiv für Warmewirtschaftz., vol. 4, no. 4, Apr. 1923, pp. 65-66, 4 figs. Purpose of design is economical burning of fuel which is slow to ignite or difficult to burn, part of fuel is finely pulverized and burned, where as another part is brought to grate without further preparation.

Power Plants. Power Plants. Ashtabula Steel Co. Uses Pulverized Fuel. Power Plant Eng., vol. 27, no. 16, Aug. 15, 1923, pp. 807-812, 11 figs. Operating difficulties experienced at first have been eliminated; engine and boilers located in same room.

Preparation. Preparation and Utilization of Pulverized Coal for Power Stations, Factories, and Steamships. James John Cantley. Brand Indus. Australian and Min. Standard, vol. 69, nos. 1803 and 1804, June 21 and 28, 1923, pp. 1044-1055. Economical use of slack coal; burning equipment; capacities of screw conveyors through 25 ft.; burners; combustion space; cost of preparation; spontaneous combustion; moisture absorption; etc. Abstract of paper before Instn. of Engrs., Australia.

Pulverizing Apparatus. A New Method of Powdered Fuel Firing. Foundry Trade Jl., vol. 27, no. 356, June 14, 1923, pp. 472-473, 1 fig. Describes "Atritor," a new apparatus for producing powdered fuel; combines advantages of drying and very fine pulverization.

PUMPING PLANTS

Irrigation Use, Cost for. Items in Cost of Pumping Water for Irrigation Use, Barry Dibble. Eng. News-Rec., vol. 91, no. 4, July 26, 1923, pp. 140-141. Vital operating factors necessary to consider in deciding on construction best adapted for securing water supply.

PUMPS

Fire. Report of Committee on Fire Pumps. Nat. Fire Protection Assn.—Proc., May 8-10, 1923, pp. 136-141 and (discussion) 141-145. Proposed amendments to centrifugal pump regulations; tentative regulations for steam turbines driving centrifugal fire pumps.

Selection. Pump Selection, B. R. Vanleer. Am. Water Works Assn., vol. 10, no. 4, July 1923, pp. 559-570. General considerations in selection; first cost, dependability, kind of water in use, total head, suction, efficiency, flexibility, priming and starting, capacity, speed, prime movers, etc.; advantages and disadvantages of various types of pumps.

R

RADIO COMMUNICATION

Transmitters. Low-power Radio Telephone and Telegraph Transmitter, I. F. Byrnes. Gen. Elec. Rev., vol. 26, no. 7, July 1923, pp. 512-517, 12 figs. Describes transmitter designed for service on yachts or small vessels where only relatively short distance transmission is required; this equipment also has possibilities as an amateur transmitter.

RADIOTELEGRAPHY

Directional, in Aircraft. Directional Wireless Telegraphy in Aircraft, C. K. Chandler. Instn. Elec. Engrs.—Jl., vol. 61, no. 320, July 1923, pp. 803-811, 19 figs. Deals with operation of directional wireless telegraphy in aircraft where directional aerials are installed in aircraft; methods of predicting and correcting errors; gives curves of variation in bearings of transmitting stations, and possible cause of these variations.

RADIOTELEPHONY

Broadcasting Stations. Radio Broadcast Central WJY and WJZ, New York City. I. F. Byrnes and H. R. Butler. Gen. Elec. Rev., vol. 26, no. 8, Aug. 1923, pp. 541-553, 17 figs. Describes broadcasting station at Aeolian Hall, New York City; one of chief features is "two-channel" operation or simultaneous transmission of two programs on separate wavelengths; details of equipment; control and transmitter room; audio amplifier design; radio circuits.

Receivers, Super-Heterodyne. Notes on a Super-Heterodyne Receiver, Charles R. Leutz. Electrician, vol. 90, no. 2356, July 13, 1923, pp. 30-32, 4 figs. Failure of magnifying amplifiers; technical details; distortion; details of equipment.

Receivers. The Construction and Operation of a Radio Receiving Set, E. R. Dawley. Kansas State Agricultural College, Bull., no. 13, vol. 7, no. 3, Mar. 1, 1923, 28 pp., 9 figs. Practical information on development of radiophone, and the cost, construction, installation and operation of radio receiving sets.

Transoceanic. Transatlantic Radio Telephony. H. D. Arnold and Lloyd Espenschied. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 815-826, 14 figs. Results of series of experiments now under way; new method of transmission radiating only single side band, and comparison with ordinary transmission method; advantages of new method.

RAILS

Joint Tests. Rail Joint Tests on the Detroit Municipal Railway. Elec. Ry. Jl., vol. 62, no. 3, July 21, 1923, pp. 89-95, 56 figs. Particulars of extended series of tests conducted by department of street railways in Detroit on seam-welded rail joints; comments on a large number of cast-welded joints removed during track rehabilitation.

RAILWAY ELECTRIFICATION

Argentina. Buenos Ayres Western Railway Electrification. Elec. Ry. & Tramway Jl., vol. 48, no. 1190, June 22, 1923, pp. 261-269, 12 figs. Details of power station, boiler-house plant, engine-room plant, cables, traction substations and their equipment, electric equipment of track, overhead-track equipment, rolling stock and car sheds.

RAILWAY MANAGEMENT

Personnel. A Fundamental Weakness of Railroad Organization, Roy V. Wright. Pacific Ry. Club Jl.,—Proc., vol. 7. no. 2, May 1923, pp. 5, 7, 9, 11, 13, 15, 17, 19-20 and (discussion) 21-27. Discusses personnel questions; educational clubs and employees' magazines track workers, shop apprentices, trainman, supervisory forces, selection of foremen, foremen's clubs, personnel departments, and employee representation.

Physical Statistics. Physical Statistics and Economical Operation, William H. Williams. Ry. Age, vol. 75, no. 6, Aug. 11, 1923, pp. 245-247. Difference between financial and statistics; suggestions for use of latter. Address before Ry. Accounting Officers Assn.

RAILWAY MOTOR CARS

Gasoline. Developments in the Motor Rail Car Field. Ry. Rev., vol. 73, no. 6, Aug. 11, 1923, pp. 201-204, 6 figs. Data on Chicago Great Western Ry. cars which compete successfully with bus competition; Meister car enables profitable short-line operation.

Power Plant of New Rail Car Located at Rear End. Automotive Industries, vol. 49, no. 6, Aug. 9, 1923, pp. 282-283, 2 figs. Narrow-gage design is to run at altitudes varying from 4500 to 5500 ft.; length, 32 ft.; width, 7ft.; operated by one man; 4-cylinder engine.

Steam. The "Sentinel" Steam Rail Coach. Ry. Gaz., vol. 38, no. 25, June 22, 1923, pp. 925-929, 11 figs. New type of car recently placed in service by Jersey Rys. & Tramways Ltd. Light construction and durability offer many possibilities for developing intermediate traffic, and amplifying ordinary facilities on branch and light-traffic lines.

RAILWAY OPERATION

A. R. E. A. Report. Economics of Railway Operation—Report of Committee XXI. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 255, Mar. 1923, pp. 1043-1094. Effects of speed on cost of operation, p. 1045; methods of increasing traffic capacity of a railway, pp. 1046-1054, 4 figs.; methods of analyzing costs for solution of special problems, pp. 1055-1076; feasibility and economy of through routing of solid trains and its effect upon capacity of terminals, pp. 1077-1083; methods for determination of proper allowances for maintenance of way expenses due to increased use and increased investment, pp. 1084-1094.

Efficiency. I. C. C. Statistics and Operating Efficiency, J. E. Slater. Ry, Age, vol. 75, no. 3, July 21, 1923, pp. 115-117. Analyzes statistical indices provided in reports made by railways to Interstate Commerce Commission, and points out certain fundamental truths which must be constantly borne in mind in use of these statistics.

Traffic Studies Show Need of Balanced Budgets, B. H. Mann. Ry. Signal Engr., vol. 16, no. 7, July 1923, pp. 289-294, 3 figs. Shows that operation of a freight train district or subdivision is a mathematical problem and no longer a matter of mere energy; train movements scientifically scheduled cut down side-track delays and speed up service; law of songle-track capacity. Abstract from paper before Am. Assn. R. R. Supts. convention.

Electrified Railways. A Decade of the N. &. W. Electrification. Elec. Ry. Jl., vol. 62, no. 6, Aug. 11, 1923, pp. 203-208, 9 figs. Operating experience of Norfolk & Western Ry. has led to minor changes in original designs; electrified mileage has been doubled since first project was completed; describes some of the methods of transportation and other operating departments.

Heavy Traffic. Handling Important Race Traffic on the Southern Railway. Ry. Gaz., vol. 39, no. 5, Aug. 3, 1923, pp. 154-159, 5 figs. How South Eastern & Chatham section of Southern Railway, by careful and preliminary scheduling of engine and train movements, etc., in full detail, enabled heavy and complex traffic of Derby Day to be operated with great exactitude, and without delay or confusion, while, at same time, meeting requirements of ordinary suburban and main-line traffic.

Long Runs. Extending Locomotive Runs on the Santa Fe, J. N. Nicholson. Ry. Rev., vol. 73, no. 3, July 21, 1923, pp. 83-88, 4 figs. Pooled power plus long runs result in doubling monthly mileage of coal-and oil-burning motive power.

Train Control. Big Four Tests I. E. C. Train Control Device. Ry. Age, vol. 75, no. 3, July 21, 1923, pp. 103-106, 7 figs. Description of device developed by Indiana Equipment Corp., Indianapolis, Ind., and its operation, and tests made on St. Louis division of Cleveland, Cincinnati, Chicago & St. Louis at Avon, Ind.

Frisco Train Control Tests, Ry. Signal Engr., vol. 16, no. 7, July 1923, pp. 284-286, 7 figs. Describes test installation of automatic train-control system of Nat. Safety Appliance Co. on St. Louis-San Francisco line; intermittent inductive type including stop and speed-control indication incorporated with existing single-track signalling.

The Richards Automatic Train Control System. Ry. Rev., vol. 73, no. 4, July 28, 1923, pp. 135-139, 4 figs. Is of intermittent, magnetic-induction type, providing continuous indications in locomotive cab; details of construction and operation.

RAILWAY REPAIR SHOPS

Boiler Shops, Trestles for Use in. Trestles That Have Been Found Useful in Boiler Shops, James F. Hobart. Boiler Maker, vol. 23, no. 7, July 1923, pp. 192-194, 10 figs. Steel and wood trestles made from materials in shop to meet every emergency.

Cost Accounting. Practical Plan for Analyzing Account No. 314, Laurence Richardson. Ry. Rev., vol. 73, no. 4, July 28, 1923, pp. 133-135, 2 figs. Expedient for analyzing car-repair costs by requiring an accounting for all repair charges for a sample number of each type of car in service.

Freight-Car. Unit System of Repairing Freight Cars. Ry. Mech. Engr., vol. 97, no. 8, Aug. 1923, pp. 568-572, 8 figs. Good results secured at Readville shops with unit or station-to-station method.

Labor, Specifications for. Specifications for Labor, Elec. Ry. Jl., vol. 68, no. 3, July 21, 1923, pp. 97-101, 3 figs. Power and equipment department of Connecticut Company has drafted specifications for work required in car overhauling and periodic inspections; it also has a simple system for tabulating and charting essential data.

Locomotive. New Burlington Locomotive Shop at Denver, A. H. Ostberg. Ry. Mech. Engr., vol. 97, no. 7, July 1923, pp. 485-489, 3 figs. $2,500,000 project will employ 750 men, will turn out 200 classified and 50 running repairs a year; details of plant and its equipment.

RAILWAY SHOPS

Locomotive. Erecting Shop Practice at Battle Creek, M. H. Westbrook. Ry. Mech. Engr., vol. 97, no. 8, Aug. 1923, pp. 581-591, 23 figs. Efficient devices and methods which facilitate erecting work at Grand Trunk locomotive shops.

RAILWAY SIGNALLING

Colored-Light Signals. C. B. & Q. Installs New Light Signals. Ry. Signal Engr., vol. 16, no. 8, Aug. 1923, pp. 323-326, 10 figs. Also Ry. Age, vol. 75, no. 4, July 28, 1923, pp. 159-160, 5 figs. Details of home and distant colored light automatic block signals just completed on Chicago, Burlington & Quincy between Hannibal, Mo., and Louisiana.

Interlocking. A Notable Interlocking Replacement. Ry. Gaz., vol. 39, no. 3, July 20, 1923, pp. 89-90, 8 figs. on pp. 91-92. How permanent way and signal departments of Great Eastern Section of Lond. & North Eastern Ry. replaced a complicated 136-lever interlocking mechanism at Liverpool Street station in 32 hours without hand signaling or interruption of traffic.

Three-Position Semaphore Arms. Mechanical Manipulation of the Three Position Semaphore Arms on the Belgian State Railways, R. Minet. Int. Ry. Congress—Bul., vol. 5, no. 7, July 1923, pp. 619-695, 83 figs. Transmission of power by double wire for working signals on Belgian State Rys.; semaphores of new method of signaling.

Train Operation in Either Direction. Train Operation Against Traffic. Ry. Signal Engr., vol. 16, no. 8, Aug. 1923, pp. 330-334, 6 figs. Signaling double track for movements in either direction, on Cleveland, Cincinnati, Chicago & St. Louis, allows idle stretches to be utilized to advantage.

RAILWAY TRACK

Curves. The Perfect Transition Curve (Der einwandfreie Uebergangsbogen), K. Borschke. Organ für die Fortschritte des Eisenbahnwesens, vol. 78, no. 3, Mar. 15, 1923, pp. 45-53, 16 figs. Consideration of cubic parabola; transition curve for sharp curves and flat gradients.

RAILWAY TRACK

Elevation of. Track Elevation at Aurora, Illinois, Ry. Rev., vol. 73, no. 6, Aug. 11, 1923, pp. 191-198, 11 figs. Details of methods used on project now nearing completion which relieves both city and railroad from burdensome conditions.

Load Analysis. An Analysis of Special Trackwork Loads, M. Bernard. Elec. Ry. Jl., vol. 62, no. 5, Aug. 4, 1923, pp. 173-174, 7 figs. Analysis showing location of points where impact, the most serious factor, is greatest; special examples showing where excessive wear and impact take place.

RAILWAY YARDS

Gravity Freight Yard. New Gravity Freight Yard at Denison, Tex.; M.-K.-T. Ry. Eng. News-Rec., vol. 91, no. 6, Aug. 9, 1923, pp. 221-224, 6 fifgs. Extensive layout in cutoff line has daily capacity for 80 trains and classifying 2000 cars; two hump tracks have different grades; separate departure yards.

RAILWAYS

Never-Stop Train System. The "Never-stop" Train System. Engineer, vol. 136, no. 3526, July 27, 1923, pp. 94-95, 7 figs. Notes on scheme devised vy Yorath Lewis in 1911, for central-area passenger service; "never-stop" railway is being built at Southend-on-sea, so arranged that it will demonstrate conpletely ability of system to change gradient and take curves of short radius; cars travel continuously around circuit.

Trans-Siberian. The Trans-Siberian Railways, Benjamin O. Johnson. Worcester Polytechnic Inst.—Jl., vol. 26, no. 4, July 1923, pp. 179-185. Deals with transportation or manufacture of ton miles. Describes this Russian railway and develops peculiarities in its operation as compared with American practices and methods, with view to what it may contribute to more intensive use of American transporation machine.

RAPID TRANSIT

Chicago. Chicago City Council Plans Unified Transit System. Eng. News-Rec., vol. 91, no. 3, July 19, 1923, pp. 104-105, 1 fig. Abstract of report and recommendations on physical plan for unified transportation system.

REACTORS

Short-Circuit Forces. Short-Circuit Forces on Reactor Supports, R. E. Doherty and F. H. Kierstead. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 8, Aug. 1923, pp. 832-841, 9 figs. Investigation, in theoretical way, of character of force which is required to hold reactor as a whole, against short-circuit forces.

Current-Limiting. The Development of Current Limiting Reactors and Their Shunting Resistors, F. H. Kierstead. Gen. Elec. Rev., vol. 26, no. 8, Aug. 1923, pp. 560-564, 5 figs. Author lays emphasis on value of shunted resistance as means of dampening out disturbances.

REFORESTATION

Watersheds for. Reforestation of Water-Sheds, Philip W. Ayres. New England Water Works Assn. Jl., vol. 37, no. 2, June 1923, pp. 127-141, and (discussion) 141-144, 8 figs. Timber supply, municipal forests, handling white-pine seedlings blister rust.

REFRACTORIES

Review of. A Review of Refractories, P. S. Devereux. Birmingham Met. Soc.—Jl., vol. 8, no. 2, 1923, pp. 53-61 and (discussion) 61-64, 1 fig. Destructive agents refractory materials at high temperature must resist; important factors in connecting with production of refractories, effect of load on refractoriness of firebricks.

REFRIGERATING MACHINES

Absorption. The Absorption Machine, C. O. Fehl. Refrig. World, vol. 58, no. 7, July 1923, pp. 16-18. Describes modern refrigerating machine of this type and its operation; causes to which undercapacity can usually be attributed.

REFRIGERATION

Methyl Chloride. Methyl Chloride Refrigeration, H. Herter. Refrig. World, vol. 58, no. 7 July 1923, pp. 13-16. Relative gas volumes to be pumped when using either ammonia or methyl chloride piston displacement and horsepower per ton of refrigeration with ammonia and methyl chloride gas compressors.

REFUSE DISPOSAL

Removal Methods. Town Refuse Transport. Motor Transport (Lond.), vol. 37, no. 957, July 2, 1923, pp. 5-8, 10 figs. Consideration of problems involved in loading and unloading. Describes trucks and carts used for refuse, large and small vehicles, walking controls.

RESEARCH

Industrial. Industrial Research, C. E. Skinner. West. Soc. Engrs.—Jl., vol. 28, no. 7, July 1923, pp. 279-292. General effect of research, organizations methods, and examples; insulation research; transformer oil, turbo-alternators, ventilation of electrical apparatus, steel for magnetic purposes, molded materials, iron plating, etc.; cooperative research.

RIVERS

Revetment of Banks. Revetment of Reinforced Concrete Mats, A. M. Todd. Military Engr., vol. 15, no. 81, May-June 1923, pp. [illegible], [illegible] figs. Description of reinforced-concrete type of mats developed and applied in the Third Mississippi River Commission District.

RIVETING

Machines for. The Design of Bear Type Portable Hydraulic Riveting Machines. Machy. (Lond.), vol. 22, no. 564, July 19, 1923, pp. [illegible], 11 figs. Recommends cylinder details, including main and return cylinders, leathers, frames, working valve, etc.

PROBLEMS. The Problem of Riveting. Zum Vernietungs-Problem. R. Maillart. Schweizerische Bauzeitung, vol. 82, no. 4, July 28, 1923, pp. 43-45, 6 figs. Author formulates a rule of construction.

ROLLING MILLS

ELECTRIC HEATING OF ROLLS. Electric Heating of Finishing Rolls of Sheet and Tin Mills. Gordon Fox. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 7, July 1923, pp. 253-268, 5 figs. Points out that same advantages which accrue to electric heating in many other operations also occur in this application.

ELECTRICALLY DRIVEN. New Mill at the Works of Brown, Bayley's Steel Works, Limited, Sheffield. Iron & Coal Trades Rev., vol. 107, no. 2888, July 6, 1923, pp. 1-2 and 8 figs. on pp. 17-20. Modern rolling mill consisting of an electrically driven 14-in. three-high rolling mill fitted with special mechanical handling equipment, etc. Arrangement for conveying billets to rolls, feed rollers and manipulating gear, conveying rolled material.

ROADS

DRAINAGE. Culverts and Small Bridges, E. L. Miles. Can. Engr., vol. 44, no. 25, June 19, 1923, pp. 600-601. Essential features in drainage of roads, pipe culverts; cost of laying concrete pipe, box culverts; gravel field tests, pouring concrete under water. Paper before Can. Good Roads Assn.

SURFACE TREATING

SURFACE TREATING. Surface Treating and Liquid Asphalts, C. M. Naskin. Can. Engr., vol. 45, no. 4, July 24, 1923, pp. 167-170, 3 figs. Cementing property of asphaltic oils makes them desirable for road work; advantages of oil for dust laying, production of asphalt by steam reducing process; results from two different processes of distillation.

ROADS ASPHALT

CONSTRUCTION, CANADA. Paving Cote Saint Catherine Road, Outremont, Irving H. Parker. Can. Engr., vol. 45, no. 5, July 31, 1923, pp. 192-194, 1 fig. Materials used and methods employed in paving this thoroughfare in Outremont, a residential suburb of Montreal, with sheet asphalt; report and analyses of asphalt paving materials used; careful technical control a feature.

TYPES. How is Asphalt Used in Road Construction?, I. W. Patterson. Contract Rec., vol. 37, no. 29, July 18, 1923, pp. 708-713. Describes the various asphaltic types of pavements and practical considerations governing their selection. Paper read at Can. Good Roads Assn. convention.

ROADS, CONCRETE

CONSTRUCTION. Progress and Plant Co-ordination, Concrete Road Work, Austin E. Page. Eng. News-Rec., vol. 91, no. 3, July 19, 1923, pp. 98-99, 2 figs. Tentative charts laid out at beginning of job for progress record; later, give warning of need for more equipment.

CORE-DRILL TESTS. Conclusions From Core-Drill Tests of Concrete Roads, R. B. Gage. Eng. News-Rec., vol. 91, no. 6, Aug. 9, 1923, p. 226. New Jersey records furnish unexpected information on influence of reinforcement and nature of cracks.

S

SAND, MOLDING

NATURE OF. Molding Sand—Size of Grain Secondary to Purity, F. W. Best. Can. Foundryman, vol. 14, no. 7, July 1923, pp. 24-25. Basis of good sand should be pure silica; unsatisfactory sands made valuable by proper blending.

PERMEABILITY. Testing Permeability of Molding Sand. Foundry, vol. 51, no. 14, July 15, 1923, pp. 587-588, 1 fig. Describes method for testing permeability of molding sand presented at convention of Am. Foundrymen's Assn.; tempering important; calculation of permeability.

SAWS

COLD. A New Metal Sawing Machine. Iron Age, vol. 112, no. 4, July 26, 1923, p. 203, 1 fig. Cold saw with capacity for 12-in. square bars; hardened gears used; convenient control. See also Iron Trade Rev., vol. 73, no. 4, July 26, 1923, p. 259, 1 fig.

SCREW THREADS

INVOLUTE, GAGING. The Gaging of Involute Threads, Henry E. Merritt. Machy. (Lond.), vol. 22, nos. 549, 551 and 565, Apr. 5 and 19 and July 26, 1923, pp. 11-13, 79-81 and 525-528, 13 figs. Apr. 5 and 15: Gaging straight-spur teeth by tooth caliper, and by plug or wire method. July 26: Geometry of finish-ground worm thread; fundamental dimensions; application of some of the properties of thread surface to gaging problems.

MEASURING DEVICES. Thread Measuring Devices, B. M. W. Hanson. Machy. (N. Y.), vol. 29, no. 12, Aug. 1923, pp. 946-948, 4 figs. Describes different devices with special reference to lead-measuring machine.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Activated Sludge Process. Public Works, vol. 54, no. 7, July 1923, pp. 216-217. Principles and recent development; intermittent aeration; mechanical aeration; sludge dewatering and drying; fertilizing value of sludge; effluent for fish ponds.

Mechanics of Activated Sludge Process, J. A. Coombs. Can. Engr., vol. 45, no. 6, Aug. 7, 1923, pp. 201-207, 8 figs. Design of tanks and apparatus for producing suitable conditions for treating crude sewage; experiments conducted at various plants and results obtained; advantages of diffused air method of aeration. From paper read before Instn. Sanitary Engrs.

PURIFICATION PROCESSES. Sewage Purification Processes Analyzed, J. H. Garner. Can. Engr., vol. 45, no. 5, July 31, 1923, pp. 187-191. Features of activated sludge process; intensifying aeration process; use of chemical precipitants; characteristics of combined sewage; fill and draw and continuous flow systems; results of experiments with domestic and trade sewage. From paper read before Assn. Mgrs. of Sewage Disposal Works.

SLUDGE DRYING. Expediting Drying of Sewage Sludge, Public Works, vol. 54, no. 7, July 1923, pp. 213-215, 8 figs. Initial dewatering of sludge by use of alum with subsequent drying on stone beds; experiments at Plainfield, N. J., plant reduced drying period, to less than one-third, even in wet weather.

SEWERS

CLAY. Clay Sewers Withstand Severe Test. Brick and Clay Rec., vol. 63, no. 1, July 10, 1923, pp. 33-34, 3 figs. partly on p. 35. Evens and Howard sewer pipe, 36 in. in diameter, successfully held up load of 83,000 lb., comparison of sewer pipe with one-ring brick sewers, tests show one-ring brick sewers 26 in. in diameter to be satisfactory, withstand strength test, not as foolproof as pipe-units.

SILICA BRICK

COKE OVENS, FOR. Silica Bricks for Coke Ovens, A. H. Middleton. Ceramic Soc. — Trans., vol. 22, Part 2, Session 1922-23, pp. 168-181 and discussion 182-198, 1 fig. Advantages of silica brick, one point in which silica bricks differ fundamentally from quartzite bricks, viz., their permanent expansion when heated to temperatures at which ovens built of silica bricks are frequently operated; raw material, and burning of bricks.

SIPHONS

INVERTED. Building a 9-ft. Siphon on the Hetch Hetchy Aqueduct, N. A. Eckart. Eng. News-Rec., vol. 91, no. 3, July 19, 1923, pp. 100-101, 4 figs. Armored with concrete outside and lined with cement mortar inside, steel pipe crosses reservoir under 367-ft. head.

SOLIDS

RUPTURE OF. The Theory of Rupture According to A. Griffith. Zur Bruchtheorie von A. Griffith. Karl Wolf. Zeit. für angewandte Mathematik u. Mechanik, vol. 3, no. 2, Apr. 1923, pp. 107-112, 3 figs. Derivation of formulas based on Griffith's work on the phenomena of rupture and flow in solids.

SOUND

INTENSITY MEASUREMENT. A Method for the Measurement of Sound Intensity, J. C. Karcher. Sci. Papers of Bur. of Standards, U. S., No. 473, May 7, 1923, pp. 105-111, 2 figs. Some features which enter into measurement of sound intensities; description of apparatus features of which are that a single instrument has a relative intensity range of a to 1,000,000 with lower limit near threshold value of audibility, precision of measurement increases rather than decreases with decrease of intensity, and that elements of apparatus which enter into calibration consist of two coils, a scale, and magnetophone.

SPRINGS

LEAF. New Spring Design Makes Master Leaf Thinner Than Shorter Plates. Automotive Industries, vol. 49, no. 3, July 19, 1923, pp. 117-120, 13 figs. Conventional practice revised to reduce probability of breakage; leaves are tapered and nip is kept at a minimum; construction of Landau high endurance product claimed to insure uniform distribution of stress throughout mass of material.

STACKS

FLUES AND. Stacks and Flues. R. H. Barber. Combustion, vol. 9, no. 2, Aug. 1923, pp. 160-161 and 194. Steel, brick, concrete and combination stacks; stack proportions; flues. Report presented by N. E. L. A. Prime Movers Committee.

STEAM-BOILER. Diameters and Heights of Stacks for Steam Boilers, E. C. Fisher. Boiler Maker, vol. 23, no. 7, July 1923, pp. 201-206 and 212. 6 figs. Assumptions for stack calculations. Report of subcommittee of joint Am. Boiler Mfrs.' Assn. and Stoker Mfrs' Assn. committee read at convention of Am. Boiler Mfrs' Assn.

STANDARDS

GERMAN N. D. I. Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie), vol. 6, no. 19, June 30, 1923, pp. N127-N138, 11 figs. Tentative proposals for testing of steel and iron workshop material, and Brinell hardness test. Proposed standards for punched wrenches, foundation blocks, testing of steel and iron workshop material; silver and hard solder; pipe molds.

STEAM ACCUMULATORS

RUTHS. The Ruths Steam Accumulator (Der Dampfspeicher von Dr. Ruths). W. Heepke. Feuerungstechnik, vol. 11, no. 19, July 1, 1923, pp. 193-196, 3 figs. The Halpin idea and the Ruths accumulator; calculation of steam output, water, content, dimensions and weight of storage tank; regulation of accumulator in accordance with pressure diagram; arrangement of accumulator in plant; technical and economic advantages. Based on article by Fritz Krauss in Zeit. der Dampfkesseluntersuchungs- u. Versicherungsgesellschaft.

TYPES. Steam Accumulators. M. Emanaud. Chem. & Met. Eng., vol. 29, no. 4, July 23, 1923, pp. 149-152, 10 figs. General considerations; discharge of accumulators; comparison of the types. From Technique Moderne, Apr. 1923.

STEAM-ELECTRIC PLANTS

AUSTRALIA. The Morwell (Australia) Electric Power Scheme. Elec. Times, vol. 64, no. 1655, July 5, 1923, pp. 3-7, 11 figs. Details of generating station now being erected, which will have initial capacity of over 60,000 kw, capable of extension to 100,000 kw.; turbine house and equipment.

EDISON ELEC. ILLUMINATING CO. BOSTON. Some Engineering Features of the Weymouth Station of the Edison Electric Illuminating Co. of Boston, I. E. Moultrop and Joseph Pope. Am. Inst. Elec. Engrs. Jl., vol. 42, no. 8, Aug. 1923, pp. 799-808, 8 pgs. Present construction covers installation of two 32,000-kw. generating units with three 1975-hp. boilers, operating at 375 lb. steam pressure and 700 deg. fahr.; details of feedwater heating and switching arrangement.

HEAT BALANCE. Power Station Heat Balance, G. G. Bell. Combustion, vol. 9, no. 2, Aug. 1923, pp. 148-156 and 194, 7 figs. Sources of power for electrically driven auxiliaries; variable-speed auxiliaries; jet condenser, closed and open heater; evaporators for preparing make-up water; stage heating of condensate. Manufacturers' statement. Report relative to combustion accessories from N. E. L. A. Prime Movers Committee report.

SIGNAL SYSTEMS FOR. Signal Systems for Power Stations, C. D. Gray and M. M. Samuels. Elec. World, vol. 82, no. 5, Aug. 4, 1923, pp. 225-228, 6 figs. Recent practice in providing for various alarm signals inside and outside switchboard room and for operating instructions as well as general communication; not too elaborate but still adequate.

STEAM METERS

ORIFICE TYPE. A New Orifice Steam Meter (Ein neuer Mundungsdampfmesser), H. Kraushaar. Braunkohle, vol. 22, no. 11, June 16, 1923, pp. 161-167, 9 figs. Advantages of orifice over float-type meters; and description of type developed by author.

STEAM POWER PLANTS

DESIGN. A South Dakota Power Plant, W. F. Schaphorst. Nat. Engr., vol. 27, no. 8, Aug. 1923, pp. 350-352, 5 figs. Comparison of old and new methods in power plant design; describes plant of State College of South Dakota, designed to burn lignite coal, which has not proved very successful; data on municipal heating.

HIGH-PRESSURE. Improving the Efficiency of Steam Plants with Very High Pressure (Die Verbesserung der Wirtschaftlichkeit im Elektrizitätswerksbetrieb durch Erhöhung von Druck, Ueberhitzung und thermodynamischem wirkungsgrad der Dampfturbine), H. Gleichmann. Siemens-Zeit., vol. 3, no. 6, June 1923, pp. 245-250, 3 figs. Author assumes existing steam plant, operating at 16 atmos. pressure, and investigates theoretical possibilities and efficiencies resulting from increase of boiler pressure to 101 atmos., driving with this high pressure a turbine, exhaust of which would drive under pressure of 16 atmos. the existing turbine. Efficiency charts show effect of intermediate superheater between two turbines and financial gain achieved with this system.

MANAGEMENT. Power Problems of Vital Interest to Executives, James T. Beard. Indus. Management (N. Y.), vol. 65, nos. 5, 6 and vol. 66, no. 1, May, June, and July, 1923, pp. 268-273, 7 figs., 369-374, 8 figs. pp. 16-52, 8 figs. May: Feedwater treatment. June: Possibilities of pulverized coal as fuel. July: Keeping tabs on combustion.

OFFICE BUILDING. The Power Plant and Its Problems. Harold R. Hilton. Nat. Engr., vol. 27, no. 8, Aug. 1923, pp. 361-363. Practical discussion on chief items of mechanical equipment in office buildings, special stress upon those items of equipment that most closely affect operating expense.

STEAM TURBINES

FOUNDATIONS. Steam-Turbine Foundations (Dampf-turbinen-Fundamente), Paul Boros. Bauingenieur, vol. 4, no. 11, June 15, 1923, pp. 339-341, 15 figs. Calculation of reinforced-concrete foundations.

LARGE, DESIGN OF. Design Characteristics of Large Steam Turbines, H. F. Ely. Southern Engr., vol. 39, no. 6, Aug. 1923, pp. 43-45, 7 figs. Improvements in design of 25,000 and 30,000-kw. turbines for steam pressures as high as 350 lb. and about 700 deg. steam temperature.

ORIFICE-DISCHARGE PHENOMENON. A Discharge Phenomenon in Steam-Turbine Orifices (Eine Ausströmungserscheinung bei Dampfturbinenmündungen), A. Loschge. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 30, July 28, 1923, pp. 740-741, 11 figs. Describes following phenomenon observed in tests carried out in laboratory of Munich Technical College: the steam jet, after leaving disgonally cut-off nozzle orifices of guide wheel, especially under low pressure conditions, shows inclination to adhere to outside wall of guide-wheel orifice.

SLOW SPEED OF. The Steam Turbine—a Slow-Speed Machine (Die Dampfturbine—ein Langsamläufer), H. Baudisch. Wärme, vol. 46, no. 21, May 25, 1923, pp. 219-220. By comparison of specific values of steam turbine with those of other turbogenerators, it is shown that steam turbine is slowest-speeed machine; its slow speed is brought about purposely by means of multi-stage construction.

20,000-KW. 20,000-Kw. Steam Turbine for Shanghai. Engineering, vol. 117, no. 3002, July 13, 1923, pp. 39-42, 15 figs. partly on supp. plate. Turbine designed to be operated with steam supplied to stop valve at 180 lb. per sq. in (gage pressure), and at temperature of 300 deg. cent., while vacuum provided for is $28\frac{1}{2}$ in.

STEEL

DETERIORATION BY AMMONIA. Deterioration of Steel and Wrought Iron Tubes in Hot Gaseous Ammonia, J. S. Vanick. Am. Soc. for Steel Treating—Trans., vol. 4, no. 1, July 1923, pp. 62-78, 9 figs. Describes failure in service of wrought iron and steel tubes employed in apparatus used for decomposition of ammonia; macroscopic and microscipic features of deterioration of metal; briefly sketches relations between temperature and joint reactions representing decomposition of ammonia and nitrogenization of iron to illustrate general character of deterioration of steel in heated ammonia.

SPRING, DECARBONIZATION OF. The Decarbonization of Spring Steels, Wm. J. Merten. Forging and Heat Treating, vol. 9, no. 7, July 1923, pp. 308-309, 8 figs. Scaling or decarbonization occurring during rolling is claimed to be of minor importance; oxidation takes place while heating unless reducing atmosphere is maintained.

TEMPERED, STRUCTURE OF. Structure Phenomena in Tempered Steel (Gefügeerscheinungen im angelassenen Stahl), H. Hanemann. Stahl u. Eisen, vol. 43, no. 27, July 5, 1923, pp. 880-882, 5 figs. Investigation of phenomena of structure in hardened steel at tempering temperatures between 600 and 700 deg. cent.

TESTING. Magnetic Testing of Steels (Essai magnétique des aciers à la traction. Limites élastiques), L. Fraichet. Académie des Sciences—Comptes Rendus des Séances, vol. 176, no. 25, June 18, 1923, pp. 1795-1796. Describes method of photographically recording magnetic changes in test bars undergoing elongation tests at constant speed and gives results of experiments.

STEEL CASTING

CLEANING. Cleaning Steel Castings, Herbert R. Simonds. Foundry, vol. 51, nos. 9, 11, 12, 13 and 14, May 1, June 1 and 15, July 1 and 15, 1923, pp. 345-350, 457-460, 486-490, 528-532 and 582-587, 35 figs. Importance of cleaning procedure; how apparatus is handled and cared for in torch department; layout for cleaning room; types of grinding wheels; selection and care of wheels; safety considerations; chipping hammers for removing surface defects and chills and also to knock out hard-burned cores; cost comparisons; care of equipment; cleaning light and medium heavy castings by sand blasting; tumbling adapted to wide use.

DESIGN. The Design of Steel Mold Castings (Konstruktion von Stahlformgusstücken), H. Oeking. Sr Stahl u. Eisen, vol 43, no 26, June 28, 1923, pp 841-845, 17 figs. Examples for improvements of construction parts from technical viewpoint.

PRODUCTION. Producing Steel Castings—III, R. A. Bull. Foundry, vol. 51, no. 15, Aug. 1, 1923, pp. 619-623 Occurrence, treatment and mixtures of molding sands; outstanding points of molding and cleaning equipment; review of different American specifications.

STEEL, HEAT TREATMENT OF

LARGE SECTIONS. Forging and Heat Treating Large Sections, W R Klinkicht. Am. Soc. for Steel Treating Trans , vol 4, no. 1, July 1923, pp 50-61, 9 figs. Describes routine operations which are used, as practised in a modern heavy forging plant equipped with suitable cranes, manipulating devices and heating equipment.

STOKERS

AUTOMATIC COMBUSTION CONTROL Application of Automatic Combustion Control to Mechanical Stokers, Charles H Smoot Combustion, vol 9, no 2, Aug. 1923, pp 171-175, also (abstract) Power ,vol 58, no 4, July 24, 1923, p 152. Why test runs and commercial operation differ; regulation of mixture important. Paper presented before Am Stoker Mfrs Assn

CHAIN-GRATE Performance of Large Chain-Grate Stoker at Calumet Station (Chicago) Power, vol 58, no 7, Aug 14, 1923, pp 254-255, 2 figs Features of construction and results obtained on stoker 24 ft. wide by 18 ft. 3 in. long.

MULTIPLE-RETORT. The Underfeed Type "F" Multiple Retort Stoker Electrician, vol 90, no 2340, Mar 23, 1923, pp 307-308, 4 figs Details of stoker on plan of a number of interchangeable retorts or troughs placed side by side and inclined downwards at angle of 20 deg to horizontal, forming therefore a composite stoker which may be of almost any desired width

STREET RAILWAYS

CARS. Hull Corporation Tramway Car With Worm Drive Tramway & Ry World, vol 54, no 3, July 19, 1923, pp 9-11, 2 figs Details of lightweight single-truck double-deck car with top cover, quiet running, and reduced power consumption, 60 passengers capacity

SUBSTATIONS

AUTOMATIC Peoria's Automatic Substations, C R Bush Elec World, vol 82, no 6, Aug 11, 1923, pp 279-283, 4 figs How regulation is improved and relief afforded to overloaded pole lines of 2300-volt distribution circuits leaving generating station; two 3000-kw. automatic substations cost $53,392.

SUPERHEATERS

BOILER PERFORMANCE, EFFECT ON Effect of Superheat on Boiler Performance, R A Helme Power, vol 58, no 7, Aug 14, 1923, pp 259-260, 2 figs. Evaporative performance and boiler efficiency

SURVEYING

HYPOTENUSE CHAINING Chaining on Boundary Survey, R W Cautley Can Engr , vol 45, no 4, July 24, 1923 pp 164-166 Hypotenuse method employed on survey of Alberta-British Columbia boundary advantages of method

T

TANKS

STORAGE, LARGE, FABRICATION OF. Fabricates Large Storage Tanks, John D. Knox. Iron Trade Rev., vol. 73, no. 4, July 26, 1923, pp. 241-247, 12 figs. Units of 80,000-barrel holding capacity are carried in stock by Riter-Conley Co.; construction of large gas holders; description of plant in Pittsburgh district.

TELEPHONEY

CROSS-TALK IN CABLES. Cross-Talk in Multiplex Telephone Cables and Its Reduction (Ueber das Nebensprechen in mehrfachen Fernsprechkabeln und seine Verminderung, K. Küpfmüller. Archivfür Elektrotechnik, vol. 12, no. 2, May 5, 1923, pp. 160-203, 48 figs. Induction in short cables and its elimination theory of cross-talk in long homogeneous lines; deduction of cross-talk in pupinized cables; measurement of couplings and intensity of cross-talk.

TEMPERATURE CONTROL

AUTOMATIC. Production Economies through Automatic Temperature Control. Factory, vol. 30, no. 6, and vol. 31, no. 1, June and July, 1923, pp. 696-699, 724, 726, 728, 730, 732 and 734; and 37-40, 68, 70, 72, 74 and 76, 6 figs. June: Regulation of temperature in both drying and workroom. July: Regulation of temperature in industrial; heating operations.

TEMPERATURE MEASUREMENT

INSTRUMENTS. Temperature-Measurement Instruments (Temperaturmessgeräte). Archiv für Wärmewirtschaft, vol. 4, no. 7, July 1923, pp. 127-128, 4 figs. Thermoelectrical pyrometers, temperature indicating meters, redording temperature-measuring apparatus, and remote electric resistance thermometers made by Paul de Bruyn Apparatus Co., Düsseldorf.

TERMINALS, RAILWAY

A. R. E. A. REPORT. Yards and Terminals—Report of Committee XIV. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 255, Mar. 1923, pp. 809-942. Specifications for manufacture and installation of motor truck, built-in, self-contained and portable scales for railway service, pp. 815-835; handling freight in two-track-level freight houses and team tracks, multiple-story freight houses, and by mechanical means, pp. 836-848, 9 figs.; proper relation of passenger station facilities which should exist between business handled and size and arrangement of such facilities, pp. 849-930, 55 figs.

CANADIAN NATIONAL RAILWAYS. Neebling Terminal, Canadian National Railways. Can. Ry. & Mar. World, no. 305, July 1923, pp. 322-325, 3 figs. Location, layout, and plans of large terminal erected by Canadian National Railways near West Fort William.

FREIGHT. Freight Terminal Executives and Chart of Organization, H. McL. Harding. Eng. World, vol. 23, no. 2, Aug. 1923, pp. 83-87, 2 figs. Details of organization chart of terminal executives for marine or waterway terminals of 100,000 lin. ft., by means of which, supplemented by descriptions outlining authority and responsibility of each position, much friction is eliminated, as relations, of individuals to each other are emphatically defined.

PORTLAND, ORE. Passenger Terminal Improvements at Portland, Ore. Eng. News-Rec., vol. 91, no. 3, July 19, 1923, pp. 94-96, 2 figs. To secure joint terminal city vacates streets and railway give land for widening streets; terms of agreement.

TEXILE MILLS

POWER AND PROCESS STEAM IN. Power and Process Steam in Finishing, Alfred Iddles. Textile World, vol. 64, no. 1, July 7, 1923, pp. 83, 85, 87, 89 and 91, 13 figs. Description of installation in a cotton goods, bleaching, dyeing, printing and finishing plant; combinations of non-condensing turbines and bleeder type; relation between electrical load and requirements for process steam studied and unusual degree of heat balance secured.

PRODUCER GAS AS FUEL. Producer Gas in the Textile Industry, Paul A. Merriam. Texile World, vol 63, no 18, May 5, 1923, pp 79 and 81-82, 6 figs. A cheap, clean fuel suitable for mild temperatures employed in various applications of heat; what producer gas is and how it is made; application to yarn and cloth singeing, drying and calender roll heating; description of equipment.

TIRES, RUBBER

TEMPERATURE MEASUREMENT ON ROAD The Measurement of Temperature in Rubber and Insulating Materials by Means of Thermocouples, Ellwood B. Spear and J. F. Purdy. Indus. & Eng. Chem., vol. 15, no. 8, Aug. 1923, pp. 842-845, 7 figs. Describes new thermocouple casing which has been found convenient for measurement of temperatures in solid or pneumatic tires while latter are in use on road.

VULCANIZATION, TEMPERATURE DURING The Actual Temperature of Tires During Vulcanization, D. F. Cranor. India Rubber World, vol. 68, no. 5, Aug. 1, 1923 pp 709-710, 6 figs Deals with full-molded fabric tires, air-bag single-cured cord tires, and single-cured cord truck tires

TOOL STEEL

FORGING AND HEAT TREATMENT Forging, Annealing, Hardening and Tempering Tool Steel E. J. O'Leary. West, Machy. World, vol. 14, no. 7, July 1923, pp. 227-228. Important points.

TRANSFORMERS

ACCURACY TESTS Accuracy Tests for Transformers Elec World, vol 82, no 5, Aug 11, 1923, p 284 Results of tests for determining mechanical strength and thermal limitation of common types of voltage transformers

CENTRAL-STATION, TESTING OF Testing Transformers for Central Stations, A B. Hendricks, Jr Gen Elec Rev , vol 26, no 7, July 1923, pp 477-495, 45 figs Necessary qualifications for reliable insulation testing and description of the various equipments standardized for this purpose and for high current testing

RATING Tests for Rating Current Transformers Elec World, vol 82, no 4, July 28, 1923, pp 169-173, 8 figs Effect of high current on mechanical strength thermal capacity studied; details of tests and conclusions for specific types used on two large Atlantic Coast systems

TRANSPORTATION

MOTOR-TRUCK AND RAILWAY The Coordination of Motor-Truck and Railroad Transportation, M J L Baldwin Soc Automotive Engrs J1, vol 13, no 2, Aug 1923, pp 122-124 and 148 Terminal transportation, practice in Canada field of motor truck, trap cars

TUBES

SEAMLESS ALUMINUM COPPER MAGNESIUM ALLOY Tubes, Aluminum Copper Magnesium Alloy Seamless U S Army Air Service Specification, No 11,055-A June 20, 1923, 4 pp Specification covering material, manufacture, physical properties and tests, lengths, and packing

TURBO-GENERATORS

COOLING. Cooling of Turbine Generators, A. R. Smith. Gen Elec. Rev., vol. 26, no 8, Aug. 1923, pp 564-579, 1 fig Utilization of heat in steam-electric power plants

LARGE GERMAN. 65,000 kva Generator Design, Robert Phol. Elec. World, vol. 82, no. 5, Aug. 4, 1923, pp. 229-230, 5 figs. Respects in which plan followed in Germany differs from that adopted in America; constant stresses and self-ventilation are main features; coil, teeth and rotor despresses are unusual.

V

VIADUCTS

CHICAGO. The South Park Boulevard Viaduct, T. L. Condron. West Soc. Engrs.—Jl., vol. 28, no. 7, July 1923, pp. 261-278, 13 figs. Main viaduct is to be of structural steel encased in concrete with reinforced concrete deck; there are three independent structures of three spans each, with six lines of parallel girders, supported on columns and connected by transverse floor beams to support concrete deck.

W

WAGES

SYSTEMS. Piece-Time-Rate Determination from Time Records (Stuckzeitermittlung aus Zeitaufnahmen), H. von Weese. Werkstattstechnik, vol. 17, no. 12, June 15, 1923, pp. 370-373. Critical discussion of existing methods of piece-rate determination, and suggestion of new method.

Wage Systems. Les nouvelles méthodes de rémunération du travail), Lucien Freling. Technique Moderne, vol. 15, no. 14, July 15, 1923, pp. 427-429, 10 figs. Summary or present systems of time and piece rate and their modification.

WATER

REACTIONS OF CULTURE MEDIA. The Reactions of Culture Media.—Part 11, George C. Bunker and Henry Schuber. Am. Water Works Assn.—Jl., vol. 10, no. 4, July 1923, pp. 672-685, 1 fig. Medalia's standards; a buffer mixture of wide range (pH 1 to 12), buffer tablets, and indicator tablets; standards from buffer mixtures of Clark and Lubs; color standards prepared from mineral colors; influence of H. I. C. of nutrient agar on development of colonies of bacteria.

WATER-GAS MANUFACTURE

BLUE-WATER-GAS. The Manufacture of Blue Water Gas. Gass Jl., vol. 163, no. 3138, July 4, 1923, pp. 134-157, 8 figs. Tenth report of Research Sub-Committee of Gas Investigation Committee of Instn. Gas Engrs. Theoretical considerations; experiments to ascertain wheteer, by reducing depth of fuel bed (in manufacture of blue water gas according to principle of ellwik-Fleischer process), manufacture could be carried out more efficiently than according to method of operation describes in Sixth Report; description of installation at Adderley Street Works of Birmingham Gas Dept., where experiments were made, details of tests and results obtained.

WATER PIPES

JOINT MATERIALS. St. Louis Tests Three Water-Main Joint Materials, Leland Chivvis. Eng. News-Rec., vol. 91, no. 5, Aug. 2, 1923, pp. 190-191, 2 figs. Cement and leadite shown to be superior to lead for resistance and deflection, while lead and leadite are more readily worked.

WATER POWER

DEVELOPMENT. Graphic Analysis of Economy of Developing Water Powers, G. R. Kenny and Page Golsan. Elec. World, vol. 82, no. 3, July 21, 1923, pp. 119-122, 8 figs. Aid to study of sites which may become economically feasible through increase demand for power, greater interconnection and use of automatic or semi-automatic generating stations.

NORTH CAROLINA. The Water-Power Situation in North Carolina, Thorndike Saville. N. C. Geological and Economic Survey, Water Resources Division, Circular No. 6, 1923, 25, pp., 3 figs. Status of developed power; growth of power use; growth of steam power; output of public utility power; horsepower required for future power demands; sources of water power; use of power; engineering investigations.

WATER SOFTENING

LIME-SODA AND ZEOLITE PROCESSES. The Relative Merits of Lime-Soda and Zeolite Water Softening, A. S. Behrman. Am. Water Works Assn. Jl. vol. 10, no. 4, July 1923, pp. 623-629. Points out that neither process is to be recommended indiscriminately, each has its advantages and each its limitations and therefore each has its particular fields of usefulness, although in a few cases choice is a debatable question.

PLANTS. New Features Incorporated in Water Softening Plants, C. R. Knowles. Ry. Eng. & Maintenance, vol. 19, no. 7, July 1923, pp. 275-276, 5 figs. Conical bottom tanks and filters new features of water treating plants recently completed by Ill. Central.

WELDING

REPAIR JOBS. Welding and Brazing Practices That Make Repairs Easy, Gustav Radebaugh. Coal Age, vol. 24, no. 3, July 19, 1923, pp. 99-101, 11 figs. Building fire, repairing a broken machine casting, good job gives part 80 per cent of its original strength, preparing work, various kinds of fluxes, causes of poor weld.

see also Electric Welding; Electric Welding, Arc, Electric Welding, Resistance; Oxy-Acetylene Welding.

WELDS

QUENCHED-ARC. Quenched Arc Welds, O. H. Eschholz. Am. Weld Soc.—Jl., vol. 2, no. 6, June 1923, pp. 35-38, 3 figs. Effect of cooling rate on welded structures; control over residual stress, weld strength, ductility, stress distribution, shock and fatigue resistance, points needing further investigation.

WIND MOTORS

USES. Wind Motors and Their Uses (Les aéromoteurs et leurs applications), Ach. Delamarre. Outillage, vol. 7, no. 27, July 7, 1923, pp. 694-699, 3 figs. Power of wind mill, their velocity and operation; formulas and calculations; describes different types of wind mills; generation of electricity by wind power according to various schemes.

WIND TUNNELS

DIMENSIONS AND TEST RESULTS. The Modification of Wind-Tunnel Results by the Wind-Tunnel Dimensions, Max M. Munk. Franklin Inst.—Jl., vol. 1, no. 2, Aug. 1923, pp. 203-213. Necessary corrections are determined for influence of dimensions of wind tunnel upon results of tests on wings and propellers.

WIRE

SPRING, CARBON-STEEL. Wire, Spring, Carbon Steel (Heat Treated). U. S. Army Air Service Specification, No. 10,293-A, June 15, 1923, 4 pp. Specification covering material, manufacture, inspection and packing of carbon-steel spring wire which is suitable for springs which are not heat treated after forming.

WOOD

CONSOLIDATED. Consolidated Wood—A New Material for Various Industries, W. R. Turnbull. Roy. Aeronautical Soc.—Jl., vol. 27, no. 151, July 1923, pp. 342-347, 4 figs. Describes what is called by author consolidated wood, obtained by compressing wood across grain and parallel to annular rings, and its probable advantages for airplane and propeller parts, farm-implement parts, wheel spokes, etc.

WOOD PRESERVATION

A. R. E. A. REPORT. Wood Preservation—Report of Committee XVII. Am. Ry. Eng. Assn.—Bul., vol. 24, no. 255, Mar. 1923, pp. 943-1041. Service test record pp. 944-953; Douglas fir treatment, pp. 954-959; treatment of marine piling along Atlantic and Gulf Coast, pp. 959-964; Pacific Coast marine piling, pp. 965-970, 1 fig.; marine piling investigation, pp. 971-1010, 14 figs.; marine piling research, pp. 1011-1022, 4 figs.; preservative treatment of white oak ties, pp. 1023-1029; mechanical preparation of ties and timber treatment, pp. 1030-1040, 7 figs.; directions for determining penetration of sodium fluoride in wood, p. 1041.

TIE-TREATING PLANT. Treating Plant at the Dalles Embodies Permanent Construction. Ry. Eng. & Maintenance, vol. 19, no. 8, Aug. 1923, pp. 302-304, 7 figs. Describes timber-treating plant put into operation by Union Pacific at Dalles, Ore.

Two views of Main Street, Dutton, Ontario, constructed with Tarvia in 1912. A surface treatment of "Tarvia—B" has been applied every few years.

What Dutton thinks of Tarvia after 11 years—

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"I believe that this maintenance, which was never neglected, is the real reason why I can say the pavement is in better condition today than when first laid.

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"We will require a few barrels of 'Tarvia—B' this year probably, as no maintenance was given last year."

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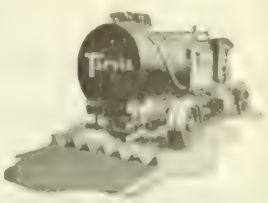

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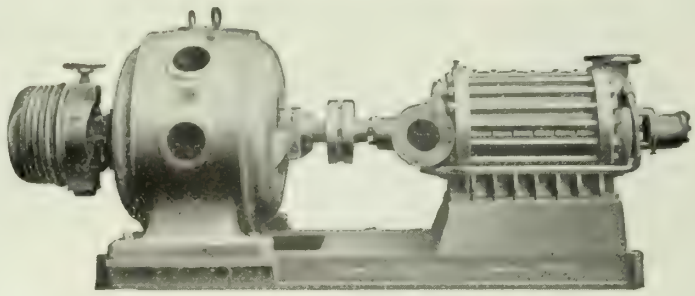

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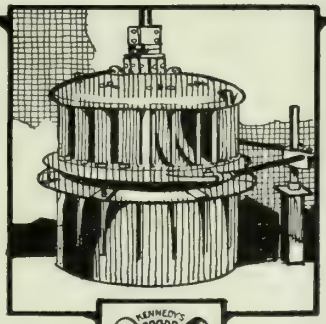

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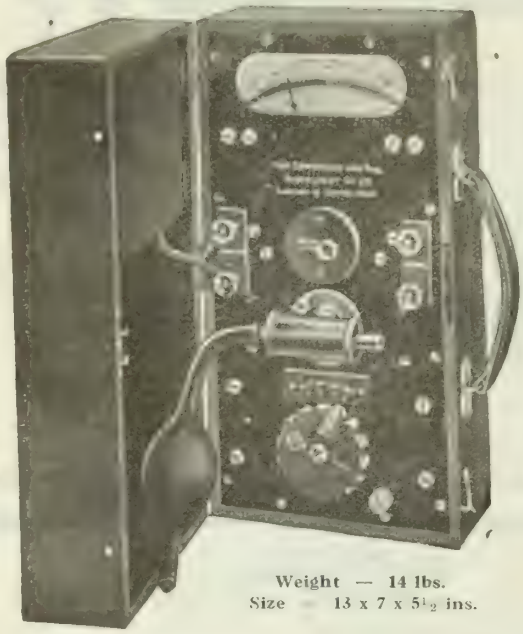

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WITH this instrument, both the temperature and percentage of CO_2 in the flue gases can be indicated on the one instrument, the time lag being practically negligible.

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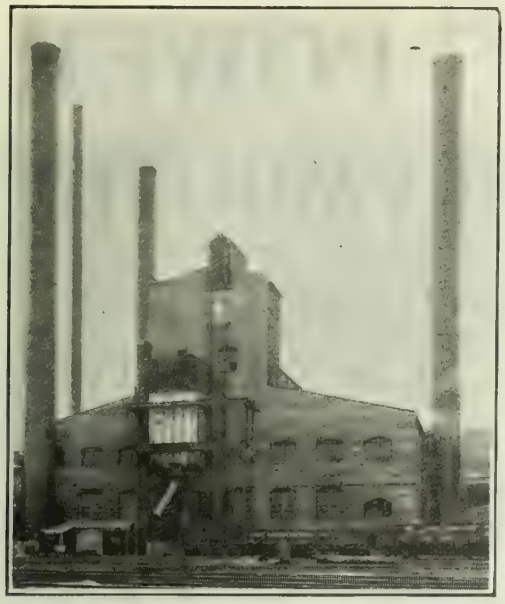

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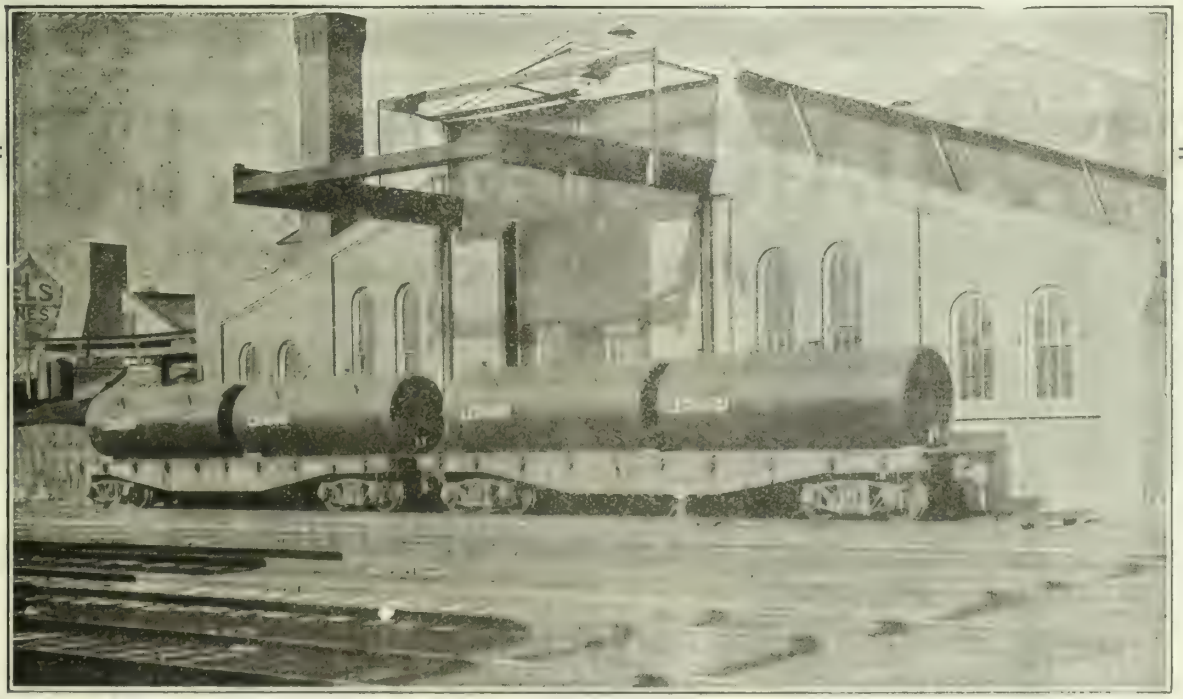

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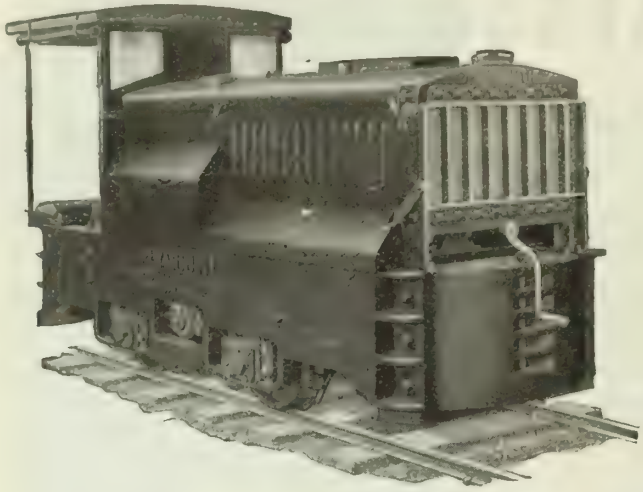

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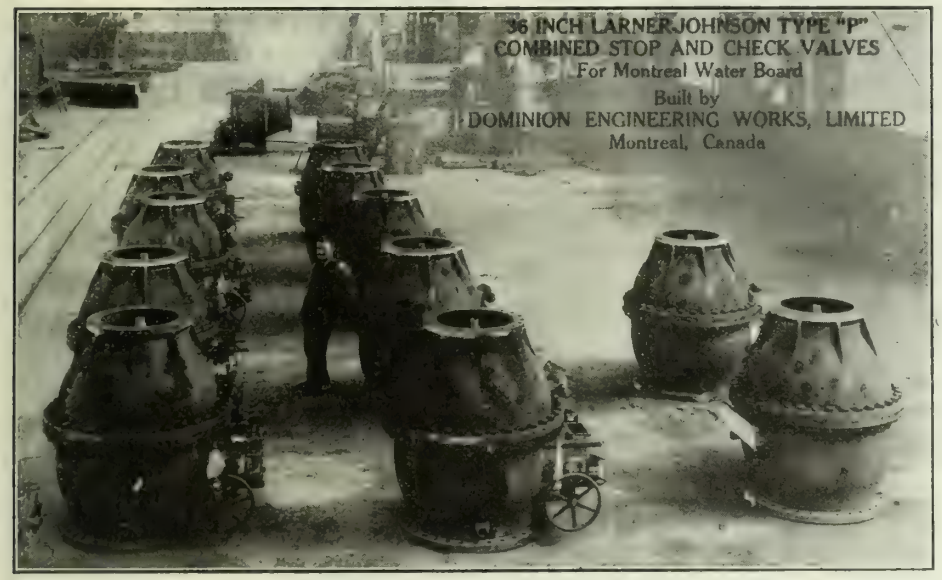

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THESE valves are built in standard sizes above 12" diameter.

Our bulletin No. 3 fully explains them

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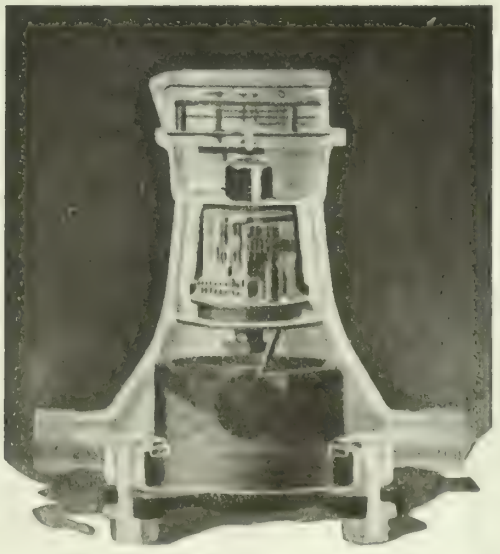

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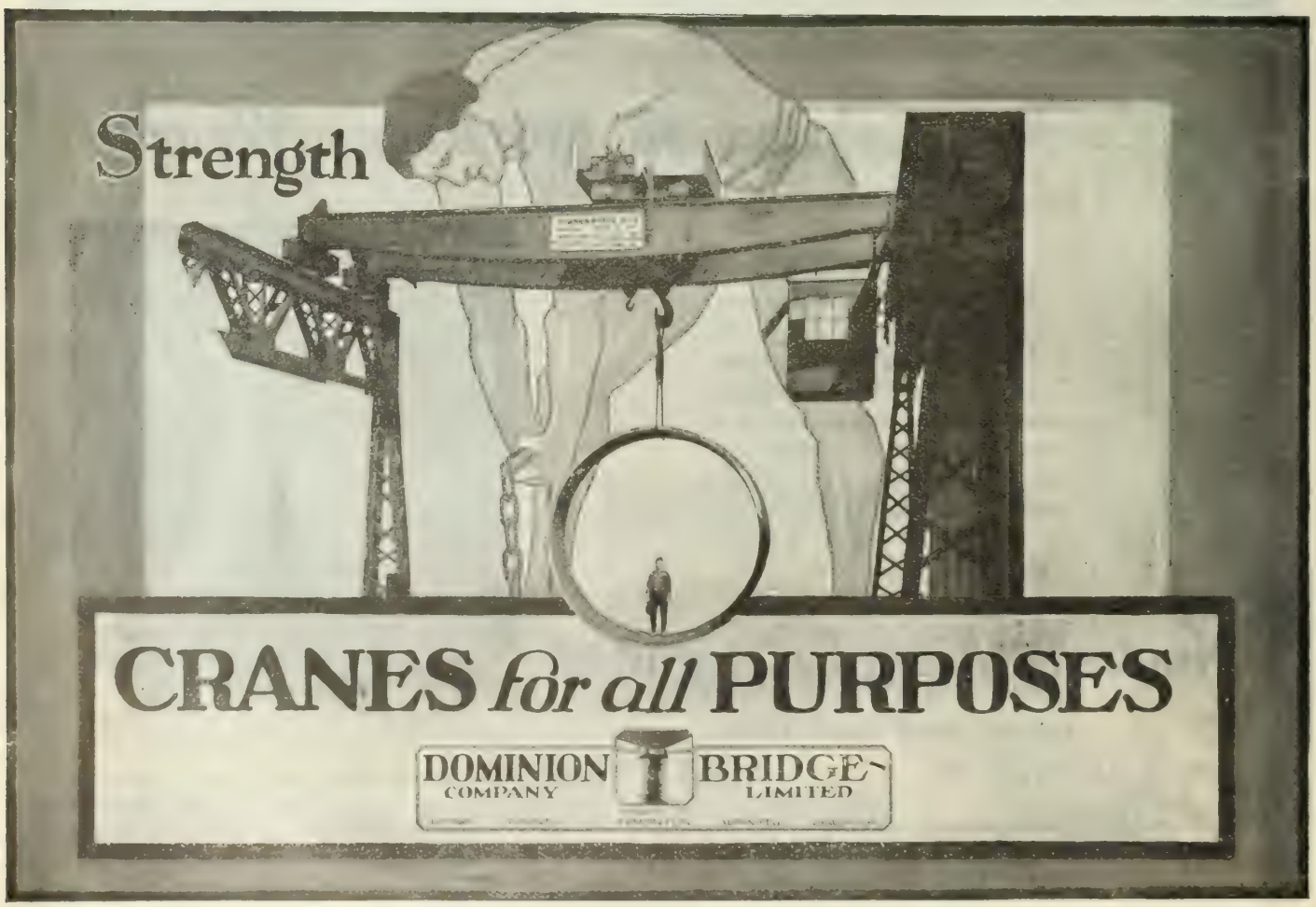

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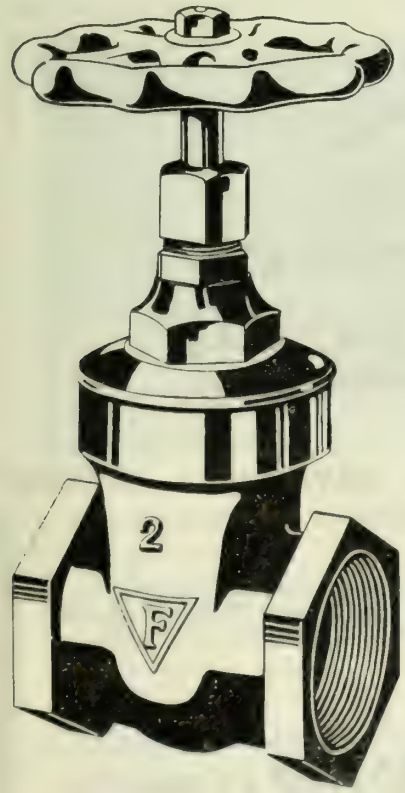

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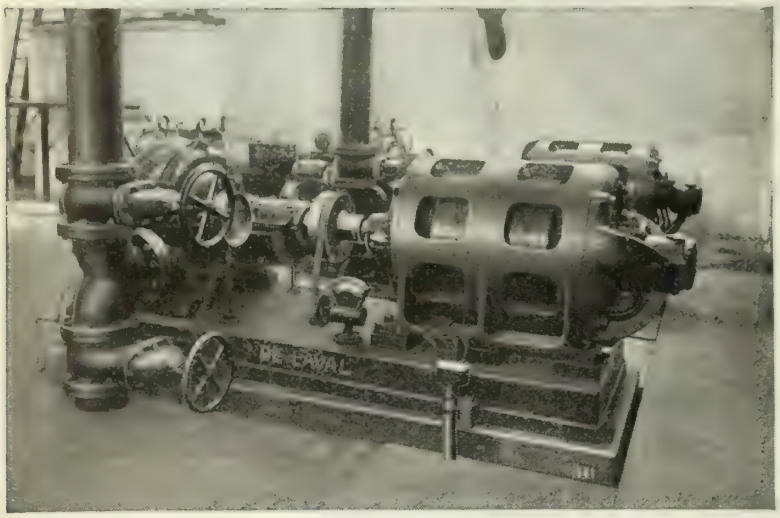

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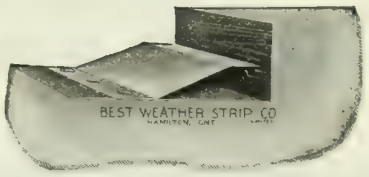

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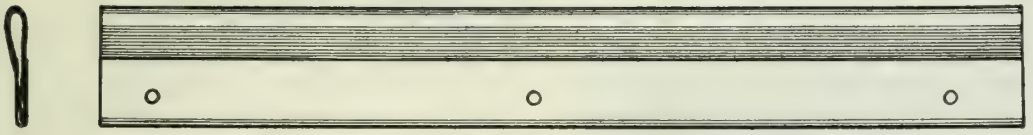

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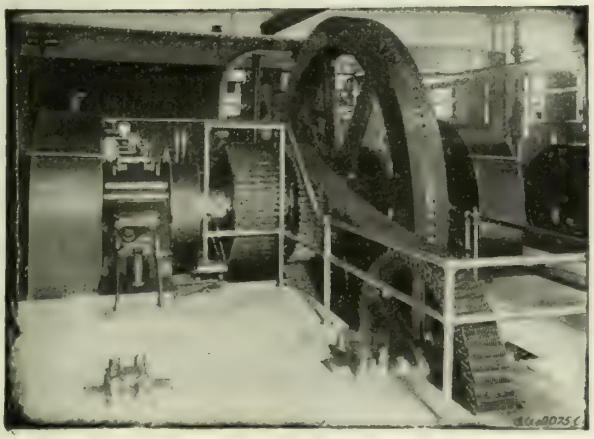

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3 inches to 60 inches diameter.

for Water, Gas and Culvert

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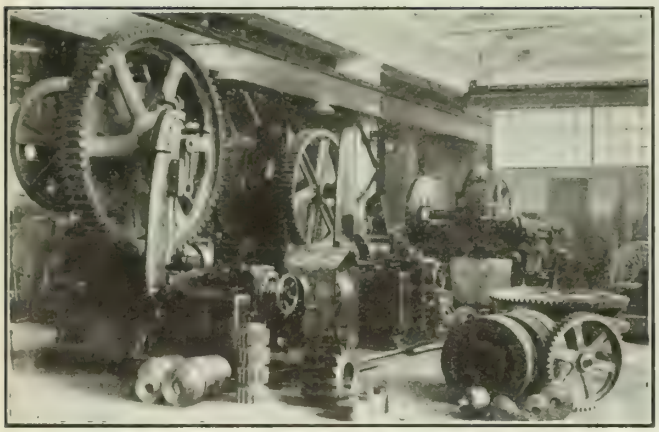

NOTE CAPACITIES OF MACHINES IN OUR GEAR CUTTING PLANT

Spur Gears up to -	16 ft. diam.
Internal Gears - -	26½ ins. diam.
Bevel Gears - - -	62 ins. diam.
Worm Wheels - -	52 ins. diam.
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Racks, - - - - - -	25 ft. long
or, by reversing,	45 ft. long

Hamilton Gear & Machine Co.

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Columbia Pyramid Brushes are uniform in size, structure, capacity and performance. Once tried they are always continued.

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MONTREAL TORONTO WINNIPEG

Look for this Mark on your Brushes

MG6

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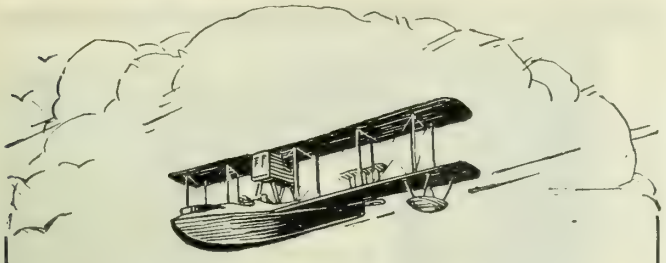

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But it is quickly spotted by a plane on patrol. Headquarters are called by wireless and the fire reported — not a second is lost.

The wireless apparatus must be dependable—efficient. It is a necessary link in the system of fire fighting. It must not be responsible for the loss of a second, for each second lost means a further swelling of the huge annual forest fire loss.

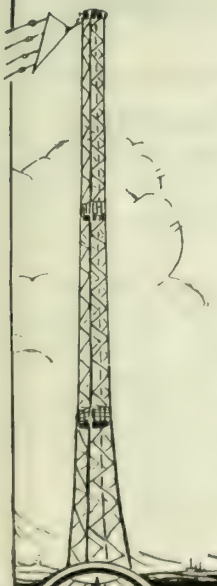

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Fig. 490
Steam Radiator Valve Angle Screwed

Ordinary radiator valves cannot compare with these Jenkins models.

Made of virgin metal they are much heavier and stronger and embody the well known Jenkins Standard in design, material and workmanship.

These Radiator Valves can be supplied in either screwed or male union ends. The Angle Patterns, Figs. 490-1, are fitted with genuine Jenkins renewable composition discs for either steam or hot water service whichever may be desired.

The Quick Opening type, figs. 493-4, which are recommended for Hot Water Heating only are fitted with a plug or cylinder of suitable metal, both types are equipped with polished, black, fibre composition wheels.

Catalog No. 9 - free on request - describes every Jenkins Valve in detail. May we mail you a copy?

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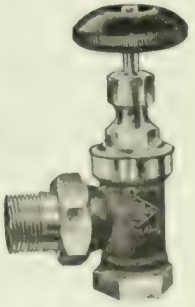

Fig. 494
(Male Union)

Always marked with the "Diamond"
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Unit cell being removed from Midwest Air Filter for cleaning.

Data Book F-16 is just off the press. Send for your copy.

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MIDWEST CANADA LIMITED
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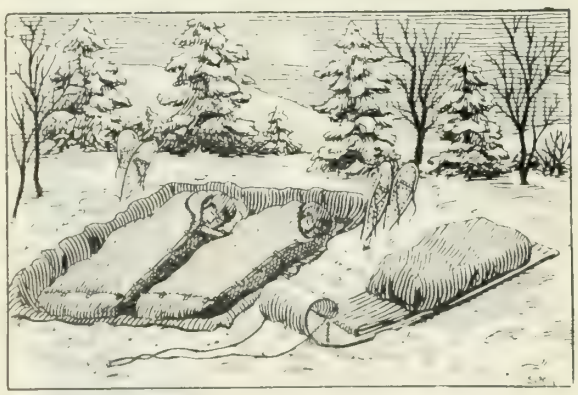

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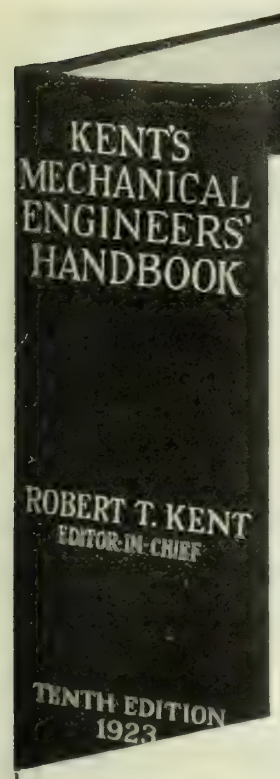

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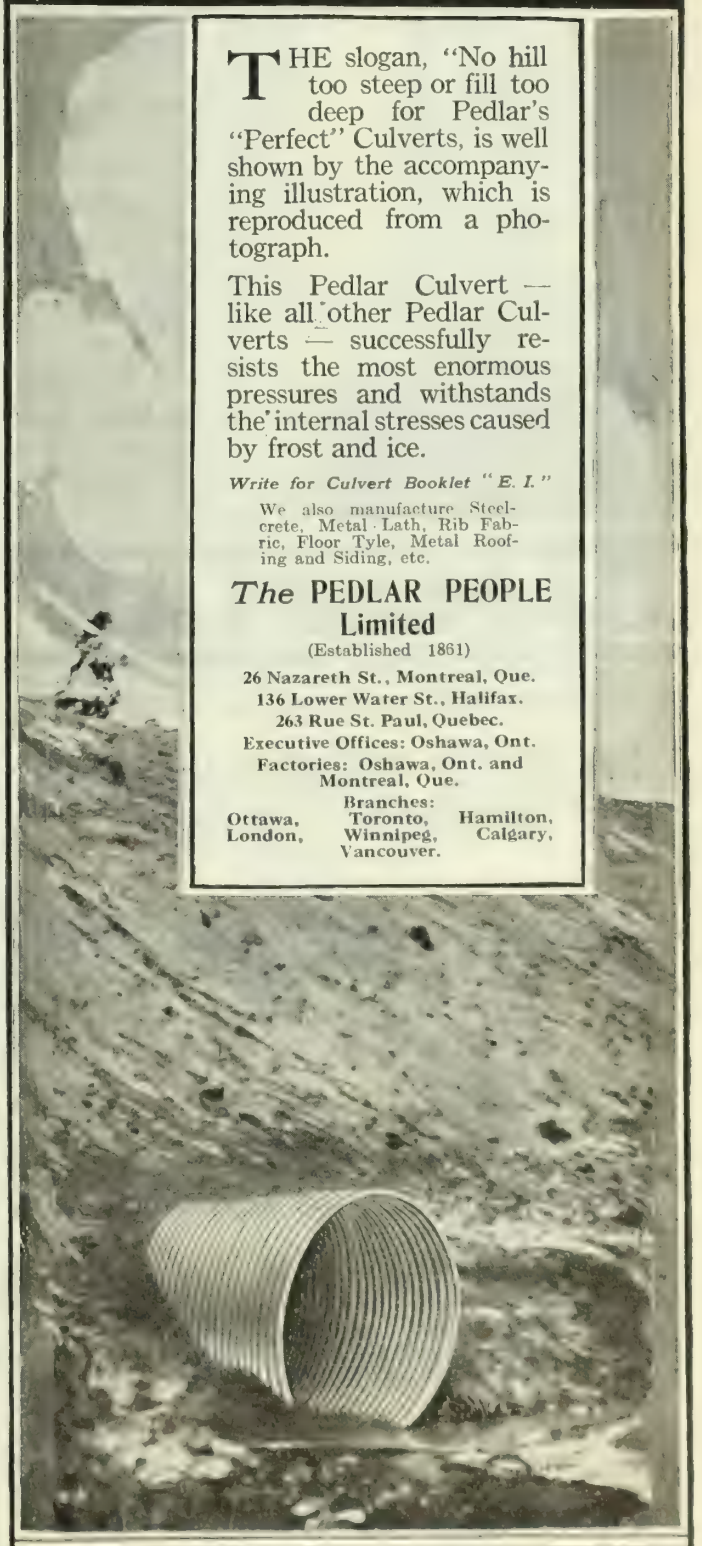

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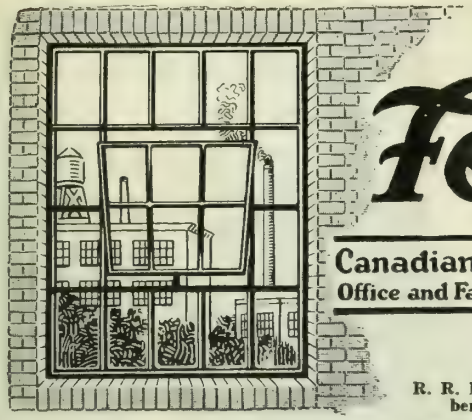

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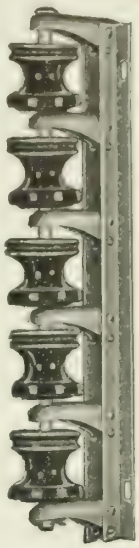

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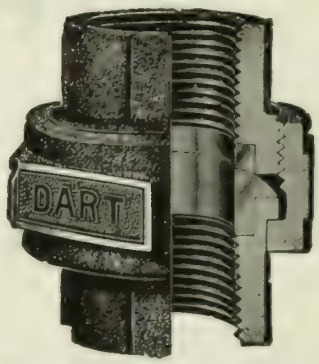

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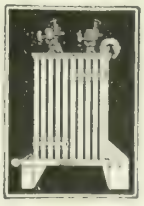

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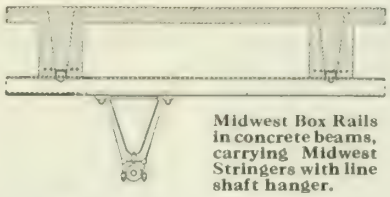

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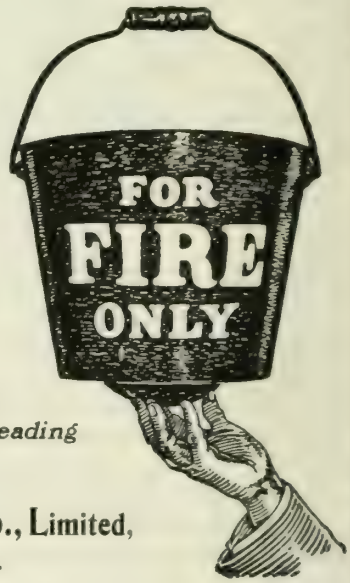

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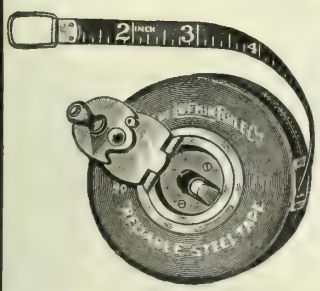

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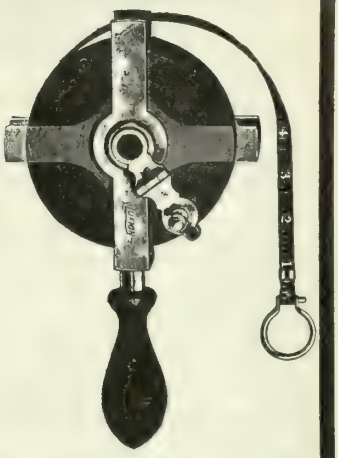

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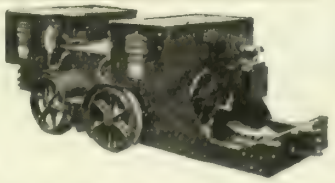

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Castings; Ferro-Alloy.
Canadian Steel Foundries, Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Engineering & Machine Works of Canada, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
Castings, Steel:
Canadian Steel Foundries, Ltd.
Catenary Materials:
Dominion Insulator & Mfg., Co. Ltd.
Cement, Dealers:
Jno. E. Russell Co., Ltd.
Cement Gun:
General Supply Co., of Canada, Ltd.
Cement, Manufacturers:
Canada Cement Co., Ltd.
Cement, Waterproofing:
Dominion Tar & Chemical Co., Ltd.
Chains:
Canadian Link-Belt Co., Ltd.
Chains, Silent:
Jones and Glassco, Regd.
Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Chemist, Industrial:
Milton Hersey Co., Ltd.
Chimneys:
Combustion Engineering Corp., Ltd.
Circuit Breakers:
Dominion Engineering Agency, Ltd.
Coal:
British Empire Steel Corp., Ltd.
Coal Handling Equipment:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd
Dominion Bridge Co., Ltd.
Coke:
British Empire Steel Corp., Ltd.
Cooling Air Filters:
Midwest Canada, Ltd.
Compressor Filters:
Midwest Canada, Ltd.
Compressors:
General Supply Co., of Canada, Ltd.
Compressors, Air:
Canadian Westinghouse, Co., Ltd.
Hydro Salvage Syndicate.
Compressors, Ammonia:
Taylor Stoker Co., Ltd.
Compressors, Centrifugal: Co.
De Laval Steam Turbine
Concrete Inserts, Continuous:
Midwest Canada, Ltd.
Concrete Mixers:
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Hydro Salvage Syndicate.
Koehring Co., of Canada, Ltd.
Mussens Ltd.
Condensers, Synchronous & Static
Canadian General Electric Co., Ltd,
Condensite Celoron Silent Gears.
Diamond State Fibre Co., of Canada Ltd.
Construction Material:
Northern Electric Co., Ltd.
Contractors:
E. G. M. Cape & Co.
Chick Contracting Co., Ltd.
E. O. Leahey & Co., Ltd.
Randolph MacDonald Co., Ltd.
Contractors' Plant and Supplies.
F. H. Hopkins & Co., Ltd.
Controllers, Electric:
Canadian Westinghouse Co. Ltd.
Conveyors:
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd.
Conveyors, Belt and Screw:
Canadian Link-Belt Co., Ltd.
Conveyors, Portable Belt:
Mussens Ltd.
Couplers, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Cranes, Caterpillar type:
Koehring Co., of Canada, Ltd.
Cranes, Locomotive:
Canadian Link-Belt Co., Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Cranes, Travelling:
Dominion Bridge Co., Ltd.
Creosote Oils:
Barrett Co., Ltd.
Dominion Tar & Chemical Co., Ltd.
Cross Arm Braces, Steel:
Burlington Steel Co., Ltd.
Crushed Stones:
Jno. E. Russell Co., Ltd.
Culvert Pipe:
Canada Lock Joint Pipe, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Pedlar People, Ltd.
Culverts, Metal:
Pedlar People, Ltd.
Culverts, Road:
Canada Lock Joint Pipe, Ltd.

D

Damp Proof Coating:
Dominion Tar and Chemical Co., Ltd.
Damper Regulation:
Under-Feed Stoker Co., of Canada, Ltd.
Derricks:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Dies:
Pratt & Whitney Co., of Canada, Ltd.
Doors, Fireproof:
Canadian Metal Window and Steel Products, Ltd.
Draughting Supplies:
Instruments, Ltd.
J. Frank Raw Co., Ltd.
Dredges:
Canadian Mead-Morrison Co., Ltd.
Drill Chucks:
Canadian S.K.F., Co. Ltd.
Drying Systems:
B. F. Sturtevant Co., of Canada, Ltd
Dumb Waiters, Electric:
Turnbull Elevator Co., Ltd.

E

Economizers:
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada, Ltd.
Educational:
Industrial Extension Institute.
Electrical Appliances:
Northern Electric Co., Ltd.
Electrical Instruments:
Instruments, Ltd.
Electrical Supplies:
Northern Electric Co., Ltd.
Elevator Safety Gates:
Turnbull Elevator Co., Ltd.
Elevators, Freight:
Turnbull Elevator Co., Ltd.
Elevators, Passenger:
Turnbull Elevator Co., Ltd.
Elevators, Push Botton:
Turnbull Elevator Co., Ltd.
Enamels, Acid & Fume Resisting:
Dominion Paint Works, Ltd.
Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.
Engines, Gas and Oil:
Canadian Fairbanks-Morse Co., Ltd.
Engines, Steam:
Goldie & McCulloch Co., Ltd.
Laurie and Lamb.
E. Leonard & Sons, Ltd.
Excavators:
Engineering & Machine Works of Canada, Ltd.
Excavators, Dragline:
Koehring Co., of Canada, Ltd.
Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.
Expanded Metal:
Pedlar People Ltd.

F

Fans:
B. F. Sturtevant Co., of Canada. Ltd.
Fan Engine Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.
Fence Posts, Steel:
Burlington Steel Co., Ltd.
Fibre, Hard Vulcanized:
Diamond State Fibre Co., of Canada, Ltd.
Fillers, Wood and Metal:
Dominion Paint Works, Ltd.
Filters, Air:
Midwest Canada, Ltd.
Fire Alarm Apparatus:
Northern Electric Co., Ltd.
Fireproofing, Hollow Tile:
Interlocking Tile Co., Ltd.
Fish Paper:
Diamond State Fibre Co., of Canada, Ltd.
Floortyle:
Pedlar People, Ltd.
Forgings:
British Empire Steel Corp., Ltd.
Dominion Bridge Co., Ltd.
Friction Clutches:
Dodge Manufacturing Co., Ltd.
Fuel, Oil:
Imperial Oil, Ltd.
Furnaces, Automatic:
Under-Feed Stoker Co., of Canada, Ltd.

G

Gasoline:
Imperial Oil, Ltd.
Gauges:
Pratt & Whitney Co., of Canada, Ltd.
Gear Reductions:
Hamilton Gear & Machine Co.
Gears:
Canadian Link-Belt Co., Ltd.
Dominion Engineering Works, Ltd.
Hamilton Gear & Machine Co.
Gears, Machine Cut:
Jones and Glassco, Regd.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

	Elastic Limit Pounds Sq. In.	Factor of Safety	Working Stress Pounds Sq. In.	Saving over Structural Steel	Saving over Intermediate Steel
Structural	33,000	2.06	16,000	.....	.....
Intermediate	40,000	2.22	18,000	11.2%	.....
Hard { Rail or Billet }	50,000	2.56	20,000	20.0%	10%

The Strongest Bars Made

A glance at the above table shows that by using hard steel, or Rail Steel, for reinforcement the designer may use 20,000 pounds unit stress in his steel, and still have a factor of safety of 2.50, or a 25% greater factor of safety than by using structural grade steel and designing for only 16,000 pounds unit stress. At the same time he uses 20% less steel, and as a consequence considerably less concrete. He has, therefore, designed a **safer structure** for **less money.**

Send for This Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

If he is sure to specify Rail Steel, he will actually have a factor of safety of over 3. Several different investigations, comprising in total over 8,000 tests, have shown Rail Steel Bars to have an average elastic limit of over 60,000 pounds per square inch. Rail Steel Bars are the strongest reinforcing bars made.

Further proof of this statement, and other valuable information on both Billet and Rail Steel Bars, are contained in the booklet "Rail Steel for Concrete Reinforcing." Send for it.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal

Purchasers' Classified Directory

For Alphabetical List of Advertisers see page 58

Gears, Silent, Waterproof:
Diamond State Fibre Co., of Canada, Ltd.
Gears, Double Helical:
De Laval Steam Turbine Co.
Generators:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Grab Buckets:
Canadian Mead-Morrison Co., Ltd.
Ground Joints Unions:
Dart Union Co., Ltd.

H

Hangers:
Dodge Manufacturing Co., Ltd.
Heaters, Boiler Feed-Water:
Goldie & McCulloch Co., Ltd.
Heating Material:
Crane Ltd.
Hoisting Engines:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Hoists:
Koehring Co., of Canada, Ltd.
Hoists, Electric:
Hydro Salvage Syndicate.
Taylor Stoker Co., Ltd.
Hoists, Hydraulic:
Turnbull Elevator Co., Ltd.
Hoists, Mono-Rail:
Taylor Stoker Co., Ltd.
Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.

I

Industrial Electric Control:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.
Insulated Rail Joints, Continuous
Rail Joint Co., of Canada, Ltd.
Insulating Compounds:
Dominion Tar & Chemical Co., Ltd.
Insulation, Fibre and Celoron:
Diamond State Fibre Co., of Canada, Ltd.
Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
Barrett Co., Ltd.

K

Kerosene:
Imperial Oil Ltd.

L

Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency Ltd.
Lighting Equipment, Industrial and Street:
Canadian General Electric Co., Ltd.
Locomotives:
Mussens Ltd.
Locomotives, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd.
Hydro Salvage Syndicate.
Lubricating Oils & Greases:
Imperial Oil Ltd.

M

Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Hydro Salvage Syndicate.
Charles Walmsley & Co., (Canada), Ltd.
Machinery, Special:
Dominion Engineering Works, Ltd.
Marine-Machinery:
William Kennedy & Sons, Ltd.
Material Handling Plants:
Canadian Mead-Morrison Co., Ltd.
Measuring Tapes:
Lufkin Rule Co., of Canada, I td
Merchant Bars:
British Empire Steel Corp., Ltd.
Metal Lath:
Pedlar People, Ltd.
Trussed Concrete Steel Co. of Canada, Ltd.
Milling Cutters:
Pratt & Whitney Co., of Canada, Ltd.
Mining Machinery:
William Kennedy & Sons. Ltd.
Motors:
Canadian Fairbanks-Morse Co. Ltd.
Dominion Engineering Agency Ltd.
Motor Cars:
Ford Motor Co., of Canada, Ltd.
Motors, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Motor Oils:
Imperial Oil Ltd.
Motor Trucks:
Ford Motor Co., of Canada, Ltd.
Mixers, Paving:
Koehring Co., of Canada, Ltd.

N

Nails:
British Empire Steel Corp., Ltd.

O

Oil Burning Equipment:
Combustion Engineering Corp., Ltd.
Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

Packing:
Dunlop Tire & Rubber Goods, Co., Ltd.
Paints, Acid Resisting:
Dominion Paint Works, Ltd.
Paints, Anti-Corrosive:
Dominion Paint Works, Ltd.
Paints, Concrete:
Dominion Paint Works, Ltd.
Paints, Damp-proof:
Dominion Paint Works, Ltd.
Paints, Graphite:
Dominion Paint Works, Ltd.
Paints, Machinery:
Dominion Paint Works, Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd.
Dominion Paint Works, Ltd.
Paper Mill Machinery:
Dominion Engineering Works, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Paving and Paving Materials:
Dominion Tar & Chemical Co., Ltd.
Penstocks:
Engineering & Machine Works of Canada, Ltd.
Pinions:
Hamilton Gear & Machine Co.
Pipe Coils:
Superheater Co., Ltd.
Pipe, Concrete:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Pipe Couplings, Union
Dart Union Co., Ltd.
Pipe Fittings:
Crane Ltd.
Pipe, Lead:
Steel Co. of Canada, Ltd.
Pipe Lines:
Canada Lock Joint Pipe, Ltd.
Pipe, Lock Joint:
Canada Lock Joint Pipe, Ltd.
Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
General Supply Co., of Canada, Ltd.
National Iron Corp., Ltd.
Pipe Lock Bar:
General Supply Co., of Canada, Ltd
Pipes, Reinforced Concrete:
Canada Lock Joint Pipe, Ltd
Pipes, Wrought Iron:
Crane Ltd.
Pitch:
Dominion Tar & Chemical Co., Ltd.
Plates, Brass and Copper:
Openshaw & Bennett, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co.,Ltd.
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
Power Apparatus:
Northern Electric Co., Ltd.
Power Plant Equipment:
Instruments, Ltd.
Propellor Wheels:
Wm. Kennedy & Sons, Ltd
Publishers:
John Wiley & Sons, Inc.
Renouf Publishing Co.
Pulleys:
Canadian S.K.F. Co., Ltd.
Dodge Manufacturing Co., Ltd.
Pulleys, Fibre:
Diamond State Fibre Co. of Canada, Ltd.
Pulp Grinders:
Engineering & Machine Works of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulp Mill Deckers:
Engineering & Machine Works of Canada, Ltd.
Pulp Mill Machinery:
Waterous Engine Works Co., Ltd.
William Hamilton Co., Ltd.
Pulpwood Machinery:
Canadian Mead-Morrison Co., Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulverized Fuel Systems:
Combustion Engineering Corp., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Pump Governors:
Under-Feed Stoker Co., of Canada, Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Koehring Co. of Canada, Ltd.
Canadian Fairbanks Morse Co. Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pumps and Condensers.
Goldie & McCulloch Co., Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil,
Taylor Stoker Co., Ltd.

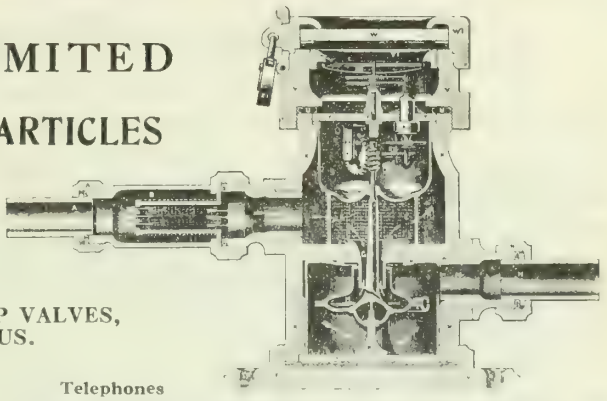
R

Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Marconi Wireless Telegraph Co. of Canada, Ltd.
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Ties:
Canadian Tie & Lumber Co., Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Receptacles, Fibre:
Diamond State Fibre Co., of Canada, Ltd
Recording Instruments:
Combustion Engineering Corp., Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Reservoir Fittings:
Guest & Chrimes, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Materials:
Dominion Tar & Chemical Co., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
Road Tar:
Dominion Tar & Chemical Co., Ltd.
Roofing Cement:
Dominion Tar & Chemical Co., Ltd.
Roofing Material:
Dominion Tar & Chemical Co., Ltd.
Roofings, Metal:
Pedlar People Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Rolling Mill Rolls:
Canadian Steel Foundries, Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Rope Wheel:
Dodge Manufacturing Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Rubber Goods, Mechanical:
Dunlop Tire & Rubber Goods, Co., Ltd.
Jenkins Bros., Ltd.
Rules Steel and Wood:
Lufkin Rule Co., of Canada, Ltd.

S

Safes:
Goldie & McCulloch Co., Ltd.
Sash, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Machinery:
Waterous Engine Works Co., Ltd.
William Hamilton Co., Ltd.
Scales:
Canadian Fairbanks-Morse Co., Ltd.
Screening Equipment:
Canadian Link-Belt Co., Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Sewer Pipe:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Shaftings:
Dodge Manufacturing Co., Ltd.
Shafting, Anchorage:
Midwest Canada, Ltd.
Sheets:
Steel Co., of Canada Ltd.
Shovels, Gasoline:
Koehring Co., of Canada, Ltd.
Sheating:
Barrett Co., Ltd.
Shingles, Prepared Asphalt:
Barrett Co., Ltd.
Skip Hoists:
Canadian Mead-Morrison Co., Ltd.
Smoke Stacks:
Engineering & Machine Works of Canada, Ltd.

THE PRODUCTS OF
GUEST & CHRIMES LIMITED
ROTHERHAM (ENG).
WATERWORKS CONSTRUCTIONAL ARTICLES
Siemen's and Adamson's "Turbine"—WATER METERS
Sizes ⅜"—18"
VALVES for Water, Gas and Sewage.
Bateman and Moore's AIR VALVES.
RESERVOIR FITTINGS
Standpipes, Draw-Off Valves, Filter Valves, etc.
PENSTOCKS, WATER LEVEL RECORDERS, FLAP VALVES,
PRESSURE GAUGES, TESTING APPARATUS.
— Canadian and U. S. Representatives —
703 Federal Bldg., TORONTO
BRITISH-AMERICAN FUEL & METALS LIMITED
Telephones Adelaide 6958-9



Turbine Water Meter—⅜ to 1½ inches

TENDERS

Quebec Harbour Commission

TENDERS FOR COLD STORAGE, WAREHOUSE, Etc., Etc.

TENDERS will be received up to noon of the 10th day of October, 1923, by the Harbour Commissioners of Quebec for supplying materials and executing work in the construction of a Cold Storage Warehouse, Power Plant and Fish Storage House in the city of Quebec.

Tenders will be considered for the whole plant complete or for the following items separately:

MACHINERY—Including piping, power wiring in the Power Plant, complete and running, etc.

PIPING—Including all cooling coils and connections from and to the brine coolers, heating apparatus and air conditioning machines, air-ducts, etc.

ELECTRIC WIRING—For lighting of all buildings.

INSULATION in all buildings.

ELEVATORS in Main Warehouse and Fish Warehouse.

SPRINKLERS in Main Warehouse and Fish Warehouse.

BUILDINGS—Including everything to make the plant complete except as mentioned above.

A marked cheque must accompany each tender equal to ten per cent of the gross amount of the tender, made to the order of the Secretary-Treasurer of the Harbour Commission which will be returned to the unsuccessful bidders immediately after the contract has been awarded.

After the contract has been awarded the successful bidder shall furnish a satisfactory security bond of double the amount of the security cheque, when the security cheque deposited with his tender will be returned to him.

Tenders must be made out on the forms supplied by the Commissioners.

The lowest or any tender will not necessarily be accepted.

Plans and specifications may be seen at the Harbour Commissioners' office in Quebec or a set of blue prints and specifications may be had for fifteen dollars from the Secretary-Treasurer upon application in writing.

CHARLES SMITH,
Secretary-Treasurer.

Quebec, September 18th, 1923.

The Quebec Streams' Commission

PROPOSED STORAGE DAM AT LAKE MITIS

Notice To Contractors

SEALED TENDERS, addressed to the undersigned and marked "Tender for Storage Dam at Lake Mitis", shall be received at the Office of The Quebec Streams' Commission, Parliament Buildings, Quebec, until twelve noon, on Wednesday, the 17th of October, 1923.

Plans and specifications can be seen on or after this date at the Office of the Commission, 59 Notre Dame Street East, Montreal.

Parties tendering shall be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour of the Province of Quebec, which schedule shall form part of the contract.

Tenderers are notified that tenders shall not be considered unless made strictly in accordance with the printed forms.

A cheque accepted by a Canadian Bank for the sum of Twelve Thousand Dollars ($12,000), made payable to the order of the Provincial Treasurer, must accompany each tender, which sum shall be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted. The cheque of the successful tenderer shall be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By Order,
J. A. TESSIER,
Chairman.

THE QUEBEC STREAMS' COMMISSION
59 Notre Dame Street East.

Montreal, September 21st, 1923.

Newspapers inserting this advertisement without authority from the Commission will not be paid for it.

Department of Lands and Forests

Province of Quebec

LEASING OF WATER POWERS

Notice is hereby given that on Tuesday, October 16th, 1923, at 10.30 A.M., in the sales room, Parliament Buildings, at Quebec, the Department of Lands and Forests will offer on lease at public auction three different water power sites of the Megiscane river, in the county of Temiscamingue and in the vicinity of the Canadian National Railways.

Interested parties shall be under the obligation to deposit $10,000.00, by accepted cheque to the order of the Minister of Lands and Forests, at least three days before the auction.

This deposit will be forfeited should the applicant put up no bidding; it shall be refunded after the auction to the unsuccessful bidders, while the grantee's deposit will be retained as a guarantee until the development is completed.

For further information, write to the Department of Lands and Forests, at Quebec.

Elz. Miville-Dechêne,
Deputy Minister.

Hydro-Electric Power Commission of Ontario

TENDER FOR EXCAVATION OF A TAILRACE CHANNEL AT DAM No. 9, ON THE TRENT RIVER

Sealed tenders for the Excavation of a Tailrace Channel in rock will be received by the Hydro-Electric Power Commission until 4.00 p.m.

Monday, October 15th, 1923.

The work involves approximately 20,000 cu. yds. of rock excavation, disposal and fill.

Instructions to Bidders, Specifications, Drawings, Form of Tender, and Schedule of quantities, may be obtained at the office of the Commission, 190 University Avenue, Toronto, on and after September 24th, on deposit of a marked cheque for $15.00, which deposit will be returned upon receipt of a bonafide tender or upon the return in good condition of all plans and documents issued.

Tenders must be accompanied by an accepted cheque for $2,000.00, payable to the order of the Hydro-Electric Power Commission, which cheque will be retained by the Commission until the contract is executed.

Tenders shall be enclosed in a sealed envelope, marked "Tender for Excavation of Tailrace Channel at Dam No. 9 Development" and be addressed to Sir Adam Beck, Chairman Hydro-Electric Power Commission of Ontario.

Sgd.) W. W. POPE,
Secretary.

Purchasers' Classified Directory

For Alphabetical List of Advertisers see page 58

Sodas:
Nichols Chemical Co., Ltd.
Speed Reducers, Gear:
Hamilton Gear & Machine, Co.
Steel Head Frames:
Hamilton Bridge Works Co., Ltd.
Steam Heating Specialties:
C. A. Dunham Co., Ltd.
Steam Shovels,
F. H. Hopkins & Co., Ltd.
Mussens, Ltd.
Steam Traps:
C. A. Dunham Co., Ltd
Steel Rails:
British Empire Steel Corp., Ltd.
Stokers:
Combustion Engineering Corp., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Waterous Engine Works Co., Ltd
Stokers, Side-feed:
Under-Feed Stoker Co., of Canada, Ltd.
Stokers, Underfeed:
Combustion Engineering Corp., Ltd.
Taylor Stoker Co., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Stone Crushers:
General Supply Co., of Canada, Ltd.
Structural Steel:
Algoma Steel Corporation, Ltd.
British Empire Steel Corp., Ltd.
Canadian Bridge Co., Ltd.
Canadian Des Moines Steel Co., Ltd.
Hamilton Bridge Works Co., Ltd
Standard Steel Constrn. Co., Ltd.
Vulcan Iron Works, Ltd.

Superheaters:
General Supply Co., of Canada Ltd.
Superheater Co., Ltd.
Surveying Instruments:
Instruments, Limited.
J. Frank Raw Co., Ltd.
Switchboards, Power Lighting:
Canadian General Electric Co., Ltd.

T

Tanks, Steel:
E. Leonard & Sons, Ltd.
Engineering & Machine Works of Canada, Ltd.
Taps:
Pratt & Whitney Co., of Canada, Ltd.
Tar:
Barrett Co., Ltd.
Tile, Hollow Building:
Interlocking Tile Co., Ltd.
Tools, Small:
Pratt & Whitney Co., of Canada, Ltd.
Touring Cars:
Ford Motor Co., of Canada, Ltd.
Tractors:
Ford Motor Co., of Canada, Ltd.
Transformers, Lighting & Power:
Canadian General Electric Co., Ltd
Transmission Machinery:
Dodge Manufacturing Co., Ltd.
Trucks:
Ford Motor Co., of Canada, Ltd.
Turbines:
General Supply Co., of Canada, Ltd.

U

Underfeed Stokers:
Taylor Stoker Co., Ltd.
Union Pipe Couplings:
Dart Union Co., Ltd.

V

Varnishes, Acid Resisting:
Dominion Paint Works, Ltd.
Varnishes, Insulating:
Dominion Paint Works, Ltd.
Valves:
Canadian Fairbanks-Morse Co., Ltd.
Crane Limited.
C. A. Dunham Co., Ltd.
Dominion Engineering Works, Ltd.
Guest & Chrimes, Ltd.
Jenkins Bros., Ltd.
Kerr Engine Co., Ltd.
Valves, Automatic Cut-off:
Under-Feed Stoker Co., of Canada, Ltd.
Valves, Regulating:
Under-Feed Stoker Co., of Canada, Ltd.
Valves, Relief:
Under-Feed Stoker Co., of Canada, Ltd.
Venturi Meters:
General Supply Co., of Canada, Ltd.

W

Washers, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Water Meters:
Guest & Chrimes, Ltd
Neptune Meter Co., Ltd.
Water Pipe:
Canada Lock Joint Pipe Co., Ltd.
Waterproofing:
Barrett Co., Ltd.
Dominion Tar & Chemical Co., Ltd.
Water Power Plant Machinery:
Wm. Kennedy & Sons, Ltd.
Water Softening Plants:
Laurie & Lamb:
Water Transmission:
Canada Lock Joint Pipe, Ltd.
Water Supply, Pipes:
Canada Lock Joint Pipe, Ltd.
Welding Metal:
G. D. Peters & Co., Ltd.
Welding Outfits, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd.
G. D. Peters & Co., Ltd.
Wheels, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Canadian Mead-Morrison Co., Ltd.
Winches:
Taylor Stoker Co., Ltd.
Wire:
British Empire Steel Corp., Ltd.
Steel Co., of Canada, Limited.
Wire Mesh:
Trussed Concrete Steel Co., of Canada, Ltd
Wires and Cables:
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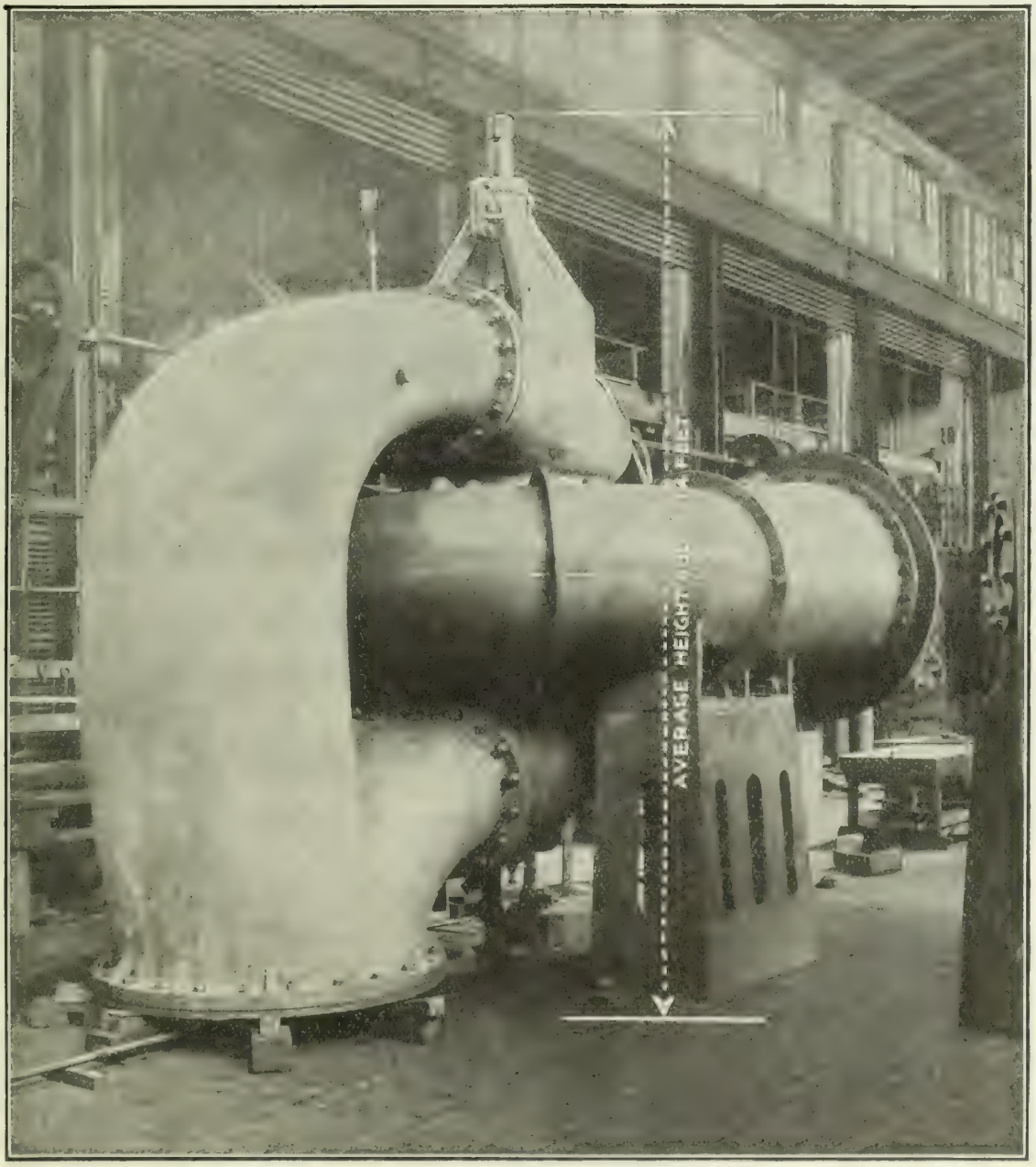

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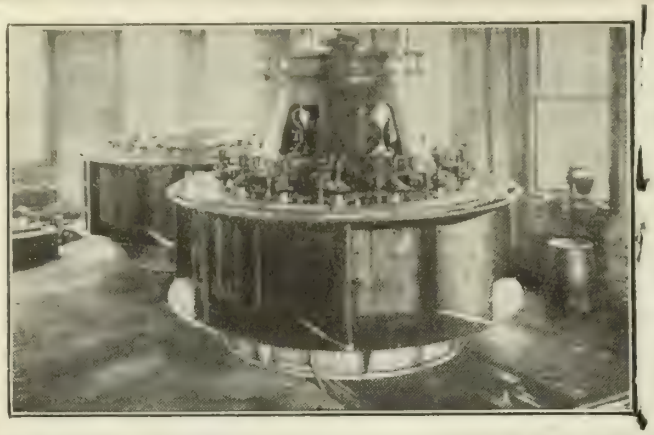

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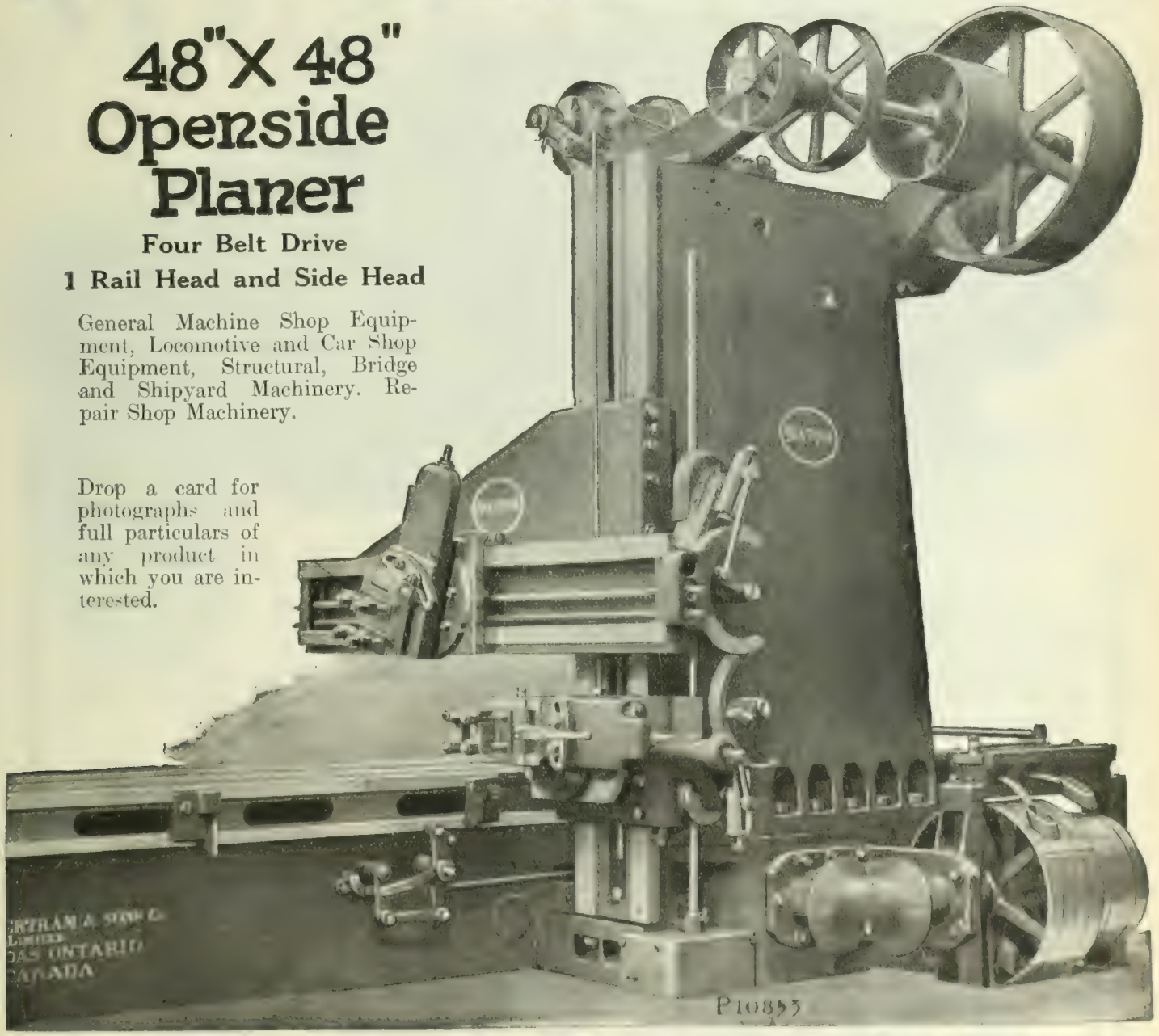

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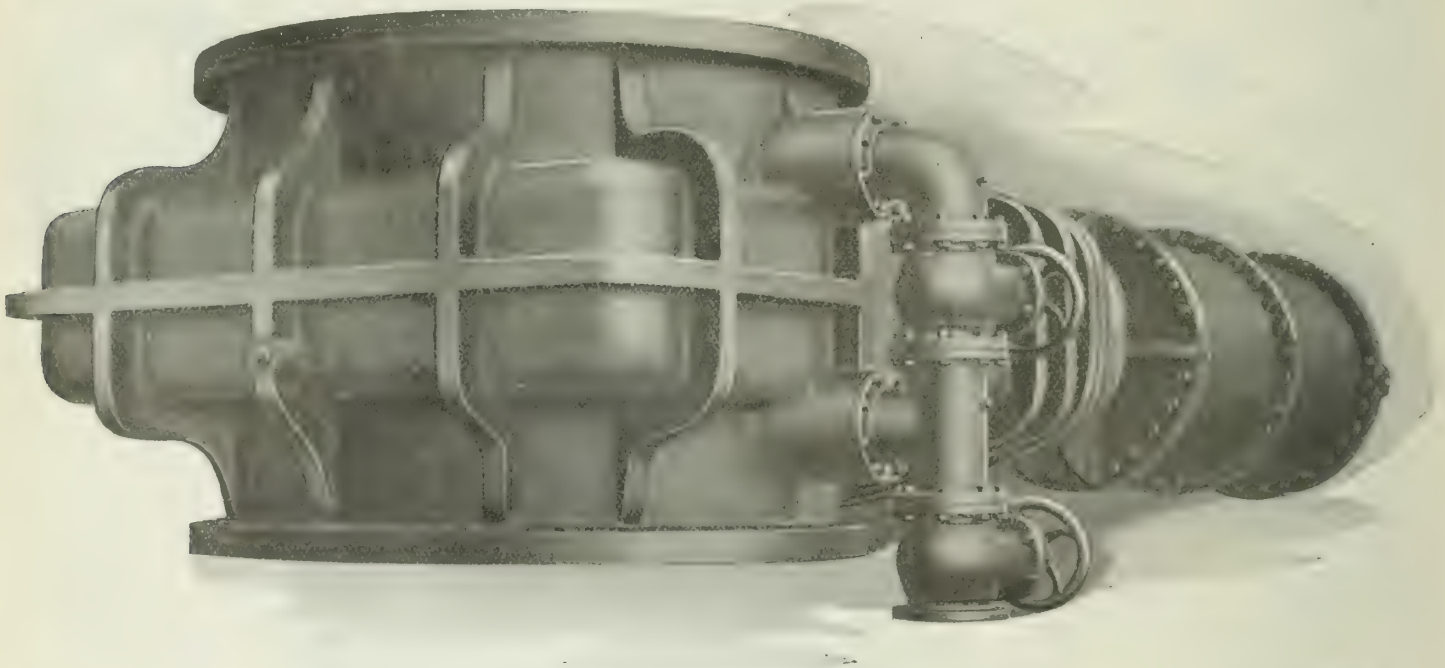

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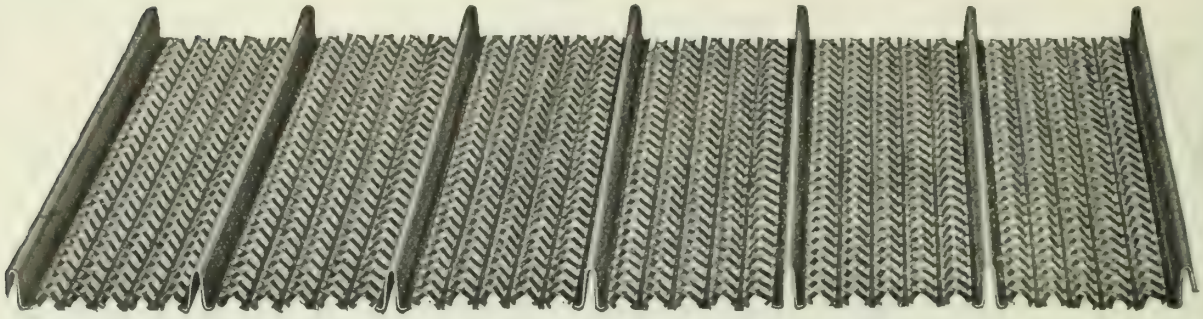

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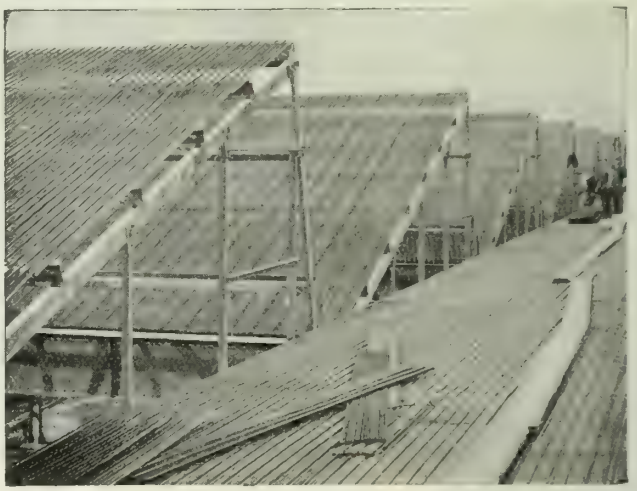

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"The clay-pipe people do not question the strength of concrete pipe, for obvious reasons. The city engineer at St. Lambert, Que., made tests of 18-inch clay and concrete pipe such as we are getting. The clay pipe broke at 4,610 pounds and the concrete at 11,285 pounds.

"They then base all on supposed acids in sewage. Sewage flowing in sewers in not septic, and putrefaction does not take place until it reaches the disposal works or outlets. Yet these disposal works are all made of concrete and no failures have been recorded in this country."

Write for complete information and quotations.

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McCracken Pipe is manufactured in accordance with standard specifications issued by American Society for Testing Materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

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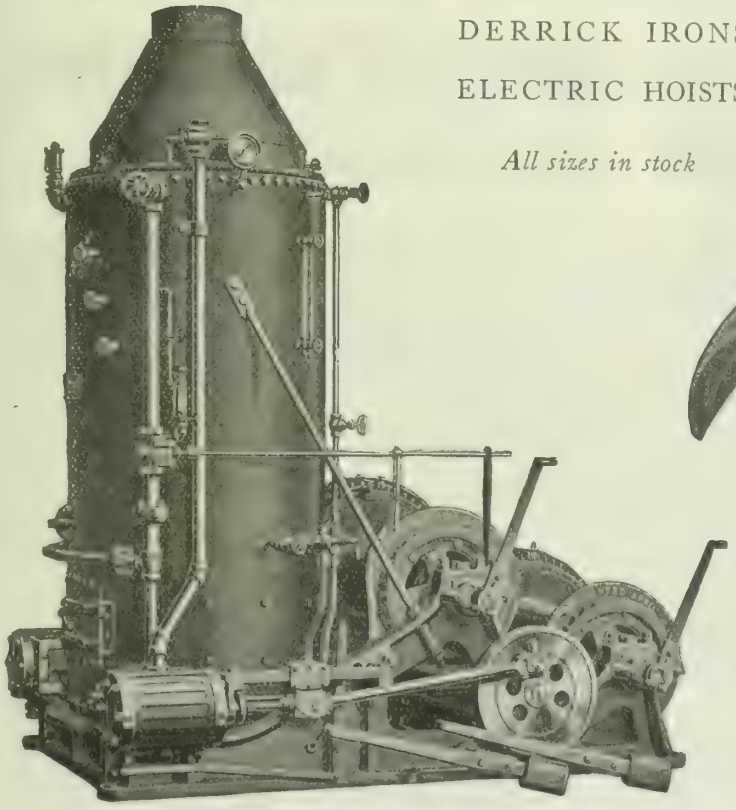
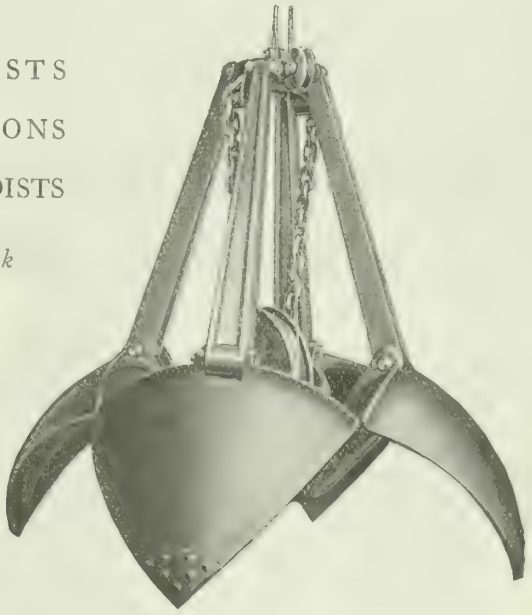


Double Drum Steam Hoist



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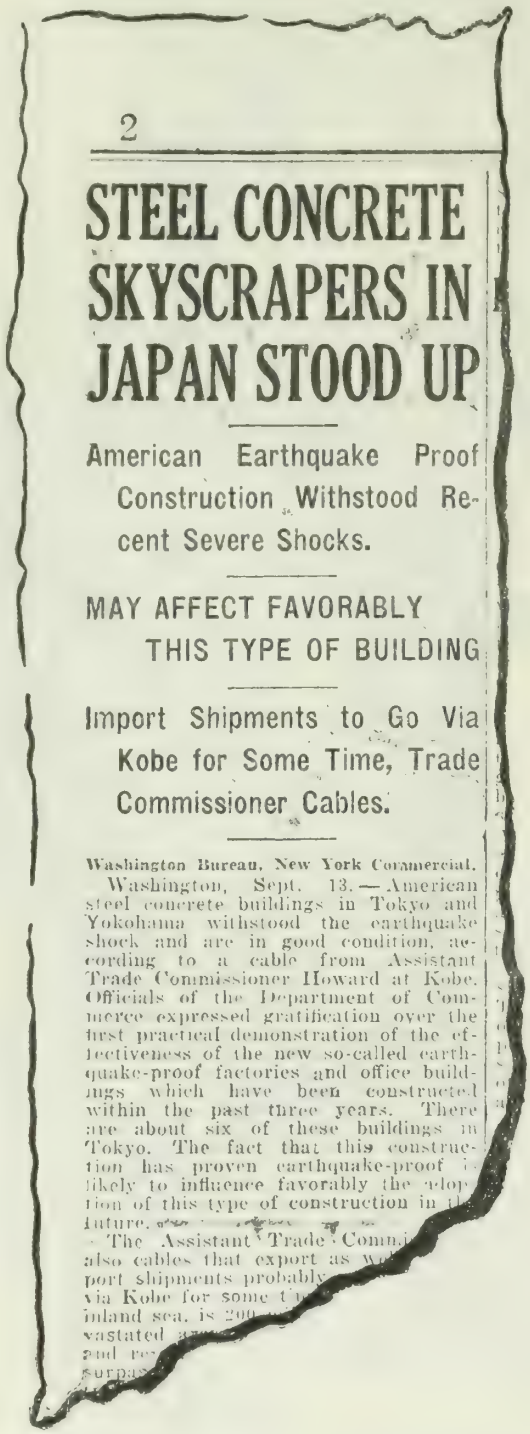

2

STEEL CONCRETE SKYSCRAPERS IN JAPAN STOOD UP

American Earthquake Proof Construction Withstood Recent Severe Shocks.

MAY AFFECT FAVORABLY THIS TYPE OF BUILDING

Import Shipments to Go Via Kobe for Some Time, Trade Commissioner Cables.

Washington Bureau, New York Commercial.

Washington, Sept. 13.—American steel concrete buildings in Tokyo and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner Howard at Kobe. Officials of the Department of Commerce expressed gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokyo. The fact that this construction has proven earthquake-proof is likely to influence favorably the adoption of this type of construction in the future.

The Assistant Trade Commi... also cables that export as w... port shipments probably ... via Kobe for some t... inland sea, is 200 ... vastated ... and re... surpas...

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Concrete adopted in Japan as an earthquake-proof building material, has met and successfully weathered the severest of all possible tests—the biggest earthquake of modern times.

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They stand to-day, in a sea of ruin, monuments to the indestructibility of Concrete construction, justifying the foresight of the men who built them.

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Uniformly Reliable

CANADA CEMENT CONCRETE FOR PERMANENCE

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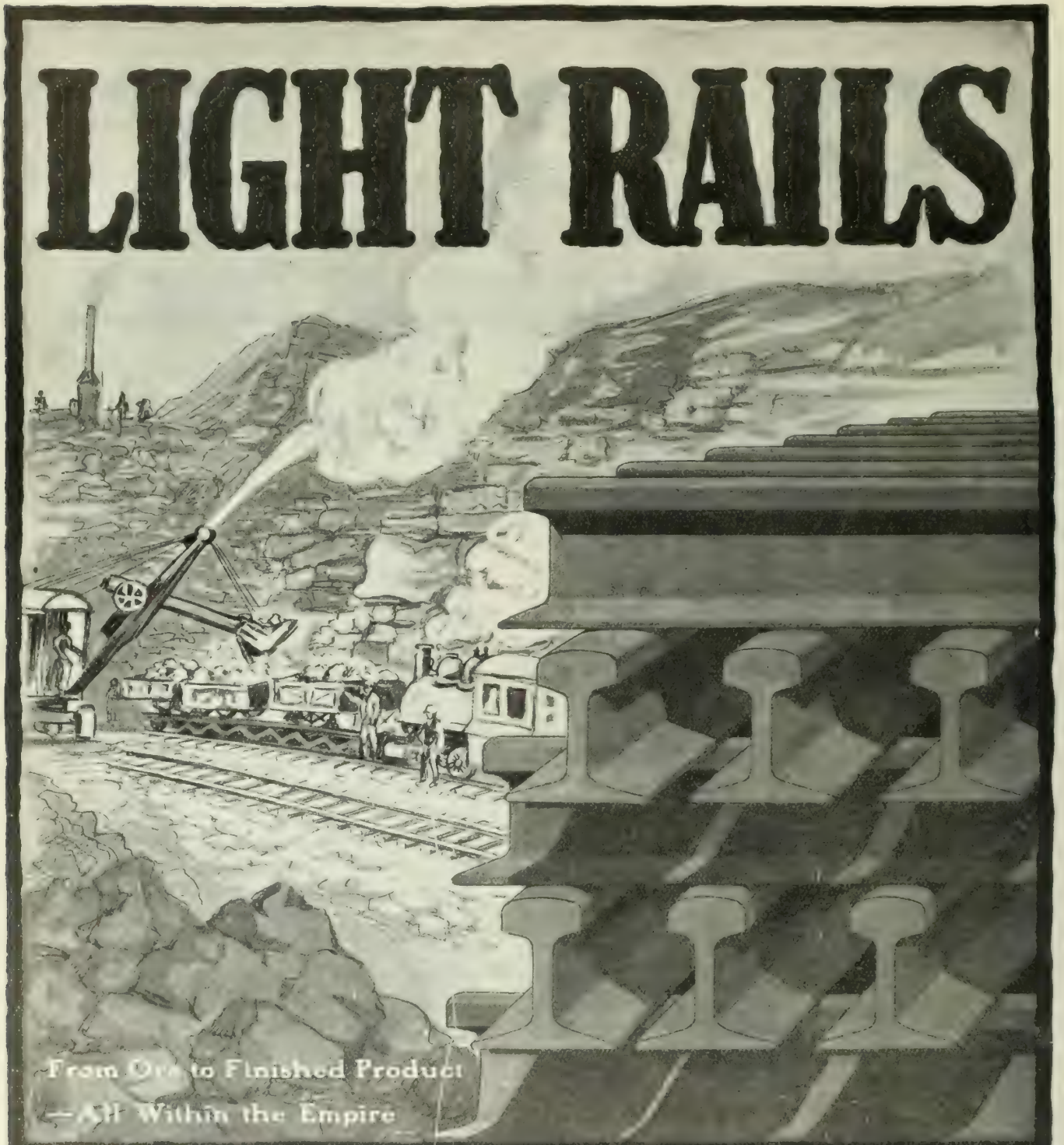

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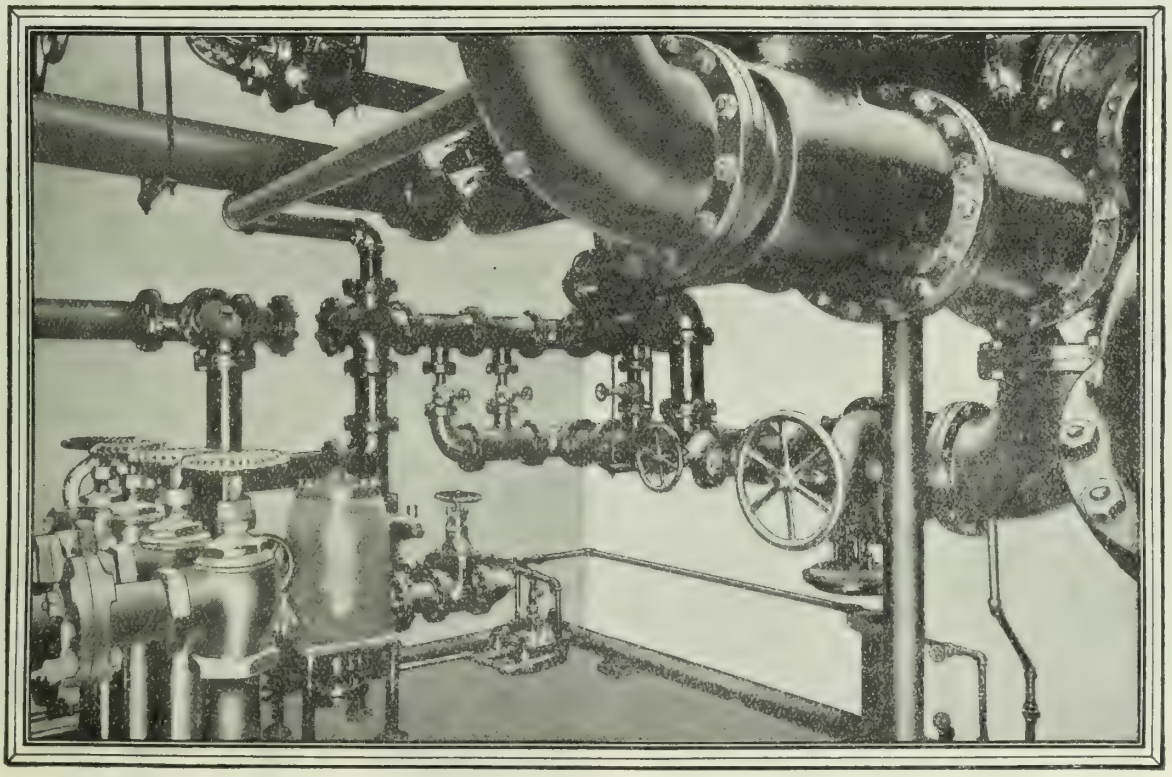

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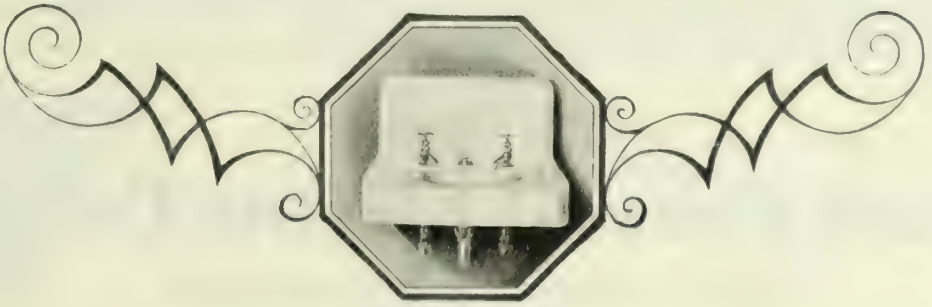

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At the plant of Hiram Walker & Sons, Ltd., Walkerville, Ontario, more steam was required. Their boiler room contained 10—125 H.P. boilers. These boilers were economically fired but the plant layout in general was inefficient.

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They replaced these *10* boilers with *3* of 487 H. P., fired by Riley Stokers which now gives them ample steam capacity. Although the normal boiler H.P. is increased but little the *actual* capacity is about three times greater because the Riley Stokers will operate the boilers up to 250% of rating or more. *When the above picture was taken two of the boilers were making 200% of rating.*

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Greatly increased capacity with a *reduction in operating expenses.* The improved power plant layout with automatic coal and ash handling equipment and Riley stokered boilers has made possible a reduction in labor from 8 men to 2 men per shift. This saving in labor alone amounts to nearly $100 per day.

Find out what the Riley can do for you. Ask for the catalog.

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When Specifying——

We are deeply indebted to Mr. Jas. Govan, M.R.A.I.C., Architect for Department of Provincial Secretary; Professor L. M. Arkley, M. Sc., M.E.I.C., Queen's University, and Professor Robert W. Angus, B.A. Sc., M.A.S.M.E., M.A.W.W.A., Toronto University, for the following compilation of data resulting from extensive tests made to determine the loss of heat through masonry walls.

Type of Wall	B.T.U.'s Transferred per 1 degree difference of temperature per hour per square foot.
9″ Brick wall	.392
8″ Tile Wall—cells vertical	.416
8″ Interlocking Tile Wall	.313
12″ Tile Wall—cells vertical	.322

Findings

(1) Hollow Tiles whose air cells lie **horizontally** when laid in the wall have a **lower** heat loss per square foot than solid brick walls.

(2) Hollow Tiles whose cells stand **vertically** when laid in the walls have **a greater** heat loss than solid brick walls.

(3) Interlocking Tile walls have a 21% **lower** heat loss than solid brick walls and 25% **lower** than vertical cell tiles.

(4) **An eight inch wall** of Interlocking Tile has a lower heat loss per square foot than on equivalent area of **twelve inch wall** built of tiles whose cells stand vertically in the walls.

The table above shows the results of the tests, supporting the deductions stated, the unit of heat measurement being the British Thermal Unit (B.T.U.)

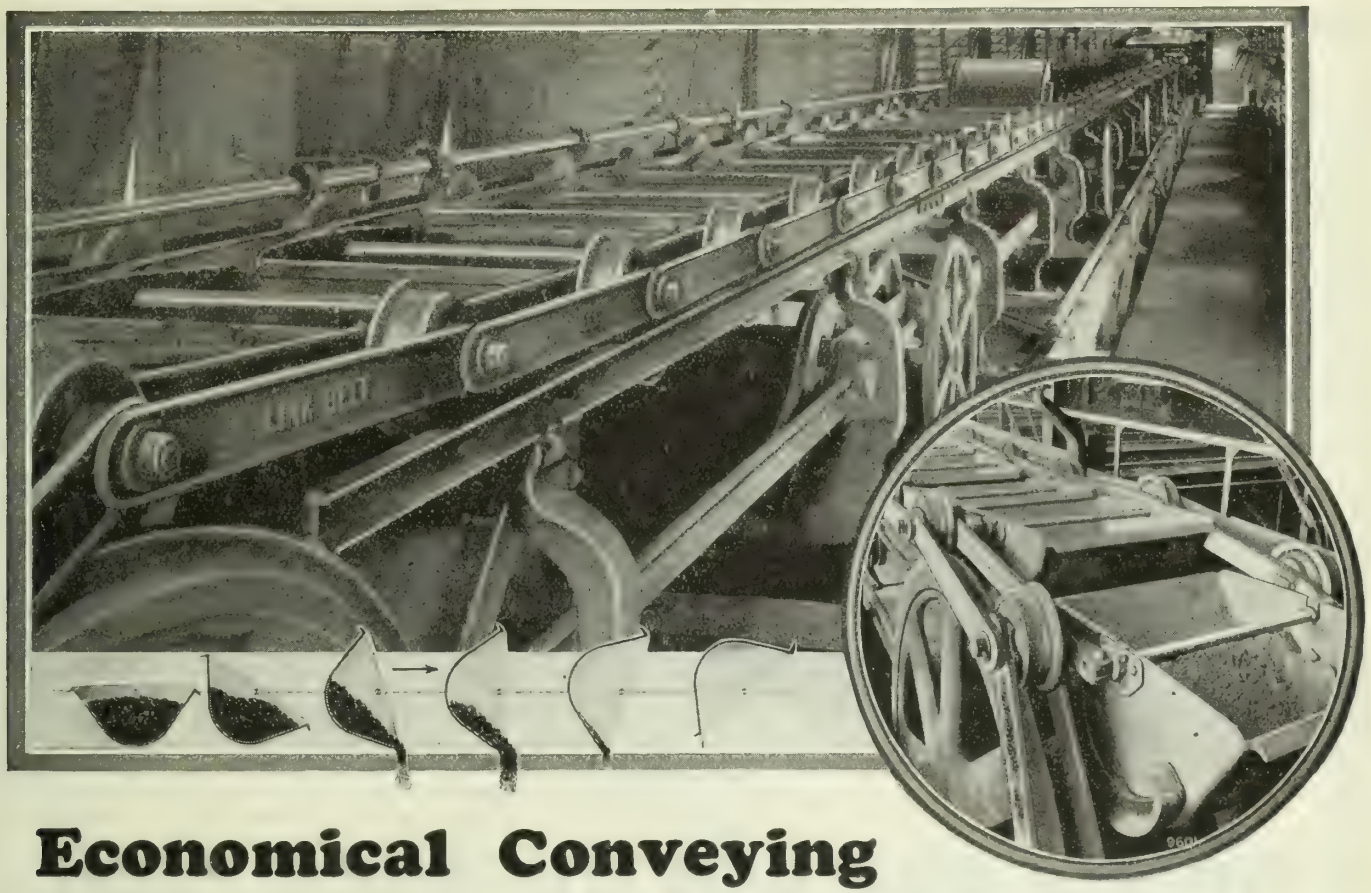
All walls tested without plaster.

From a standpoint of insulation and fuel saving the above data constitutes a most important contribution.

The Interlocking Tile Company Limited

32 Toronto Street

Toronto - - Ontario



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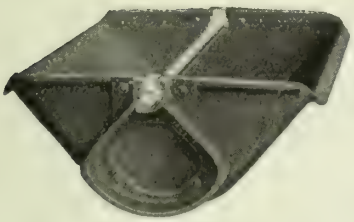

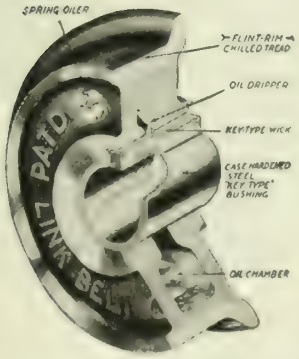

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We build, in their entirety, at our own plants, all the approved types of conveying equipment. Our plans therefore are made without prejudice. Belt Conveyors, Bucket Elevators and Conveyors, Coal Crushers, Skip Hoists, Power Hoes, Locomotive and Crawler Cranes, Bins, Chutes and all equipment for handling coal and ashes.

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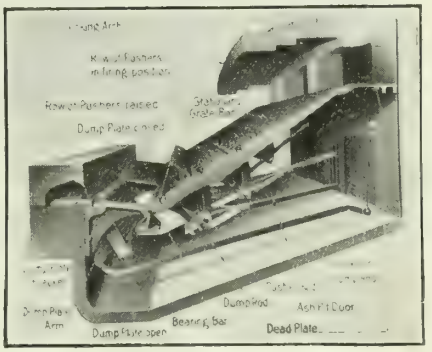
National Hand Fired Stoker

What it is and what it does

The National Stoker insures a clean stack with the lowest grades of coal, a stack that will comply with any city smoke ordinance without the use of steam jets or other devices. It will burn any kind of coal efficiently and bring about the complete combustion of all the carbon and volatile matter.

Unusually large ash doors permit the air to flow evenly and freely to the inclined grate. In many hand fired installations, air is pulled through small ash door openings in currents which rush through the thinnest part of the fuel bed. Not so in the National. In this stoker the air flows through the fuel bed evenly.



Side view of National Hand Fired Stoker.

The short coking arch effects an intimate mixture of the air and gases at the proper temperature for complete combustion.

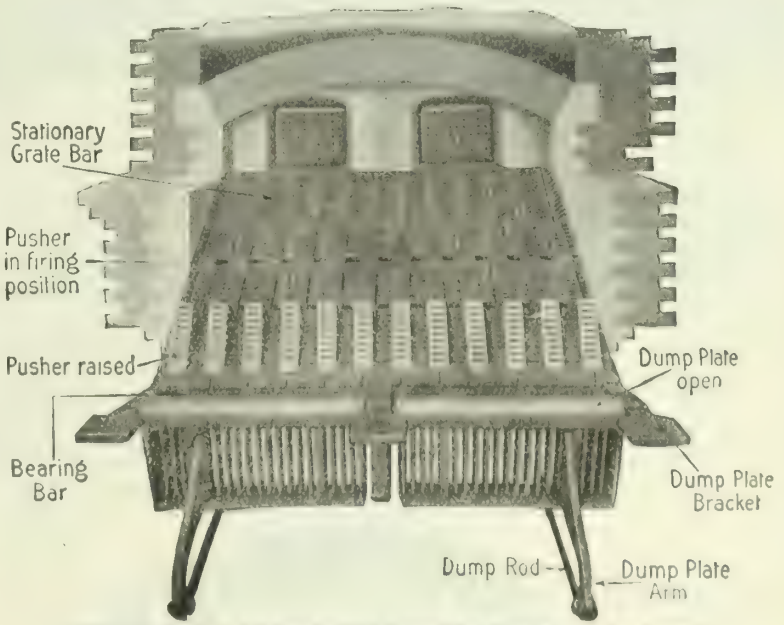
The grates are set at a 30° incline, and allow a free and easy handling of the fuel down the grate. There is no risk of good fuel avalanching when the dumps are lowered.

Between the grates are two or three rows of long-travel fuel-pushers. Each row is independently operated by means of a lever on the boiler front. By lowering the dump plates and raising the lowest row of pushers, ash and clinker are thoroughly cleaned from the bottom of the grates without disturbing the good coal and coke on the upper part of the grates. For this reason, there is practically no unburned carbon or coke in the ash. The fire can be cleaned without losing a pound of steam pressure.

The National Stoker voids the ash without raising it into the hot zone of the fire bed, and therefore without producing clinker. This is the reason why it has proved eminently successful in handling high ash, free burning western coals. With eastern caking coals, the pushers break up the cake so air can get through, thereby making possible a high rate of driving with only moderate draft. The National Stoker keeps the fire bed clean at all times.

No high degree of skill or care is required in firing. No slicing is necessary. In fact, good firing is built right into the National Stoker itself. Practically anybody can get good efficiency.

National Stoker can be used to advantage in plants up to 500 h.p. and can be installed under new or your present boilers. We gladly send Illustrated Booklet with full particulars and prices on application.



View from back of fire box looking toward fire doors which are closed. Pusher rods which actuate the successive downward sloping banks of grates are not shown, being on the outside of the furnace front.

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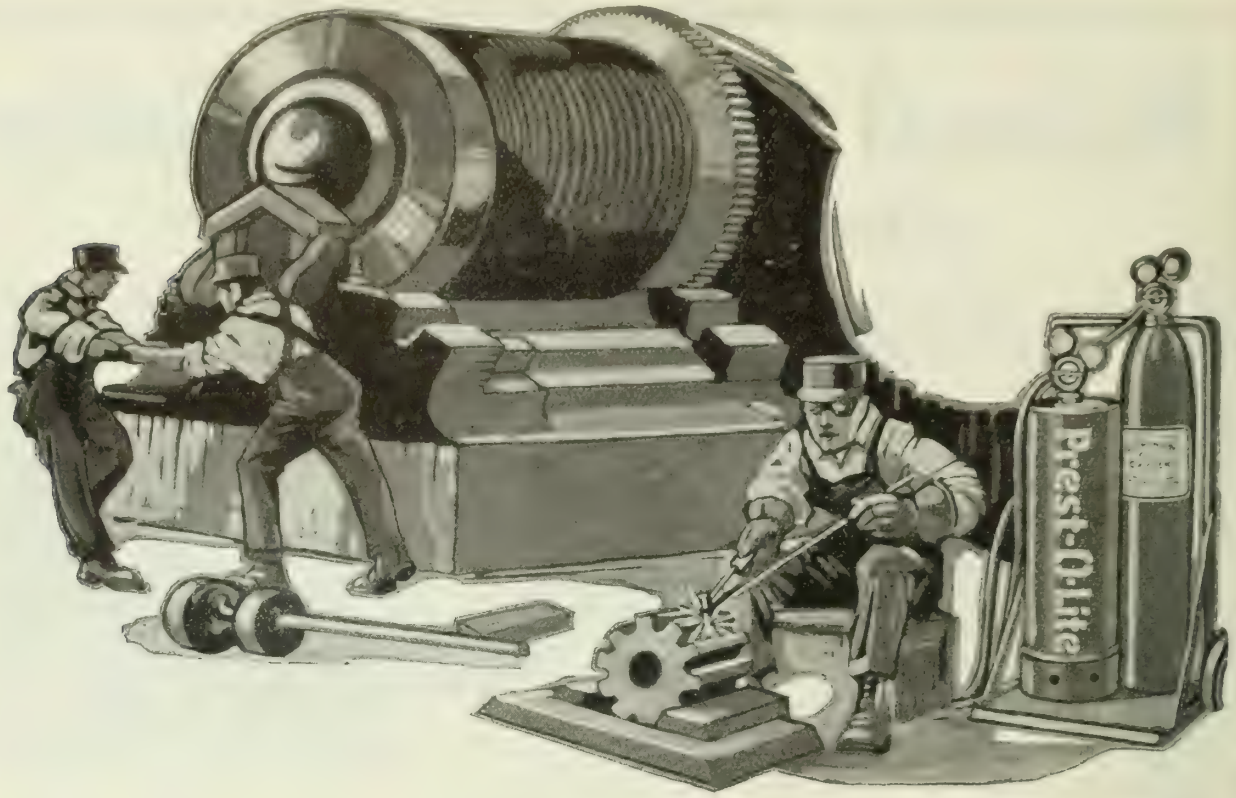

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Dominion Service is equally good for the small welding and cutting shop, manufacturing plants, and big shipyards or railroads. If you use welding and cutting in your business, or contemplate the use of the oxy-acetylene process, either in production or for general repair work, it will pay you to know about Dominion Service.

Our representative will welcome the opportunity of telling you how Dominion Service will benefit your business.

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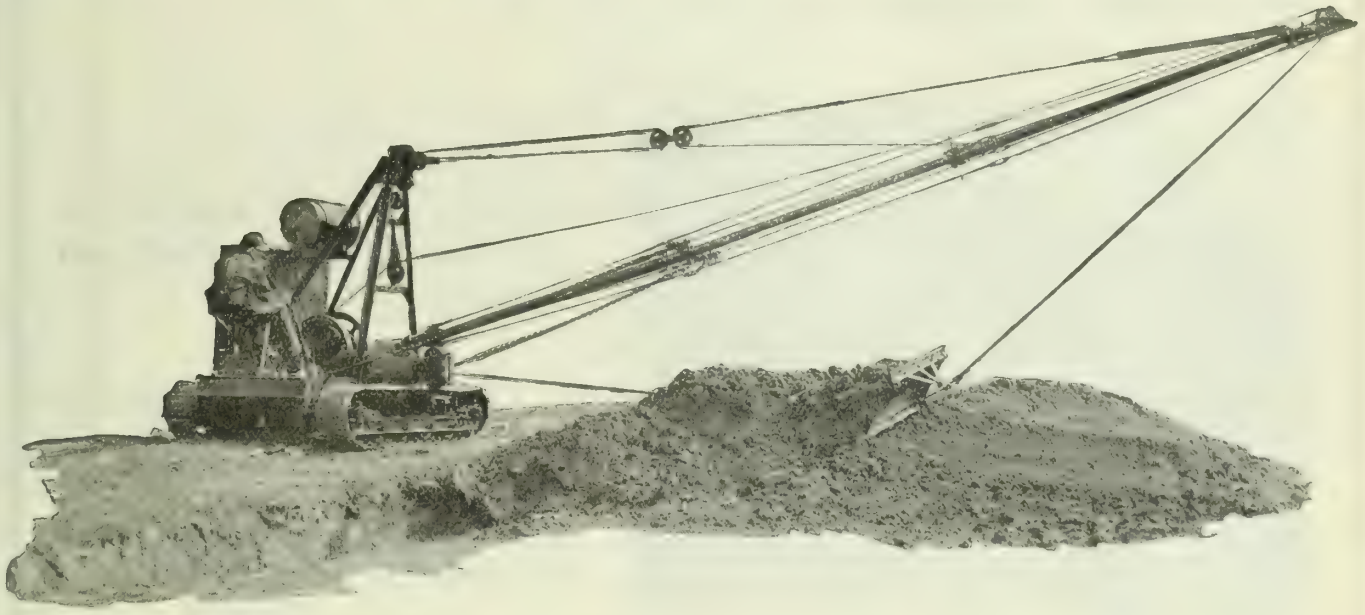

MODEL 20 BACKFILLER

THE J. P. White Company of Passaic, New Jersey recommend the Parsons Model 20 Backfiller in the following letter signed by Mr. John P. White:

"We have used Backfiller Model 20 since the purchase of same, which was four months ago. We have used it every day until we closed work due to Winter conditions.

"Outside of wear on cables, new blade on bucket we have had no trouble with this Backfiller. All we spent on same would only amount to $100.00 which speaks for itself.

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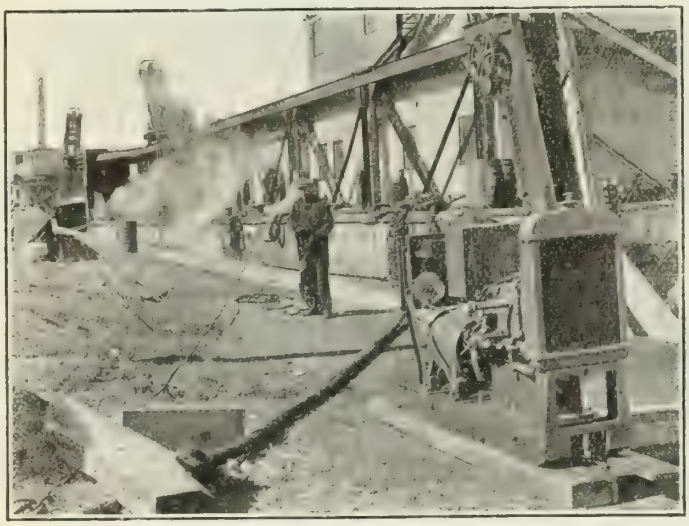
It is now being used in the construction of steel buildings, bridges, etc., where it can effect enormous savings in cost.



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It has a wide field of application.

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THE
ENGINEERING JOURNAL
THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

NOVEMBER 1923 Volume VI, No. 11

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The New Central Heating Plant of Queen's University and Kingston General Hospital

Design and Equipment of a New Central Heating Plant, in which existing equipment was used wherever practicable

L. M. Arkley, M.E.I.C.,
Professor of Mechanical Engineering, Queen's University, Kingston, Ont.

W. P. Wilgar, M.E.I.C.,
Professor, Queen's University, Kingston, Ont.

Paper to be read before the Kingston Branch, The Engineering Institute of Canada.

In 1921 the load on the old central heating and power plant of Queen's University was found to have exceeded its capacity. About the same time the authorities in charge of the Kingston General Hospital decided to change from the individual boiler method of heating, then in use, to the central plant method. On account of the proximity of the buildings of these two institutions, it was apparent that a central plant could be built to accommodate them both, the alternate scheme being for Queen's to enlarge the old central plant in Fleming Hall and for the hospital to build a central plant of its own.

After careful estimates had been made of the probable initial cost and future operating costs of the two schemes, it was decided to build a central plant to serve both institutions and a suitable site was purchased, on the water front, directly south of the university grounds.

The main advantages of the joint central plant from the standpoint of the university are, first, the removal from the campus of a power plant from which a certain amount of smoke, gas and dust was always giving trouble, and second, the releasing of valuable space required for classrooms and laboratories. The chief advantage to the hospital lies in the removal of twelve individual hand fired boilers with their attendant dirt and the constant attention required to keep them going. Both institutions reap the benefit of having the central plant located on the water front where coal can be unloaded directly from barges or coal boats, and where an abundance of water can be easily obtained from the lake, suitable for all except drinking purposes.

When it was decided to remove all the boilers from Fleming Hall, it brought up the question of the steam engineering or thermodynamics laboratory, and it was decided to move all steam equipment from Fleming Hall and build a laboratory in connection with the central plant to house it. The removal of this equipment has relieved the congestion in the internal combustion engine laboratories and made room for much needed extensions to the electrical laboratories.

The central heating plant was designed to heat and light the following buildings which are shown on ground plan, figure No. 1.

No. of building		Name of building	No. of sq. ft. of radiation.
1		Power House	
		Hospital Group	
2		Hydraulic Laboratory	
3		Isolation Hospital	5049 Hot water
4		Laundry	720 Hot water
5	(Proposed)	New Ward Building	.....
6		Service Building	2850 Hot water
7		Empire Wing	3730 Steam
8		Nurses Home	1690 Hot water
9		Main Building	9380 Hot water
10		Doran Wing	
		University Group	
11		Theological Building	3710 Steam direct
12		Kingston Hall	4580 Steam direct 1000 Steam indirect
12a		Grant Hall	1712 Steam direct
13		Ontario Hall	3626 Steam direct 1000 Steam indirect
14		Fleming Hall	2150 Steam direct 540 Steam indirect
15		Carruthers Hall	2460 Steam direct
16		Gordon Hall	3766 Steam direct 1000 Steam indirect
17		Residences	
18		Mill	550 Steam direct
19		Gymnasium	1638 Steam direct
20		New Medical Building	1776 Steam direct 280 Steam indirect
21		Douglas Library	..... Steam direct ..... Steam indirect
22		Mechanical Laboratory	350 Steam direct
23		Jock Harty Arena	1680 Steam direct
24		Gordon Hall	3700 Steam direct 1000 Steam indirect
25		Nicol Hall	2350 Steam direct 1000 Steam indirect

All the university buildings are heated by means of low pressure steam. The new library and the Jock Harty rink use the vacuum return system while all the other buildings use the old one pipe gravity return system. The returns flow by gravity to Fleming Hall and are trapped from this point to the 4-inch return pipe leading to the vacuum pump in the central plant. The vacuum pump delivers them to the Cochrane feed water heater which serves as a hot well from which the boiler feed pumps draw their supply.

The hospital buildings are heated by means of hot water, circulated from the central plant, with the exception of the Empire wing which has a steam gravity return system. It is proposed to change this in the near future and to connect it to the hot water system.

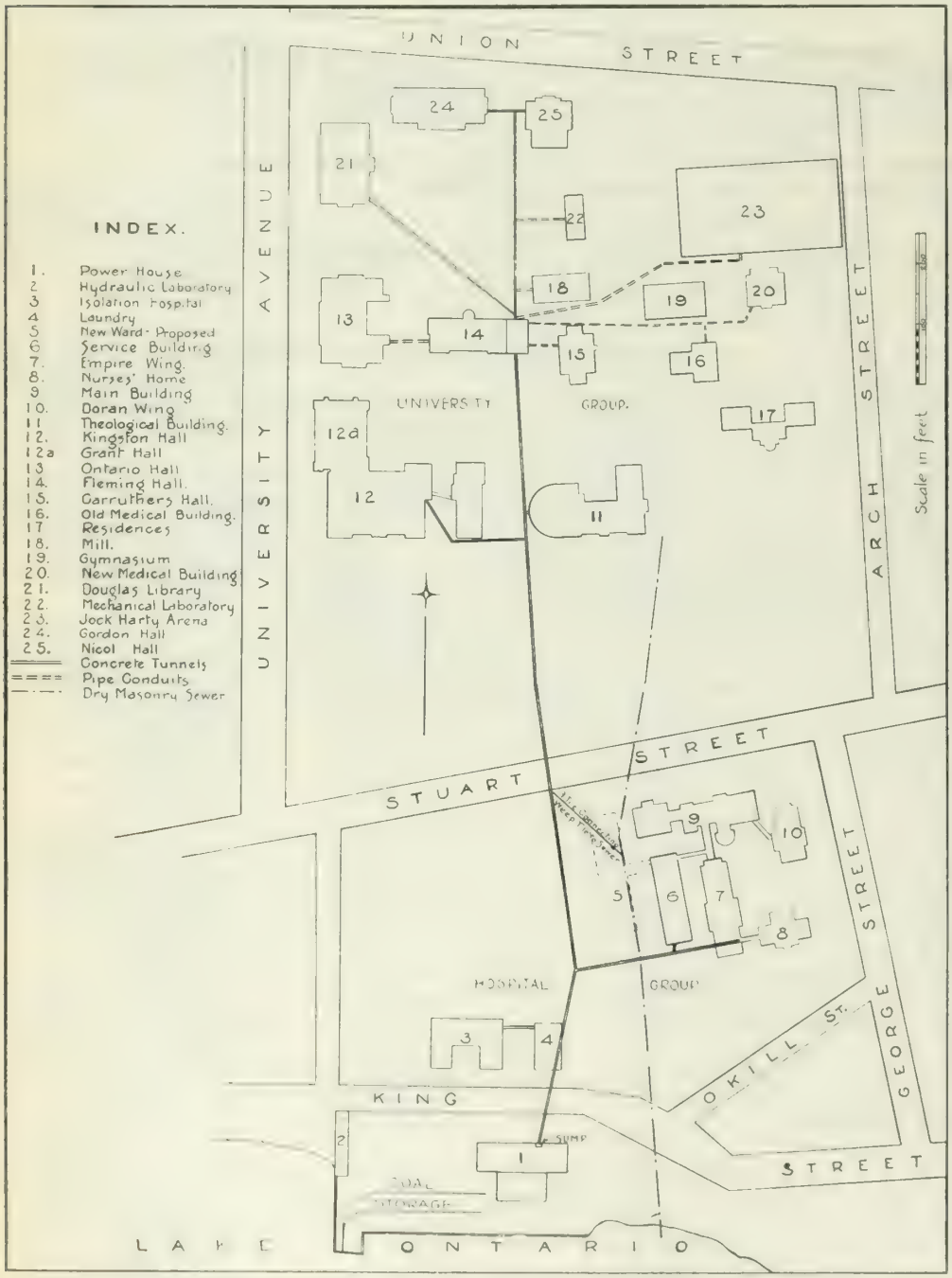


Figure No. 1.—Plan of Grounds of Queen's University and Kingston Hospital.

The Power House

As shown in figure No. 1, the power house is located on the water front south of King street, on what was formerly a knitting mill site. By choosing this location, as has been already stated, two of the main factors which govern the choice of a steam power plant site were met, that is, coal can be brought to the plant by boat, the cheapest possible way, and there is an abundant water supply at hand.

The engine room and the thermodynamics laboratory face King street and this part of the building is 40 feet wide by 144 feet long, the eastern half being the engine room. The boiler room extends south from the main building and is 48 feet wide by 80 feet 6 inches long.

The building is built of Kingston limestone, lined with brick and presents a much more substantial and attractive appearance than the average building used for this purpose, but it is well worth while to have it conform in appearance to the other splendid buildings on the Queen's campus and the General Hospital grounds.

Generating Equipment

Two high speed Bellis and Morcom engines directly connected to direct current generators furnish the current required for light and power at the university, one of these units is of 150 k.w., capacity and the other which is used when the load is light is of 75 k.w., capacity. These generators are compound wound and operate at 250 volts, the large unit runs at 440 r.p.m., and the smaller one at 525 r.p.m. By means of slip rings on these generators alternating current may be obtained when required, this current is passed through a transformer and the voltage raised to 2,200 volts and used in the metallurgical laboratory for operating electric furnaces.

The switch board contains six panels, one to take care of the 2,200-volt current, which is transmitted directly to Nicol Hall, while the others take care of the d.c., and a.c., transmitted to the old engine room in Fleming Hall, (now an electrical laboratory), and distributed from there throughout the buildings.

It has been found economical to use city power when the heating load is off in the summer. City current is supplied through a 37½-k.w., transformer and the voltage reduced from 2,200 to 110-220; by means of a motor generator set, direct current may be obtained when required.

Pumps

The pumping equipment consists of five steam driven

reciprocating pumps, two centrifugal steam turbine driven pumps and three motor driven pumps. There are two duplex Hepburn boiler feed pumps, one 7½ inches by 4½ inches by 10 inches, of 3,700 gallons per minute capacity, and the other 10 inches by 6 inches by 12 inches, of 6,500 gallons per minute capacity. These are of the outside end packed plunger type and while they require a little more steam to operate them, than the ordinary plunger pump, this is offset by the ease with which they are kept in repair. The vacuum pump is a 7-inch by 8-inch by 9-inch Northey steam pump and operates at a vacuum of 10 inches on the return line from Fleming Hall.

All raw water used in the power plant and laboratory, except for drinking purposes is pumped directly from the lake to a 4,500-gallon tank located in the boiler room, and is distributed, from there, at 40 pounds pressure. The pump used for this purpose is a 6-inch by 4-inch by 6-inch duplex Worthington. Connected to this intake pipe also is a 16-inch by 9-inch by 12-inch fire pump which can be used for either fire or service purposes.

The hot water which heats the hospital buildings is pumped by two centrifugal pumps directly connected to steam turbines. One unit is a Kerr steam turbine of 15 horse power, running at 2,100 r.p.m., directly connected to a centrifugal pump capable of pumping 350 gallons per minute against a head of 60 feet. The second unit is exactly the same as above, but the turbine is a Terry. These combined units were furnished by the Bawden Machine Company, Toronto.

One of these units is large enough to do the work at present, the other being kept as a spare unit, it is therefore always available for use as a laboratory machine. Both machines are furnished with a flanged brake wheel, and a coupling in the shaft between the wheel and the pump allows the pump to be disconnected when an efficiency test of the turbine is to be made.

In a short time it is hoped to have a meter installed in the 6-inch hot water line to the hospital, when the turbine and pump will be available for testing as a combined unit. The above illustrates the advantage of having the steam laboratory connected with the power plant, in fact, as far as the students at Queen's are concerned the whole building is one large laboratory and this is made possible by close co-operation between the central plant and laboratory staffs.

Figure No. 2.—Kingston Hall, from University Ave.

Besides furnishing hot water for heating the hospital buildings, all service water for wash bowls, bath tubs, etc., is supplied from the central plant by means of two small centrifugal pumps driven by motors, the motors are Century single-phase, of ½-h.p., running at 1,750 r.p.m., and the pumps have a capacity of 20 gallons per minute pumping against a 20-foot head.

As the lower end of the tunnel where it enters the power house is below lake level, it was decided to put in a sump at this point and a pump to take care of any leakage. This pump is a three plunger power pump geared directly to a 5-h.p., motor.

Figure No. 3.—Fleming Hall, Electrical and Mechanical Engineering Building, on left. Carruthers Hall, Civil Engineering Building on the right.

Water Heaters

The feed water heater is of the Cochrane open type and of 2,000 boiler horse power capacity. It is connected to the 12-inch main exhaust pipe from the engines, and by means of a back pressure valve on the heater, the pressure on the heating system is regulated.

The heaters which furnish the hot water for heating the hospital buildings and the service water are made on the principle of a surface condenser. They consist of a circular cast iron shell with a large number of small tubes placed inside. These are arranged so that the water to be heated passes through the tubes while the exhaust steam circulates between the tubes and the cast iron shell. During the process the steam is condensed, drawn off and fed to the boilers while the water is circulated through the hospital by the small pumps described above. The temperature of both the water for heating and the service water is under thermostatic control, the system being that installed by the Power's Regulator Company of New York.

In mild winter weather a water temperature of 120 deg. F., when leaving the central plant and returning at 105 deg. F., will keep the buildings quite comfortable, while in real cold weather these temperatures must be increased to say 190 deg. F., and 170 deg. F., respectively. A simple hand adjustment is all that is required to make this change. Briefly the system operates as follows:—The temperature of the water coming from the heater will be proportional to the quantity of exhaust steam let into it, this quantity is controlled by a diaphragm valve which is in turn controlled by compressed air at about 15 pounds per square inch. Now the air pressure acting to open the diaphragm valve against a spring is governed by the thermostat placed in the out-going hot water line. If the temperature of the water tends to rise the thermostatic valve closes, reduces the air pressure acting on the steam valve which slightly closes and thus keeps the temperature of the water uniform.

Boiler Room

The boiler room contains two 500-h.p., water tube boilers made by the Goldie and McCulloch Company of Galt, Ont., and capable of carrying 150 pounds pressure per square inch. These boilers are equipped with Laclede-Christie chain grate stokers and also with Foster superheaters by which the temperature of the steam may be raised 100 deg. F., above the temperature of saturated steam at the boiler pressure. Along side of these boilers, with a 4-foot passage between, is a 240-h.p., Babcock and Wilcox water tube boiler equipped with a Roney stoker, this unit was brought from the old central plant and while the stoker is not of modern construction it is giving good satisfaction.

Facing these boilers, with a 15-foot firing aisle between, are one 120-h.p., water tube boiler and one 140-h.p., horizontal return tubular boiler, these are equipped with hand operated stokers of the Hoft type, and illustrate an economical method of handling boiler units of small capacity. These boilers are completely fitted with draft gauges, thermometer cups, steam calorimeters, coal and water weighing devices and a CO_2 recorder, for the purpose of making boiler trials by the students. One of these boilers is also used in the summer when the steam load is light.

The total nominal rating of the boilers is therefore 1,500 h.p., and as these boilers operate quite economically at from 50 to 75 per cent overload there is sufficient capacity to take care of future loads for a number of years.

During the summer months one of the small boilers handles the load satisfactorily, during autumn and spring the 240-h.p., boiler is used and when the heavy heating load is on in the winter one 500-h.p., and the 240-h.p., may be operated when required. This means that, at all times one of the large boilers may be shut down for repairs or for cleaning purposes.

All the boilers are equipped with Bayer soot blowers for the purpose of keeping the tubes free from soot and dust, these are steam operated and enable a fireman to do effectively in fifteen minutes, work which would not be done in as satisfactory a manner in an hour by the old method. A steel coal bunker of 120-tons capacity is placed directly over the firing aisle between the two rows of boilers and about 15 feet above the boiler room floor. From the bunker the coal is fed by gravity to a coal weigher and from this to the stokers through a steel spout.

Stokers

The Laclede-Christie stokers are of the chain grate type and are adapted to the burning of the cheaper

grades of coal. They are self contained and separate from the furnace so that in case of repairs to either the furnace or stoker they may be removed easily, as they are mounted on wheels which rest on a track. The thickness of the fire carried on the grates is controlled by a plate at the coal hopper which may be raised or lowered by a handwheel. If the load is light, part of the grate surface can be cut out which gives the effect of operating a smaller stoker. The furnaces are fitted with Ellison draft gauges which give the draft, in inches of water, over the fire and in the third pass of the boiler. This data is an aid to the fireman in keeping the operation uniform and efficient.

The Roney stoker is what is known as the overfeed step grate type, where the coal is fed to the furnace by a cam operated mechanism which gives the grate bars a rocking motion. These boilers and stokers are shown in figure No. 6. The two smaller boilers are fitted with National hand fired stokers, furnished by the Engineering and Machine Works of Canada. These stokers are equipped with sloping grate bars, fuel pushers or moveable grates, which are operated by levers, from the front of the boilers. The fuel is fed from a hopper in front on to a dead plate which is covered by a coking arch. When the coal is coked it is fed downward by the hand levers.

Coal Handling and Storage

As the first cost of the fuel burned in a power plant and the handling of it from the time it leaves the car or boat until the ash is finally disposed of, is a large percentage of the expense connected with steam power plant operation, special precautions were taken to reduce the hand labour required to a minimum.

The coal storage area extends to the west of the boiler room along the water front and is served by two 24-inch gauge tracks, supported on trestles 18 feet above the ground. The coal is unloaded from the boat into two one-ton hand operated cars which deposit the coal at any point along the coal trestles. Coal can be unloaded at the rate of 50 tons per hour, and the coal storage area will hold about 6,000 tons without having it piled more than fifteen feet deep. To reduce the danger of the coal heating and eventually catching fire, it should not be piled over fifteen feet deep and preferably not over ten.

The coal is elevated from the storage area to the bunker in the boiler room by means of an inclined motor driven rubber belt 12 inches wide, another 12-inch belt conveyor operating at right angles to the first distributes the coal along the bunker.

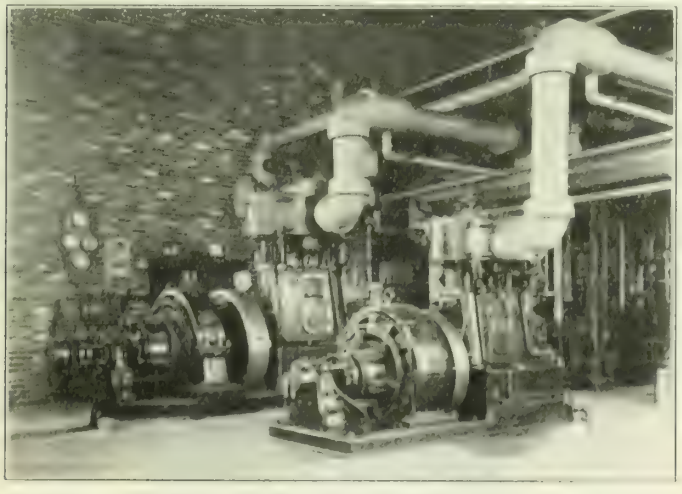


Figure No. 4.—Two main Generating Units in the Power House with Feed Water Heater and Pumps in the background.

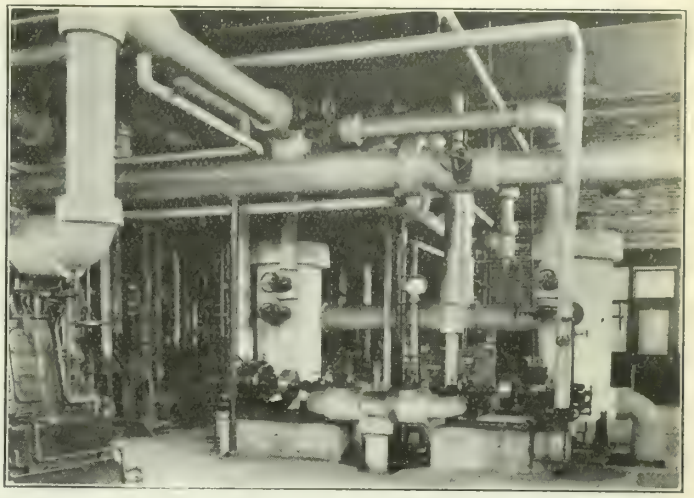


Figure No. 5.—Generators and Centrifugal Pumps for circulating hot water to the Hospital.

After the coal is burned the ash and cinders drop over the end of the stoker into a closed ash pit and from these pits they are raked into a steam jet ash conveyor, which deposits them in an elevated tank outside the boiler room. From the above it is clear that after the coal is landed on the dock only one handling by manual labour is required before it is burned and the same applies to the ash.

The Piping System

There are four main considerations which govern the design of any steam piping system.

(1) As soon as steam leaves the boiler it begins to lose heat by radiation and therefore the pipes should be thoroughly lagged with a good insulating material. The thickness of this insulation is governed by the heat saving effected per inch thickness and the cost of application of the same. There is a certain point at which the interest and depreciation on the investment will just equal the saving due to the insulation.

Figure No. 6.—Boiler Room showing main Boiler units with Stokers and Overhead Coal Bunker.

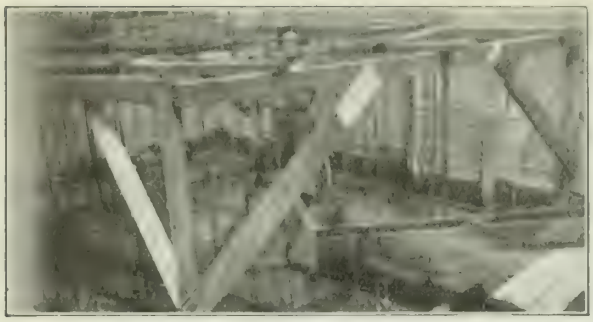


Figure No. 7.—Vertical Reinforcing Rods at Base of Chimney.

(2) Water of condensation is always present in a piping layout of any length and this must be removed or serious consequences will result, hence the necessity of steam traps at certain intervals and especially at low points or where water pockets are unavoidable. These traps remove the water without letting the steam out.

(3) The expansion in 100 feet of steam pipe when heated through 150 deg. F. is about 2 inches. This means that some provision must be made to take care of this expansion in a piping system. Perhaps the best method of taking care of this is by placing long turn bends and goose necks in the steam lines, but this type of expansion joint requires a lot of room, and is not suitable for tunnel work. All the expansion joints used in this work are of the gland and packing type which allows the ends of the pipes connected to slide in and out of the joint without leaking steam.

(4) The mechanical details of the piping layout must be such that ample strength is provided in all parts. For this reason the high pressure lines were made of extra heavy steel and joints were scarfed and welded by the electric welding process and all fittings and valves guaranteed to stand 250 pounds per square inch.

There are two main steam headers in the boiler room and the boilers are so connected that either header may be used. Between each boiler and header are two valves, one a stop valve and the other a non-return stop and check valve. This latter is so constructed that if a break occurs in the line it will automatically shut the steam from the line and let the safety valve take care of the steam generated in the boiler. In the engine room there are two main 12-inch headers, one high pressure and one low. All the steam engines, turbines and pumps take live steam from the 12-inch high pressure main and they all exhaust into the 12-inch exhaust main. The exhaust main is connected to the feed water heater and a portion of the exhaust goes to heat the feed water for the boilers, while the remainder goes to the heating system.

There are two steam pipes extending from the power house through the tunnel to Fleming Hall, a distance of about 1,300 feet. The high pressure pipe is 5 inches in diameter and is capable of carrying 150 pounds per square inch. The low pressure pipe is 7 inches in diameter and the usual pressure carried is 10 pounds per square inch. This pressure may be increased if necessary. Both these pipes are connected through pressure reducing valves to a 12-inch header in Fleming Hall, from which the steam is distributed to most of the college buildings.

A 3-inch high pressure steam line goes to the hospital to supply the steam heated Empire wing, and the sterilizer which uses steam at 60 pounds pressure. A 4-inch return pipe extends from Fleming Hall to the power house and to this is connected the return pipe from the hospital.

Water Piping and Pipe Covering

The hot water heating pipe leading to the hospital and return is a 6-inch extra heavy pipe with welded joints where possible, while Van Stone joints were used to make any other connections required. The whole piping contract was carried out by Garth and Company of Montreal.

All high pressure pipes in the boiler room, engine room and laboratory are covered with 85 per cent magnesia sectional covering 2½-inch thick, and all valves and fittings are covered with a plastic covering of the same material. The covering on the low pressure pipes is of 85 per cent magnesia, but only 2 inches thick. All other heat radiating surfaces such as water heaters are covered with a 2-inch layer of plastic insulating material. This work was done by the Philip Carey Company of Toronto.

The Chimney

The chimney is of reinforced concrete construction. This type is coming into general use now and has the following advantages. (1) It has great resisting power against tension and compression on account of the steel reinforcing rods used in its construction. (2) The whole structure, chimney and foundation is monolithic. (3) It may be built at the rate of one form length per day and the forms vary from four feet six inches to six feet in length. This means rapidity of construction. (4) It may be built for about three quarters of the cost of a radial brick chimney. (5) The material is adaptable to any form required. Two factors govern the main dimensions of the chimney, first, the height must be sufficient to give the necessary draft to burn the coal properly, and second, the area at the top must be such that it will take care of the gases of combustion when travelling at a moderate velocity.

Taking these factors into account it was found that the chimney should be seven feet in diameter at the top by 150 feet high. In regard to stability it is designed to withstand the overturning effect of a 100-mile gale, about six tons of steel reinforcing rods being used in the walls and foundation. The vertical reinforcement consists of ⅝-inch rods spaced on 8-inch centres at the base tied by ½-inch rods on 14-inch centres wound spirally. For binding purposes the vertical rods are bent over at the ends and hooked under the horizontal rods in the foundation.

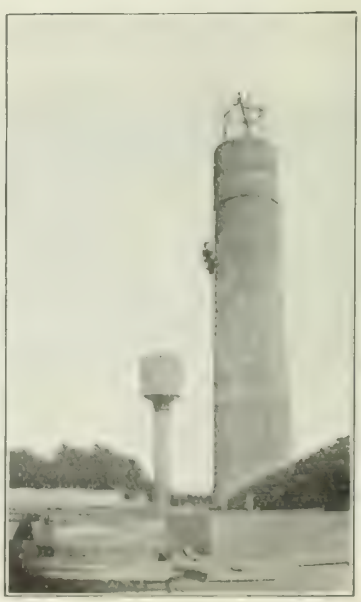


Figure No. 8.—Chimney, one-half complete.

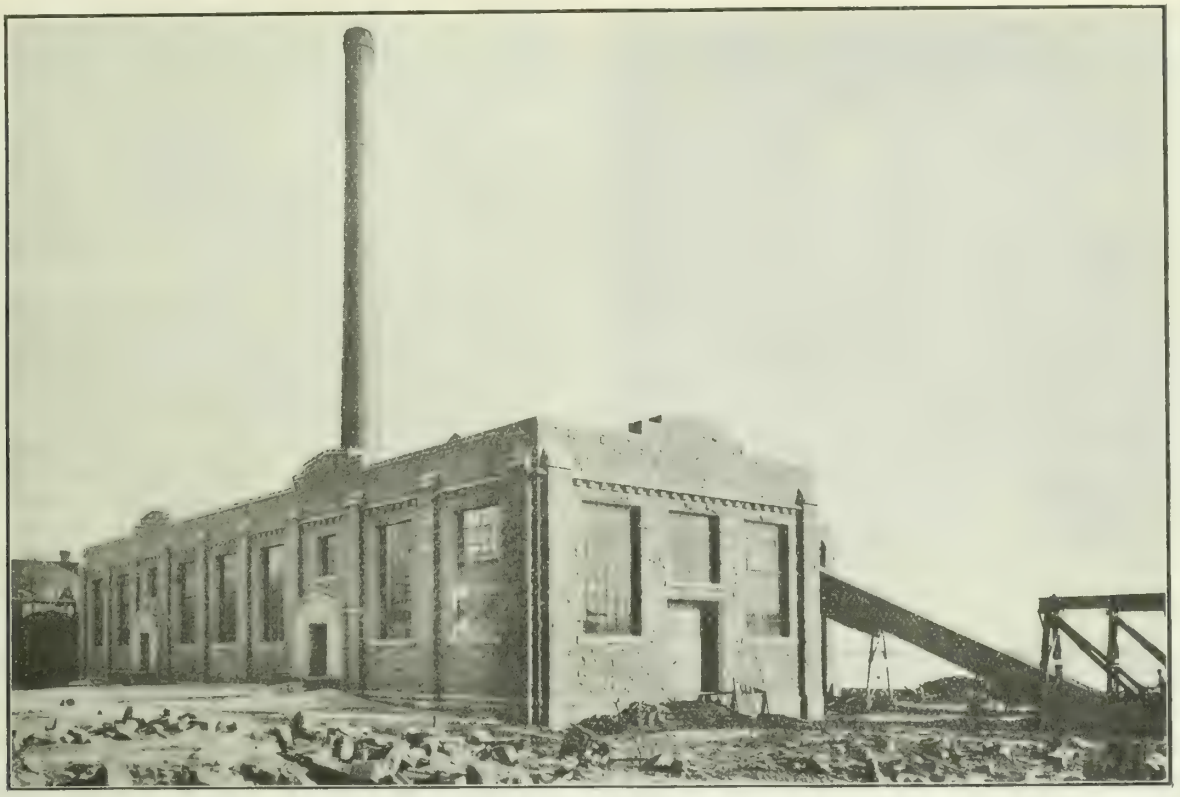


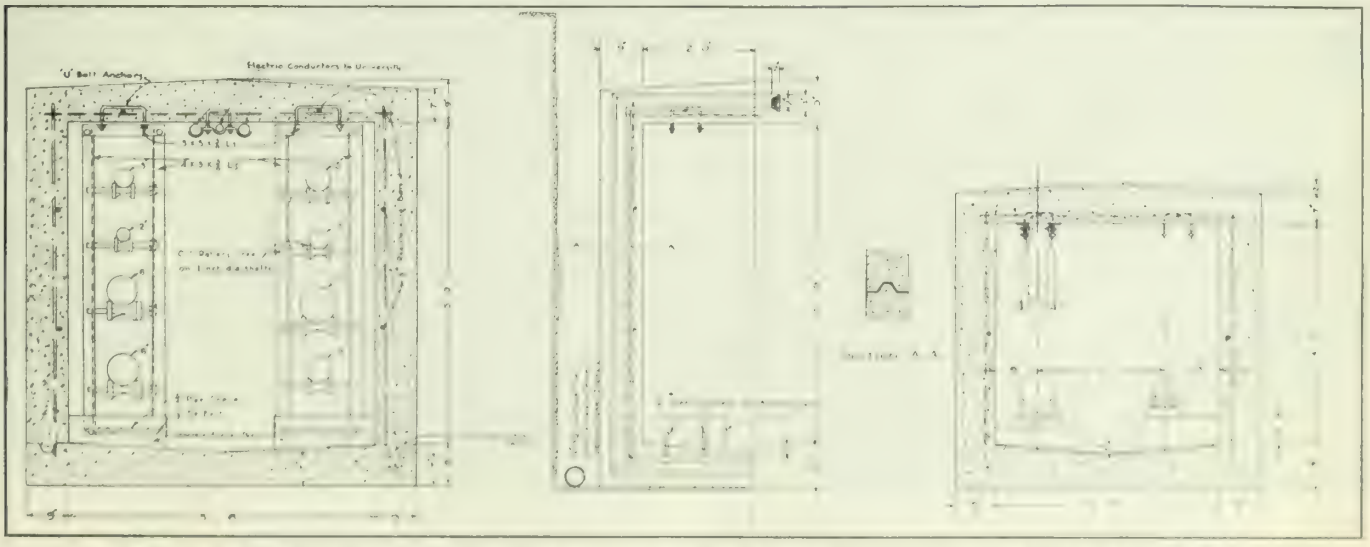
Figure No. 9.—Power House, Steam Laboratory and Chimney complete.

Figure No. 7 shows the method of placing the first row of vertical reinforcing rods in the foundation. Figure No. 8 shows the chimney one half completed with the construction scaffold projecting from the top and the two sets of forms in place. The workman on the painters scaffold is rubbing down the outside of the chimney before the cement is thoroughly dry in order to give it a smooth appearance. The chimney was given two coats of special concrete paint to fill the pores and improve the appearance. The final operation in construction was the placing of a 4-point lightning conductor on the top of the shaft, the points being grounded by means of a ¾-inch copper cable, attached to a heavy copper plate buried in the ground.

The foundation was started on June 7th, 1922, the first form was filled on June 12th, and the final cap was put in position on July 28th, 1922. The completed chimney is shown in figure No. 9.

Tunnels

The construction of a central heating plant to accommodate both the university and the hospital, occasioned the building of about 1,800 feet of conduit for the pipes required in distribution. The old heating



Cross section of Main Tunnel Half section University Main Cross section of Branch Tunnels

Figure No. 10.—Tunnel Details

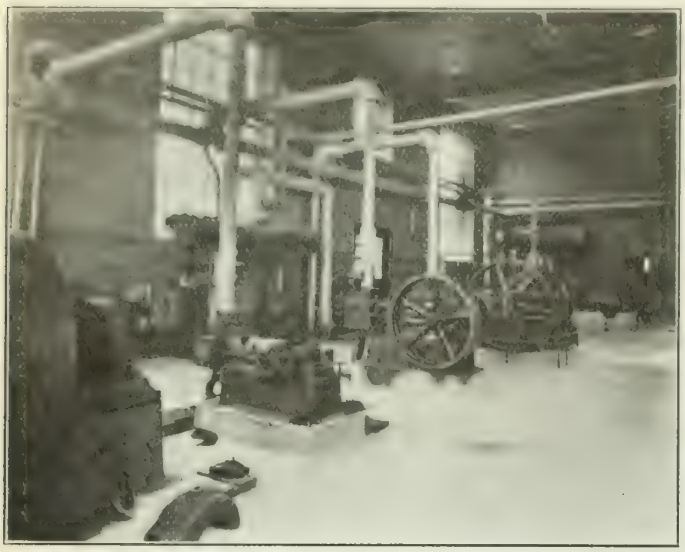


Figure No. 11.—Interior view of Steam Engineering Laboratory.

plant provided a distribution system for the university group of buildings which, with a few exceptions, was utilized in the new plant. The construction of these conduits involved the crossing of two city streets, with their gas and water mains, the crossing of one of the largest of the city's trunk sewers, and several branch sewers. (See figure No. 1.)

The cross-section chosen for the conduit is illustrated in figure No. 10. This provides ample room between the pipes for easy inspection and sufficient head room for the comfortable passage of workmen.

As the mean water level of lake Ontario is about 245, and King street, the first city street crossed, is only 250, a conduit of the section shown would be below water level, and the lower end would be without natural drainage. It was therefore necessary to make this part reasonably waterproof and, in addition, to provide a sump and pump for any seapage that might obtain. No perfection of waterproofing was considered warranted, as the pump would be a necessary part of any economical construction.

The conduit grades fell continuously from all buildings to the power house site, on the waterfront, and it was decided to use a concrete tunnel in its construction. The sump situated in the power house, was constructed of a 1–2–4 mixture, using super cement. In the lower 500 feet of the tunnel, where no sewer connections were possible, a 1–2–4 Portland cement concrete was used, with 10 per cent by volume of hydrated lime, mixed with the cement. The rest of the tunnel was a 1–2½–5 mixture with 10 per cent of hydrated lime. A specially graded aggregate was specified, designed to secure a satisfactory density, and the water content was limited to the minimum for a good working mixture. For this aggregate, an excellent gravel, dredged from the St. Lawrence river, was supplied by the Pike Salvage and Dredging Company.

From end to end no sewer connection was arranged from the inside of the tunnel, but weeping tiles were laid on the outside, at tunnel grade, from the upper end to a point beyond which no sewer connection was possible. No wash or plastering was asked for, but special attention was directed to thorough spading and compacting of the concrete, and definite methods of construction work joints were prescribed. The design was justified by the results secured. No objectionable leakage obtains and the small electrically driven power pump described in a previous paragraph, handles all the water in a maximum of thirty minutes operation in twenty-four hours.

The walls, bottom, and top were 9 inches thick. The walls and top were reinforced, transversely and longitudinally, with ½-inch medium steel bars. The spacing of the transverse bars being varied according to the loading. No reinforcement was bent for negative moment, but the vertical side bars were firmly tied to the transverse bars of the roof.

All tunnels, both mains and branches, were originally designed with a height of 5 feet 9 inches, but the branches were afterwards changed to the dimensions shown in figure No. 10. This revision was made through lack of head room in crossing one of the city's main sewers.

Gas and water crossings were taken under or over, but this monument to early municipal engineering was not to be treated so casually. It passes through the hospital grounds and its course can only be described as in a southerly direction — "in all its windings and turnings". It is 3 feet 6 inches by 5 feet inside, has for its base flat limestone of the Kingston formation and the walls are built of flags of the same stone. The top, in places, is made of round cedar poles, but for the most part large flags 12 to 15 inches thick form the cover, and no mortar was used in any part of the construction.

The construction of the tunnel provided many surprises. Kingston is one of Canada's oldest cities and the excavation of the tunnel brought to light many obscure phases of the city's sewerage systems. Some of the residences were served by individual sewers, running directly to lake Ontario, and in the lower 500 feet of excavation three of these were crossed. Two, of the dry masonry type, and one, an 8-inch tile, which, when accidently punctured by a pick, was found to be full of water under a considerable head. The dry masonry ones were traced with considerable difficulty and dealt with, but the source of the tile is still a mystery. It was finally plugged and left for time to solve in the hope that one of the buildings to be demolished, to make room for hospital extension, might furnish a clue. This hope was not realized, and the only certain information concerning that tile is the knowledge that it is now very effectively plugged.

The tunnel trench involved the removal of 1,400 yards of rock and 3,000 yards of earth, while 1,100 yards of concrete and 17 tons of steel bars were used in the construction of the conduit. The excavation work was done by Peter McCoy, the concrete, by McKelvey and Birch, both Kingston firms, and the total cost was about $28,000.

The Steam Engineering Laboratory

Figure No. 11 shows one side of the steam laboratory, which contains the following equipment:—One two-stage air compressor driven by a compound steam engine, the air end being 9 inches by 14 inches by 12 inches and the steam end 9 inches by 16 inches by 12 inches, with a capacity of 240 cubic feet of free air per minute. Both air and steam cylinders are fitted for indicating and by means of a venturi meter, and an orifice box, the output of the machine may be measured. One 10-inch by 10-inch Ideal steam engine running at 300 r.p.m., directly connected to a d.c., Crocker Wheeler generator of 30 k.w. This unit has its own switch board and rheostats for taking up the load and is especially adapted for showing the effect of varying loads on the indicated horse power of the engine. One 6-inch by 8-inch Robb Armstrong

engine fitted for indicator and brake tests. One small Robb Armstrong engine used for valve setting, etc., and one Robb Armstrong directly connected to a d.c., generator of 30 k.w., capacity. All these machines have their exhaust pipes connected to a Wheeler condenser of 200 square feet of heating surface operated by a duplex Worthington vacuum pump 6 inches by 7½ inches by 6 inches, and may be tested operating at atmospheric pressure or under a vacuum up to 25 inches. Besides the above there is the usual equipment found in all steam engineering laboratories such as indicator spring testers, pressure gauge testers, weighing tanks, brakes of different kinds, steam engine indicators, etc.

The south side of the laboratory, which is not shown in figure No. 11, is divided into five rooms, one is used as an apparatus room, one an office, one a shop for repairs, and two as class rooms. The room itself is well lighted both by natural and artificial light, the machines around which the students work while making observations and taking data are well separated and the class rooms used for working out reports are close at hand. While designing the power plant it was kept in mind that it might be made a valuable aid to the experimental laboratory without in any way limiting its value as a central heating plant, and the result is that most of the power plant equipment can be used for demonstrating power plant operation and design.

Owing to the steadily advancing price of coal and other fuels the subject of heating and ventilation of buildings is becoming one of the most important with which the mechanical engineer has to deal, and Queen's University owing to the broad way in which the central plant problem has been handled has secured a first class equipment for demonstrating this end of the work.

The foundations for the building were completed in the autumn of 1921. The building was erected, the machinery moved from Fleming Hall and the new machinery installed during the summer of 1922. The plant was put in operation on September 25th, 1923, and has been working satisfactorily since that date. The joint committee in charge of the work was made up of the following: J. M. Campbell, (chairman), W. F. Nickle, K.C., R. Crawford, Elmer Davis, J. K. L. Whiting, K.C., Col. Kent, Judge Lavell. The engineers were M. F. Thomas, Col. W. P. Wilgar, and Professor L. M. Arkley. The architects were Messrs. Power and Drever. The erection of the machinery was in charge of O. J. Hickey, chief engineer of the central plant.

Acknowledgements is here made of the hearty co-operation of the members of the engineering staff, and especially to Professor D. M. Jemmett, for advising on and checking the electrical layout.

Figure No. 12.—Ontario Hall, Physics and Geology Building, facing University Ave.

Electric Arc Welding

A Description of Systems of Electric Arc Welding and the Three Prime Factors for Successful Welding

J. M. F. Wilson, A.M.E.I.C.,
Instructor in Electrical Engineering, Kelvin Technical High School, Winnipeg, Manitoba.

Paper read before the Winnipeg Branch, The Engineering Institute of Canada, February 2nd, 1922.

When two pieces of metal are to be welded together there are two distinct methods of treatment. Where the metals are first heated to a point below fusion and then pressed or hammered firmly together, we have what is known as compression welding, including the ordinary forge weld, the electric spot and butt welds and the most recent electro-percussion weld. Where the metals are raised to such a temperature that they will flow together without the use of force or pressure, we have the autogenous or fusion weld, including the oxy-acetylene, the thermit and the electric arc processes. The purpose of this paper is to describe the processes of electric arc welding.

Two systems of electric arc welding are in use and get their names from the type of electrode used; i.e. carbon electrode, and metal electrode.

The Carbon Electrode Process

The carbon electrode process first used by Bernardos more than thirty years ago employed a direct current arc drawn between a carbon rod as positive and the work as negative, a metal filler rod being fed into the flame of the arc by hand. By reversing the polarity several advantages were obtained. The greater heat developed in the positive crater of the arc is transferred to the work where it is most needed, the arc is more stable, and the carbon particles are prevented from flowing into the weld, thus preventing the weld from becoming too hard to machine. The carbon electrodes vary in diameter from ¼ inch to 1½ inch. Greater stability for the arc is obtained by tapering all electrodes to ⅛ inch and a lower rate of carbon consumption as well as a softer weld is found when graphite electrodes are used in place of carbon. Currents range from 100 amperes to 800, but in general 300 to 400 amperes with a one-inch electrode is found sufficient.

As regards the filler material, commercially pure iron rods, low in carbon, from ⅜ inch to ½ inch in diameter, are found necessary for a strong sound weld. In operating, the surfaces should be chipped clean and the arc formed by withdrawing the graphite electrode from a clean surface of solid metal or from the end of the filler rod held in contact with the parent metal. By this means particles of slag are prevented from adhering to the end of the electrode and deflecting the arc. An inclination of the electrode at 15 degrees to the vertical makes the deflecting force of the air currents constant in direction and steadies the arc.

A surface may be built up either by puddling or by depositing in layers. In puddling the arc melts a small quantity of the parent metal; a small portion of filler rod is next melted off; the rod withdrawn; and the added material fused with the parent metal, a rotary motion being imparted to the arc. The puddling drives the slag and oxidized material to the edge and the rotary motion heats a comparatively large area about the weld, with consequently less danger of cracking the work or making a hard weld.

In depositing the filler material in layers, we have a similar deposit to that of the metal electrode but wider and higher. The layers are then smoothed over with the arc. When a fine grain structure is required the expedient of hammering the surface, as soon as the metal starts to cool, is resorted to.

As regards the length of the arc, even the lower temperature of the graphite rod as negative will vapourize the carbon in the rod and if a hard weld is to be prevented this must be oxidized. By increasing the arc length so that sufficient atmospheric oxygen will diffuse through the arc stream, this may be accomplished. To obtain the same degree of oxidation for the different currents used, the length of the arc would have to be increased in proportion to the arc diameter. As this latter varies with the square root of the current (for the same current density $\frac{c}{d^2} = K$, therefore d varies as $\sqrt{c}$) we find 1 inch quoted as the maximum for a 250 ampere arc and 1½ inch for a 500 ampere (Viall). On the other hand, we have J. H. Bryan (see Lefax) quoting 3 to 4 inches as the usual length. This latter would necessitate a voltage bordering on the dangerous side. As to its uses, the carbon arc is successfully applied without the filler rod to melt two flanged edges together. With a bronze filler rod, low in tin and zinc, but with at least 0.25 per cent phosphorus to act as a strong deoxidizing agent, copper and bronzes have been successfully welded. The class of work to which the carbon process particularly applies is the cutting or melting of metals, repairing broken parts and building up materials, but where strength is a consideration it calls for great skill on the part of the operator. Overhead and vertical surface welds are ruled out but it has a field in the finishing of welds made by the metallic arc process. It is particularly adapted to welding cast steel and non-ferrous metals, cutting cast iron, melting and cutting scrap metal, hardening rails, frogs, and wheel treads. When the art of electric welding is better understood, it may be that the pendulum will swing back again to the carbon arc process from the more recent metal electrode process.

The Metal Electrode Process

The metal electrode was first used by Slavianoff. Here the negative terminal of the arc is the filler rod itself and we find both bare and coated electrodes in common use. The voltage is low, about 22 volts for bare, and 35 for coated electrodes. A highly luminous central core of iron vapour is formed as the arc is withdrawn from the work and this is surrounded by a flame of oxide vapours formed by union with the atmosphere. The intense heat sets up a draft which, combined with local air currents, tends to break through this protecting wall. Consequently it is only by the maintenance of a *short arc* (⅛ inch) and proper inclination of the electrode that a successful weld can be produced. The *amount of current* and *size of electrode* have an important bearing on the weld. In a test carried out by Wagner for the

Welding Research Sub-committee a double *V* weld, in ½-inch ship plate, showed an increase in tensile strength as the current was increased from 100 to 200 amperes and he would advocate even 300 amperes for ¾-inch plate. British practice at present uses 4,000 to 6,000 amperes per square inch of electrode, but the welding committee recommend 10,000 as more suitable for ⅛-inch and 5/32-inch diameter electrodes. That is, a ⅛-inch electrode could carry 120 amperes although a 5/32-inch is more generally used for this current.

The Westinghouse Company have published a graph showing the relationship between size of electrode, current and thickness of plate, the latter being an important factor, as also would be the temperature of the plate and the type of joint. The values quoted, which are for a butt weld, are lower than the above.

Thickness of plate	Current in amperes	Electrode diameter
1/16 inch	20 to 50	1/16-inch
1/8 "	50 to 85	3/32 "
3/16 "	75 to 110	1/8 "
1/4 "	90 to 125	1/8 "
3/8 "	110 to 150	5/32 "
1/2 "	125 to 170	5/32 "

A lap weld, between two ½-inch steel plates has a heat storage equivalent to that of a butt weld of two 1-inch plates, hence makes a better weld with 225 amperes and a 3–16-inch electrode.

An absolutely steady current would seem to be an essential factor when the correct current is obtained. The Wilson Welder Company, who used their "plastic arc" process so successfully on the recovery of the German ships interned during the war, claim that much of the success was due to the automatic control of the current, that, as there is a certain critical temperature at which steel can be worked to give the greatest tensile strength and ductility, a variation of 20 amperes above the proper value will cause collection of carbon and slag pockets in the metal, while the same value below will cause the metal to be deposited in globules with holes in the weld to prove that there has been insufficient heat.

Types of Welding Machines

In the types of electric welding machines on the market by far the greater number are direct current. At first, designed from the view of economy in operation, the inclusion of resistances on even a 120-volt d.c., circuit being very wasteful, so called constant potential types were used. This type necessitated a series resistance and, in order to dispense with this resistance, constant current types of generator were next developed. A third type, where the product of volts by amperes is kept constant and termed the constant energy type, is claimed to be superior to the constant current and is also designed to deliver current to the arc without the use of resistors or other energy-consuming devices. In examining the various methods used for regulating the machines we have to bear in mind that the arc itself has some inherent regulating characteristics such that current and voltage are so inter-related that an increase in one causes a decrease in the other. A one per cent decrease of voltage from that of the customary 20 volts will cause about two per cent increase in current. An increase in the voltage across the arc, when other conditions remain the same, indicates an increase in length of the arc, thus giving the metal a greater opportunity to oxidize in the arc, and cause a reduction in the quality of the weld. Hence a type of machine which would make it difficult to maintain a long arc would be an advantage. Now the rate of consumption of the electrode is proportional to the current, and is independent of the voltage across the arc and the length of the arc. In the constant-energy system, when the operator shortens the arc, the increase of current consumes more electrode, and brings back the length of the arc to its original length. Lengthening the arc decreases the current and at the same time the consumption of wire, again automatically bringing the length of arc to normal. Too great a length will reduce the current to such an extent that the arc will go out. With a constant current this regulating factor is absent and a long arc is made possible. The oxidation of a long arc is shown by the increase in red oxide, (Fe_2O_3), covering the weld. The black oxide does not contain as much oxygen (Fe_3O_4).

The Constant-Potential Type

As examples of the constant-potential type we have the Wilson Welder Company's plastic arc set, a flat compounded generator where the current is automatically controlled by a solenoid operating a carbon pile resistance for small variations of current. Large current variations are obtained by means of a variable grid resistance. The volt-amperes at the arc are constant for each setting, hence the set might also be classified under the constant-energy type. It is usual to include a reactance in the welding circuit to smooth out variations of current caused by sputtering of the arc, but in this particular set the series winding on the solenoid acts in this capacity. The welding current, passing through the carbon pile and the solenoid, causes the plunger of the solenoid to slacken the springs compressing the pile when the arc is struck. When the current decreases, the pull of the plunger decreases, and the current is adjusted automatically. With the earlier models, the operator is able to control the amount of current, which is to be kept constant by means of a pilot motor which shifts the fulcrum of the pressure mechanism as desired.

The Constant-Current Type

As an example of the constant-current type we have the Lincoln Electric Company's set comprising a separately excited shunt field and a differentially wound series field changing the voltage from 65 on open circuit to 20 on load. The series field is varied by means of a diverter so that currents of 80 to 200 amperes may be obtained. An external reactance is used.

Another example of the constant-current type is the Westinghouse Company's latest model. The generator is a commutating pole machine, with a series winding, a separately excited shunt field and a second shunt winding connected between one exciter terminal and one generator terminal, the other exciter and generator terminals being connected through a resistance (R_1). Under open circuit and normal welding conditions this second winding is excited by the generator voltage and assists the first shunt winding, (separately excited), in maintaining the generator voltage through R_2. Under short-circuited conditions the second shunt winding is excited from the exciter through R_1 and opposes the field of the first shunt winding. As the series winding also opposes this first shunt winding all the time, both assist in reducing the short-circuit current to practically the same as the welding current. The variable rheostat in the generator separately excited field allows control of currents from 50 to 200 amperes. An external reactance in the welding circuit also keeps down the short circuit current at the moment that the arc is struck and stabilizes the arc. The exciter voltage is maintained by a compound winding at 125 volts and the generator pressure falls from 60 to 21 volts.

The latest-constant energy type of the General Electric Company, uses no separate exciter but makes use of the third brush idea for controlling the current through the shunt winding.

Very good results have been obtained in welding and in holding a steady arc by using an ordinary battery charging generator of 80 amperes capacity, using a very weak shunt field and a cumulative series winding.

Selection of Electrode

The physical properties of a weld depend on the crystal structure, gas holes, slag inclusion, impurities and composition. What we require in arc welding is a fine grained casting, free from blowholes, slag inclusions and impurities. It is noticeable that the first part of a weld will show a fine grained structure merging gradually into a coarse grain *as the plate heats up*. These coarse grained crystals are what is known as columnar and wherever these occur we have brittleness. Various methods have been tried to produce the finer grained structure, viz., hammering the weld, depositing the metal rapidly in thin layers and cooling by a stream of water. The structure in the interior of the weld, however, (see Rawson) is of fine grain and it is to be inferred from this that the subsequent heatings of the successive layers refine the first layers. It has also been found that the higher the current density the greater the collection of columnar crystals.

Gas holes found in all electric welds are a great source of weakness. It is not the electrode alone that can be blamed for this but also the plate. Any substance, such as carbon, having a great affinity for oxygen will produce gas holes. Carbon monoxide is formed and trapped in the weld by the rapid solidification. Usually any dissolved gas in the electrode is liberated as it passes through the arc stream causing certain electrodes to be unworkable through "sputtering", (the General Electric Company claim that by merely dipping electrodes inclined to sputter in milk of lime, white wash, sputtering may be avoided), but the carbon in the plate dissolved in the welding pool reacts with the iron oxide in the pool and forms more *CO* with no chance to escape. Examination of welds with a carbon free electrode on a carbon free plate showed only an occasional small gas hole, while it is well known that steels containing only 0.3 per cent carbon are often difficult to weld.

Certain electrodes are on the market which are annealed. As the effect of annealing is to decarburize the outside layers and hence reduce the amount of carbon, it may be for this reason. Slag inclusions are also a source of weakness, particularly where covered electrodes are used in inexperienced hands. Slag becomes entangled in the deposited metal and fails to rise to the surface. Wrought iron welding wire contains considerable quantities. Slag aids the weld, however, by preventing surface oxidation of the pool.

Impurities in Electric Welds

Under the term impurities the oxygen content, which is characteristic of the electric weld, is not alone sufficient to account for its want of ductility, but we will deal with the oxide first. In all specimens examined microscopically, are found tiny globules of oxide having no definite arrangement and scattered indiscriminately throughout the crystals of iron, (see figure 11, Rawson). A film of oxide is also found surrounding the "metallic globule inclusions" (see figure 10, Rawson). It is supposed that these globules are small metallic particles formed as a sort of spray at the tip of the electrode and have failed to fuse in with the metal subsequently deposited over them.

It is a curious fact, borne out by analysis and tests from the Bureau of Standards, Strauss and others, that electric welds show over a 0.12 per cent nitrogen content, while acetylene welds give only 0.02 per cent. Nitrogen in steel is an element producing a great degree of brittleness, as small a quantity as 0.06 per cent reducing the elongation on a 0.2 per cent carbon steel from 28 per cent to 5 per cent.

Microscopic examination shows a large number of lines, needles, or plates in the weld which resemble iron highly nitrogenized. These occur within the ferrite, (or pure iron), crystals, and are more abundant in the columnar and coarse grain crystals. It might be assumed that rupture takes place along these nitride plates, (see figure 13, Rawson), but it is found that the effect of the oxide inclusions and films, the metallic globule inclusions, and the lack of adhesion between successive layers of the weld, makes the nitrogen feature of small importance as a cause of rupture. While these unsound spots are no doubt the cause of the low ductility of the weld, the metal retains its inherent ductility, as microstructure shows after bending tests on the weld. Others impurities which must be kept to a minimum, both in plate and electrode, are sulphur and phosphorous, the latter causing a brittle envelope round the crystals.

Tests Regarding Composition of Electrodes

As regards the composition of the electrode, tests which were carried out for the Welding Research Subcommittee by the Bureau of Standards bring out some interesting points. Two electrodes, one (A) a "pure iron" electrode, and the other (B) a low carbon steel, prepared to specifications, were tested for content before and after welding.

Per Cent Composition before and after Fusion

		Carbon	Silicon	Mn.	N.	Tensile strength Average
A	Before	0.058	0.33	0.042	0.003	60,000
Iron	After	0.031	0.007	0.0	0.143	50,000
B						
Mild	Before	0.15	0.06	0.47	0.003	70,000
Steel	After	0.024	0.008	0.0	0.14	50,000

Note the heavy loss in *C.* and *Si.* and *Mn.* where they occur in large quantities, and the gain in *N.*

The arc fused metal is very much the same in both cases and hence we infer that very similar results would be obtained from both electrodes in practical welding.

Coated electrodes gave very much the same results, but did not include any of the covered electrodes on the market. Their specification for the coating paste was as follows:—Graphite—15 grams; magnesium—7.5 grams; aluminum—4 grams; Mg O—65 grams; Ca O—60 grams; sodium silicate—120 c.c. 40 deg. Be.; water—150 c.c.; This was sufficient to coat 500.

Tests on the tensile strength of specimens made from the arc fused metal gave practically similar results, (ultimate strength 50,000 pounds, from over 60,000 as electrodes), (elongation fallen from 14 to 8 per cent) with properties very like low grade cast steel. Nothing was gained by coating the electrodes.

Tests on specimens made from fused metal where the beads had been deposited across the piece instead of along the specimen showed a marked decrease in strength to 40,000 pounds.

In view of the authority of the above results it is interesting to compare J. S. Orton's figures for two specimens, *R*, according to the welding committee's specifications, and *W*, containing a much greater percentage of *C*. and *Mn*. *R* would be very similar to *B* of the bureau tests.

Per Cent Composition before and after Fusion

		Carbon	Silicon	Manganese	Tensile Strength
R	Before	0.17	0.14	0.57	
	After	0.12	0.10	0.23	57,300
W	Before	0.39	0.12	1.01	
	After	0.23	0.02	0.84	76,200

Note the retention of *C* and *Mn* in the weld, and that the greater the carbon-manganese content in the electrode the greater the percentage left in the weld.

Microphotographs showed a smaller amount of oxide and slag inclusions with the high carbon manganese wire and tests gave a much higher tensile strength (see above table). The ratio of *C* to *Mn* should be 1 to 3. Further tests by H. R. Pennington, on electrodes with still greater carbon manganese content, throw additional light on the subject.

Analysis of a Deposit on Mild Steel Boiler Plate

	Carbon	Manganese
Before	0.85	11.2
After (with electrode neg.)	0.63	8.11
After (with electrode pos.)	0.83	8.11

Note the greater loss in carbon with the electrodes negative, hence to retain the carbon it is usual practice to make the electrode positive with *Mn*. electrodes.

Depositing the same wire on a *carbon steel rail* gave in the analysis a reduction of carbon from 0.99 to 0.71 per cent and *Mn* from 10.51 to 10.19 per cent, that is a smaller loss in manganese on the carbon steel rail than on mild steel boiler plate.

The electrodes were Wanamaker coated electrodes No. 9, the coating preventing vaporization of the *Mn* and *C* constituents. These particular electrodes are designed for rebuilding worn rails, frogs and crossings, the deposit being applied diagonally to the traffic and finished up against a fire brick or carbon block on the flanged side of the rail. By taking advantage of the peculiar properties of 12 per cent manganese steel, (for example, sudden cooling makes the metal very hard and ductile, slow cooling makes it brittle), in track work, a small stream of water is directed on the deposited metal until the heat retained in the part will just dry or vapourize the water.

Tests of *Mn* bars showed that if heated for one hour to 2,100 deg. F., and then "toughened" by cold water, they lost strength (93,200 pounds breaking strength), while if heated for five minutes only and then cooled they gave a test of 157,250 pounds (ordinary 12 per cent *Mn* steel gives 108,500 pounds). From this we infer that the time for the welding cycle, a few seconds when cooled by water, would not cause any structural change in the metal.

Automatic Welding

Examination of the physical properties of the weld indicates that they are dependent to a large extent on the skill, patience and care of the operator. In order to eliminate the human element a great deal of attention has been paid lately to automatic welding.

It has been found to be adaptable to any form of weld from butt welding to deposition of metal on worn surfaces of shafts, wheels, etc. The speed of welding can be increased from two to six times that by hand. The weld is absolutely uniform and it has been found possible to weld any kind of steel from 0.1 to 0.55 per cent carbon content. High speed tungsten steel has been successfully welded to cold rolled shafting, using Bessemer wire as electrode material. This kind of wire is considered as impossible for hand work, on account of sputtering, but it is just wires of this type which cut much more deeply into the work than Norway iron wire, with its quiet arc. In fact it is now possible to study the effect of the arc and the electrode without the personal equation. Some of the characteristics of the arc have been previously pointed out. For example, a certain degree of equilibrium between the fusing energy of the arc and the feeding rate of the welding strip is brought about, since a rise in current due to shortening of the arc will cause the wire to fuse more rapidly and thus lengthen the arc. But by making use of the increased voltage across the arc as the arc lengthens, an entirely automatic machine has been designed by the General Electric Company. This regulates the rate of feeding the electrode, which is now wound on a drum and gripped between a set of rollers connected through gearing to a small d.c., motor, the field of which is separately excited, and the armature connected across the arc, so that it will decrease in speed with the lower voltage due to a shortened arc, and increase in speed with the longer arc, (see figure 171, Viall.).

It is now possible to watch the arc for long periods and amongst the observations it has been found that a variation of 5 degrees in the inclination of the electrode will make a great difference to the success of a weld. About 15 degrees from the perpendicular produces good work and with some materials the electrode should drag or point towards the welded part. H. D. Morton points out that, in spite of the fact that indicating meters show practically constant readings, oscillograph records show a succession of short circuits, due probably to globules of the molten wire between the electrode and the work, the voltage falling to zero with an increase in current; the longer the arc, the fewer the short circuits. With 1/8 inch electrodes and 150 amperes the globules are deposited at the rate of about two per second, as is also shown by ammeter records. As electrodes fuse at the rate of 1/5 inch per second, the electrode would have to be timed to be fed forward 1/10 inch after each globule to maintain a uniform arc length. The automatic machine is evidently able to respond to this.

The automatic welding machine weighs only 10¼ pounds, and it is said that a welder practising for two hours can do as good work as a welder of six months training could do by hand. Automatic welds have been made on 5/16 inch mild steel which, when subjected to a 90 degrees bending test, showed no sign of fracture and when cut with a hacksaw showed no difference in cutting qualities between the unwelded and welded parts.

Alternating Current Welding

This is a more recent method of welding, its development being no doubt delayed by the fact that most of the welding was done in railway shops where d.c., was available, and that an operator has to be capable of maintaining a much shorter arc than with d.c., and takes longer to train. Again, it was contended that 75 per cent of the heat of the d.c., arc was developed at the positive terminal, and therefore the welding could never be as good in a.c., work, where the amount of heat is equal at both terminals. However, in the city of Winnipeg it has been shown that as good a.c., work as d.c., is possible, and that the point of view of the difference of heat is very much a fallacy. Quoting from the Wate-

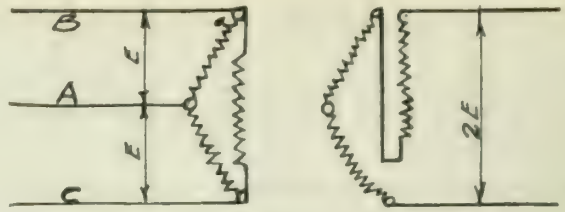
Arc Welding Corporation's pamphlet, of the three factors which go to make up the heat of the arc, (1) contact resistance between the arc and negative electrode, (2) resistance of the arc, and (3) contact resistance between the arc and the positive electrode in d.c., work, the resistance of the arc accounts for 95 per cent. Of the remaining 5 per cent, the positive electrode takes 75 per cent, or about 3¾ per cent, as against 1¼ per cent at the negative. In the a.c., arc, of course, these amounts are equal, 2½ per cent at each electrode, so that the extra heat developed at the work by the positive terminal of a d.c., arc amounts to very little.

The simplicity of the apparatus appeals also in its favour, the weight being about half the d.c., and the current control being obtained without any external regulating apparatus, a transformer of the leakage type being all that is necessary. It is claimed that the a.c., arc gives better penetration than d.c. Before the welding committee, Mr. Wagner reported that the frequency of the circuit did not make much difference, arcs being held at frequencies ranging from 12½ to 500 cycles, but of course much more easily the higher the frequency. He also found the speed of a.c., and d.c., very much the same, and that bare electrodes gave excellent results.

It is, however, so much easier to hold the arc with flux coated electrodes that they are almost invariably used and as a coating of sodium silicate, (water-glass), is easily available, these need not add greatly to the cost.

Against the a.c., it is contended that 170 amperes a.c., is required to give the same heating value as 140 d.c., and that the design of the transformer to produce a short circuit current equal to the normal welding current makes the power factor as low as 25 per cent, hence the central station engineer is not likely to favour this type, but in these days of static condensers this ought easily to be remedied.

The recent three-phase welders are attempts to equalize the load on the three phases, and reduce the drop on any one phase of the system, but unless the welding transformer has some different characteristic due to its leakage factor, it was demonstrated, as long ago as 1892 by Steinmitz, that it was impossible to take single-phase power from either two- or three-phase systems and distribute the power equally over the several phases. On a three-phase system, one of the usual methods of producing single-phase current is to connect two of the secondaries of the three transformers in open delta and join them in series with the third in reverse delta. Analysis by vectors will show that this simply results in putting



a single-phase load on the mains *B* and *C* with the current in *A* zero, gaining nothing over a single-phase connection and losing much in simplicity and efficiency.

Another point put forward against the use of a.c., is the high voltage on open circuit causing a life hazard. On one tested in Winnipeg, this was 135 volts, but there are now available on the market transformers like the Electric Arc Welding Company's which provides an auxiliary coil to limit the voltage to about 40 volts until the arc is struck.

Conclusion

In this rapid survey of the electric arc weld many important points have been omitted, such as the design of glasses and face shields, methods of allowing for expansion and contraction, many other practical applications than those shown, method of testing and inspecting welds, and costs. Only the three prime factors for successful welding, equipment, material, skill, have been briefly dealt with. As regards the equipment it has been shown that it is essential to have a machine which responds quickly to the rapid changes in the resistance of the arc, and that a.c., equipment is as successful as d.c. As regards material there must be relationship between the electrode and the work; that as the electric arc process is essentially a casting, whatever material is used must be treated to respond to the characteristics of the material. For example, if it is a high percentage manganese steel that is used, it must be given the same treatment that a manganese casting would go through (rapid cooling, etc.), and it must be protected from the action of the atmosphere by coatings which will not allow its physical characteristics to be altered in its passage through the arc.

Finally as regards skill, not only do we mean the handling of the job by men of steady nerve, but the supervising skill to know that the weld is a good one, and the services of a welding engineer, not only to select the proper material for the work, but to attend to the weld designs from a previous knowledge by test and research.

The St. Lawrence Waterway

A general discussion of the St. Lawrence Deep Waterway and Power Project

E. A. Forward, M.E.I.C.,
Consulting Engineer, Montreal, Que.

Paper read before the Montreal Branch, The Engineering Institute of Canada, October 4th, 1923.

Owing to attempted encroachments by private companies on the St. Lawrence water powers on the international section of the river, the Canadian government, several years ago, suggested to the United States federal government that steps should be taken to devise some general plan under which development of power on the international section of the St. Lawrence should proceed consistently with the preservation of rights of navigation. The Order-in-Council re this proposal read:—

> "Even though the utilization of only a portion of the whole capacity of the river can be immediately contemplated, yet the endeavour should be to design at the outset a complete scheme into which successive developments might be fitted from time to time, as and when the occasion might demand. Without some such scheme there is always the great danger that the ultimate possibilities of the St. Lawrence navigation may be neglected or even irreparably injured."

No negotiations between the two governments resulted. There has been, however, continued activity of private interests in the United States to secure the use of the water powers in this section. Following demoralization of the American railways during the reconstruction period after the war, the power scheme for the St. Lawrence reappeared coupled with an urgent demand from the middle west states for a gigantic combined deep waterway and power development on the St. Lawrence from the Great Lakes to the sea.

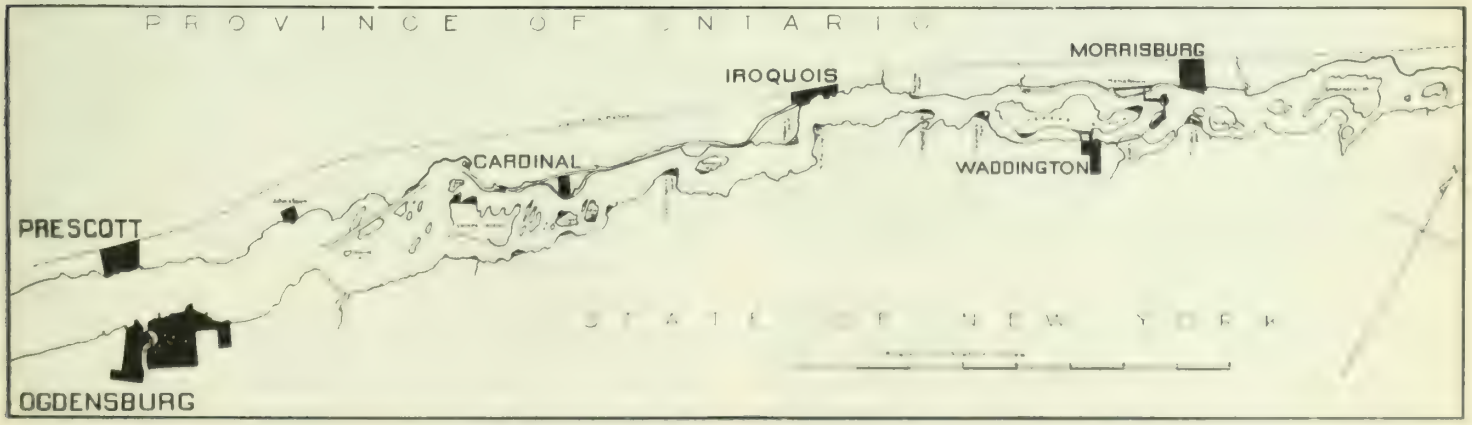
Great pressure was brought to bear upon Washington by these interests, and, as a result, instructions were forwarded to the International Joint Commission to formulate a scheme for the construction of a deep waterway, considering the obtaining of the greatest beneficial use of the water of the river in the interests of navigation and power.

The report of the commission was issued as a United States Senate document during 1922, and therein is recommended a proposal to construct a 25-foot waterway from lake Ontario to Montreal, with creation of water powers on the international section only. It includes estimates of cost with a basis for division of capital and maintenance charges between the two countries, which involves American joint ownership of the Welland canal.

Recently the government of the United States, through the late President Harding, invited the Canadian government to a conference to draft a treaty for joint development of the St. Lawrence waterway. The reply of the Canadian government was that the time was inopportune for Canada to negotiate a treaty but intimated that the government stood ready to enter upon preliminary discussion through which a basis for a treaty might be reached.

It appears from discussion in the House of Commons on June 12th, 1923, that negotiations have not been renewed. The engineers are using the time to good advantage in making further studies of the river and the making of various records. Activity of the various organizations in support of the waterway continues.

The policy of the Canadian government has consistently been to develop national lines of transportation. The Canadian waterways are highly developed. There has been a 30-foot channel from Montreal to the gulf since 1906. The 14-foot canal system has connected Montreal with the Great Lakes for nearly twenty-five years. American statesmen have referred time and again, in admiration, to the courageous broad policy pursued by Canada in this respect. To-day there is a tendency to depart from ways of national expansion into paths international and imperial. There are, in those paths, complications and difficulties which should be avoided in dealing with questions that can be treated as purely Canadian. The St. Lawrence is a Canadian river. The great waterway development in the past has been made by Canada alone for the expansion of Canadian trade.



Plan of Site of Proposed St. Lawrence Waterway and Power Scheme.

Principles Influencing further Development of St. Lawrence Waterway

Three basic principles should still influence further development of the St. Lawrence waterway:—

1 — National ownership from the lakes to the sea.

2 — Development as and when the occasion may demand in the interests of Canadian trade and commerce.

3 — The paramount importance of navigation interests over all others in the St. Lawrence.

With these principles in mind where does Canada stand in relation to the proposed extensive undertakings on the St. Lawrence river at the present time?

"*The time is inopportune,*" is the decision of the Canadian government. Taxation is onerous; revenues fall far short of requirements; and nothing but the most pressing need could justify any great additions to our financial burdens at such a time.

The Joint Commission in their report have pointed out that there is little interest in Canada in the undertaking, the demand for it coming from the middle west states, also that the railways of Canada are considerably over-developed, and, so far as the latter country is concerned, there is likely to be no pressing need of multiplying transportation routes for years to come. They might also have pointed out that the traffic of the middle west states through the St. Lawrence canals is and always has been insignificant.

It is too vast an undertaking to enter upon without knowing the benefits to be derived and the sacrifices to be made by Canada.

The 14-foot canal system on the St. Lawrence has so far met all demands upon it and has never yet been used to one-half its capacity. The cost of the system to Canada has been many millions of dollars, and it is neither worn out nor obselete, yet the proposals include the scrapping of the whole system without even a scrap value.

The outlet for grain shipments is advanced as the strongest and most convincing argument in favour of an enlarged waterway, or as it is termed "a new water route to the sea". It was said in the House of Commons a short time ago that even if the saving on the carriage of Canadian grain was only one-and-a-half cents per bushel it was worth doing. No evidence of a convincing character, which might serve to support such a statement, has yet appeared. Not only would such a saving be entirely incommensurate with the enormous capital expenditure involved, but it is by no means clear that the same or even a greater saving could not be effected at far less cost by some other means.

In 1922, Montreal's greatest year, 77,000,000 bushels of Canadian grain passed through the port, both water and rail. Assuming that as much as 100,000,000 bushels should come down by water, the saving effected at one and one-half cents per bushel would be $1,500,000, the interest at 5 per cent on a capital sum of $30,000,000. The cost of the waterway from lake Ontario to Montreal is given by the commission's engineers as $252,000,000 and it is not improbable that this amount may be greatly exceeded or even doubled.

It may be noted that the total amount of export grain coming through the port of Montreal in 1922 was 155,000,000 bushels, there being 78 millions bushels of American grain. The heavy American shipments over this route is partially accounted for by the incapacity of the railways between Buffalo and New York as an aftermath of the railroad strike. Where they were expected to handle a thousand cars of grain per day they fell down to about two hundred cars.

During the past two years and this year also, there has been more or less congestion in the handling of grain in the port of Montreal. There are several reasons for this condition. During 1921 lack of co-ordination in the use of port facilities was a factor, also the grain handling facilities were at times overtaxed. Inability of foreign markets to absorb the grain offering has been the greatest factor in retarding its movement, and delaying shipment. Grain shipped to the port and held pending sale hampered the elevators.— There was not enough storage to absorb this element. Frequently, 25 or more lake vessels are awaiting their turn to discharge at the elevators. Even under those circumstances the elevators are frequently handling only about 600,000 bushels per day whereas their capacity is fully 1,200,000 bushels per day. The canal system has never been a factor in these delays.

Additional grain handling facilities, now under construction at Montreal and lake ports which involve a comparatively very small outlay, should so lower the cost of transportation between the head of the lakes and the seaboard as to effect the saving of one and one-half cents per bushel claimed for the 25-foot water way.

Important Questions to be Settled

There are some very important questions to be definitely settled before there can be any satisfactory basis for a development of this waterway.

The Honourable George P. Graham, in reply to questions in the House re St. Lawrence waterway, recently said that there are other interests besides the Dominion of Canada and the United States government concerned in the proposition. Provincial authorities had something to say in the matter and there had been some disagreement between federal and provincial authorities on the question of legal rights. The construction of the St. Lawrence deep water way would mean a great development of important water power. The government hoped when the work was completed, to recover a sum which would come from the United States to help in its construction. Mr. Graham said that the United States had not accepted the recommendation of paying her share of the cost.

It is true that the Hydro-Electric Power Commission of Ontario have laid claim for that province to the water powers in the international section of the river, and a dispute arises as to how much power the federal government could claim in connection with a navigation project. Independent surveys of the power section were made by the Hydro-Electric Power Commission for the express purpose of reinforcing that claim. The state of New York has asserted its rights in the water powers and disputes the authority of the federal government of the United States to enter into a wholesale power development scheme on the St. Lawrence at the expense of the state. Until the legal rights in the St. Lawrence of the two contracting parties, the federal governments, have been clearly defined, and the extent of provincial and state rights ascertained and delimited, no effective compact can be formulated.

In the proposals of the Joint Commission we find costs allocated as follows: — The capital cost of "navigation works" and of the new Welland ship canal to be apportioned between the two countries on the basis of the benefits to be derived by each country from the use of the waterway, etc.

Should Americans develop a preponderant trade through the canals, Canada will have automatically surrendered ownership and control of her whole navigation system on the St. Lawrence, even in Canadian territory. On the other hand, if American traffic be diverted through southern channels, rail and water, Canada would be left to bear the whole cost of the improvements which were made largely for the benefit of our neighbours.

Is it possible that any Canadian government would sell a controlling interest in the Welland canal, or permit the United States to have proprietary rights in all-Canadian waterways from Cornwall into the port of Montreal? Is that the source of the sum to be recovered from the United States to aid in its construction? Is it likely that the United States would spend that money in a foreign state without exercising control over their interests?

Diversion of Water through Chicago Drainage Canal

The extent to which diversion of water from the St. Lawrence is to be permitted, and the effects of such diversion upon both navigation and water power should be clearly determined in advance of adoption or even formulation of any general scheme of development.

Diversion of water from lake Michigan at Chicago through the drainage canal has continued since 1900. The first amount taken was about 4,000 cu. ft. per sec. Gen. Bixby, U.S. Army engineer says that although granted a permit for 4,000 cu. ft. they were constructing works to take 14,000 c.f.s.

United States Secretary of War Stimson, in refusing an application to increase the amount of diversion to 10,000 c.f.s., said:—

> "The sanitary canal has never received the direct sanction of Congress." "It was built solely under the authority of the state of Illinois." "Very careful consideration ——— leaves no doubt in my mind that the withdrawal of 10,000 c.f.s., would substantially interfere with the navigable capacity of the Great Lakes and their connecting links ——— the Welland canal and a number of canals on the St. Lawrence river." "The available depth of water over one or all sills of each of these canals would be affected and in some cases reconstruction might be made necessary."

Despite this refusal the capacity of the sanitary canal has been increased. The completion of the Calumet-Sag channel in 1919 increases its capacity to 14,000 cubic feet per second. The attitude of the state of Illinois in this matter would appear to be that of the president of the sanitary district who said:—

> "The presumption that our water supply is to be limited to 10,000 c.f.s., is gratuitous and mischievious and should not be voiced by the officials of this district. I believe that we should have the volume requisite to our needs as they appear and are justified."

In May last engineers of the sanitary district were investigating the possibility of a regulation dam at the foot of lake Huron with a view to a greater flow through their canal. Fortunately Canada is in a position to defeat this move.

W. J. Stewart, M.E.I.C., engineer for the Canadian government, re proposed improvements in the Livingstone channel at Detroit in 1913 said:

> "There is no guarantee as to the amount of the diversion through the sanitary canal, and it is therefore impossible for any body of engineers to construct any work to give the maximum benefit..."

The effects of the diversion are already serious in the port of Montreal and in the ship channel below. At the Montreal hearing of the International Joint Commission in October 1920, among other evidence given was reports on loss of level in Montreal harbour and the ship channel due to the Chicago diversion, by prominent hydraulic engineers, Arthur Surveyer, M.E.I.C., Walter J. Francis, M.E.I.C., and the late Professor C. H. McLeod.

It was shown that a diversion of 8,000 c.f.s., at Chicago caused a direct lowering of the level in the harbour of from 9 inches to 9½ inches during the low water period of the navigation season, while a diversion of 14,000 c.f.s., will lower the harbour level nearly 17 inches at low water stages. The loss of level in the ship channel will be from one half to two-thirds of that in the harbour. The resulting loss to shipping is understood when an extra inch of water gives from 40 to 80 tons additional cargo capacity.

In the St. Lawrence canals, at times during the navigation season, there has been less than 13 feet of water on the lock sills instead of 14 feet for which they were designed.

The plans of the sanitary drainage canal include state owned power plants with an aggregate capacity of 173,000 h.p., according to the statement of one of the canal engineers. Secretary Stimson, in refusing the application for 10,000 c.f.s., points out that for every horse power realized by this water through the drainage canal, four similar units would be produced if it passed over Niagara. A development of 173,000 h.p., or the use of 14,000 c.f.s., of water by the drainage canal will rob Canada of her water powers to the following extent:—

In Niagara:	$173{,}000 \times 1.25$	$= 216{,}250$ h.p.
In St. Lawrence: 82% of 173,000	$\times 1.64$	$= 232{,}550$ "
	Total	$= 448{,}800$ "

Sir Adam Beck is reported to have stated recently that from 8,000 to 10,000 c.f.s., are now being diverted at Chicago, and that such diversion means a loss of about 300,000 h.p., to Canada. This, he said, was the equivalent of about 3,000,000 tons of soft coal, which at present prices means an annual loss of $21,000,000. On the same basis the full development contemplated at Chicago would increase this annual loss to nearly $32,000,000.

Hence the completion of plans now under way in the state of Illinois will prove very expensive for Canada.

First — The St. Lawrence canal system will have lost more than a foot in depth at the critical stages of the river.

Second — Water levels during the same periods in the ship channel will be lowered more than a foot and in the harbour of Montreal nearly two feet.

Third — The loss of water power in the Niagara and St. Lawrence rivers will be nearly 450,000 h.p.

Fourth — All harbours in lakes Huron, St. Clair, Erie and Ontario will lose in depth from 6 inches to a foot.

The report of the International Joint Commission, while recognizing that a diversion takes place, treat it as an unknown in the equation and have no suggestions to offer. They base their estimates on the assumption of no diversion. This is too important a question for everybody to sidestep. It calls for settlement.

Development of the French River for Navigation and Power

Another question worthy of consideration is the early development of water powers on the French river. There is to-day a serious shortage of power in the mining districts of northern Ontario. This power is well placed for their use and not costly to develop. The prosperity of this district is of the utmost importance to the province of Ontario. Wise co-operation in its development will yield bountiful returns. Power is an absolute necessity to the mining operations.

Coupled with such a power development should be the opening of a waterway for lake vessels up to North Bay, which becomes an important port for the handling of coal, timber, ores, etc., while grain eastbound landed there has a down grade all the way to tide water. Much heavier trains can be hauled from that point than from the Georgian Bay ports.

In the Ottawa river itself, power developments could be made from time to time in conformity with a general scheme which would safeguard the interests of navigation, and, when conditions would justify, the waterway should be completed between North Bay and Montreal, giving an all-Canadian route, the shortest possible from the head of the lakes to the sea.

Such a route will not be prejudiced by possible international complications, and is the only one which is not injured by the withdrawal of water at Chicago or elsewhere.

It is stated a million horse power on the Ottawa would result from this policy and storage works contemplated on its tributaries would add more than another million horse power, all of which is Canadian.

Insufficient Data

The Joint Commission gave their engineers but one year in which to prepare a report on the whole problem of the St. Lawrence waterway. They were not given a fair chance. It was necessary to formulate a proposal and collect what information could be gathered in the short time bearing on that one phase, in order to make an approximate estimate. This is recognized in the report itself which reads:—

> "that before any final decision is reached, the report of the Board, etc., be referred back to the Board enlarged by other leading members of the engineering profession to the end that the whole question be given that further and complete study that its magnitude and importance demand."

The Canadian engineers have at the present time excellent studies of the river in progress and will, when called upon, be in a position to criticize, favourably or otherwise, the estimates and proposals so hastily prepared.

Engineers differ widely on the effects of regulation

Nearly a dozen schemes for regulation of levels of lake Ontario have been advanced by various engineers, the American and Canadian engineers submitting separate reports on this subject. It has been claimed by some that it will result in higher high-water stages and lower low-water and by others that there will be an equalization of flow. The fear has been expressed that regulation may be in the interest of power and that navigation interests may suffer.

However, it is generally conceded that a successful regulation in the interest of navigation and afterwards of power is the basis of any satisfactory plan for a deep waterway, and no definite project can be formulated until the effects of regulation are known.

Power Proposals

> "The Commission believes that the greatest beneficial "use of the waters of the St Lawrence River between "Montreal and Lake Ontario may be obtained by a "combination of navigation and power development "in the international section and of navigation alone "in the national section with power development "therein at some future date.
>
> "While 4,000,000 h.p. may be developed between "Prescott and Montreal, it would be unwise, at the "outset, to create more than the 1,400,000 h.p. "available on the international section.

So far as Canada's best interests are concerned it would be wise to split up the 1,400,000 h.p., block once more and make an even smaller initial investment.

The Hydro-Electric Power Commission of Ontario estimates that a normal growth will create by 1941 a demand in Canada for St. Lawrence power, within a 200-mile radius, of 191,000 h.p., and it may be pointed out that there will be several other Canadian water-powers competing to supply the same area. The state of New York is not asking for this 1,400,000 h.p., development but is strongly opposing the project. Canada's share of the power created might be exported, but to-day there is genuine anxiety concerning the exodus of Canadian workmen over the line to the south. The export of a large block of power to New York and New England would only have the effect of aggravating an already undesirable situation.

The engineers of the commission report in favour of a single-stage power development by means of a dam at Barnhart's island, Long Sault rapids, with an effective head of about 74 feet. A regulating dam with low head is placed near Morrisburg.

Other engineers strongly advise that power be developed at both dams. This proposal is more in line with Canadian interests since damage from flooding through change of levels is greatly reduced. The area on Canadian side is an early settled and wealthy district. One dam could be set in operation years before the single-stage power can be put into use. Under the commission's proposal the power houses are less expensive but dams and retaining walls are higher and longer and in consequence more costly.

Proposal for Erection of a Dam at Rapide du Plat for Regulation of Lake Ontario and Development of Water Power

The proposal which follows will in the writer's judgment afford a practical working scheme which can be carried out at comparatively low cost, will avoid many of the difficulties incident to the plans recommended by the commission, will meet all power requirements for years to come and will have other striking and important advantages.

The diverse views held as to the effects of regulation show that the only safe course is to build the dam and learn by actual observation how the best results may be obtained. Place the dam at Rapide du Plat and make use of the power created through change of levels. Once conditions of flow are thus established, the engineering problems involved in future development of the lower river will be greatly simplified and results definite.

The benefits to Canada through the building and successful operation of this dam will be numerous and important.

1.—Correct regulation of flow in the interests of navigation will minimize the evil effects of diversion from the Great Lakes. This should restore to the St. Lawrence canals the 14 feet of water for which they were designed and built. Montreal harbour and the ship channel will benefit during low water stages. (Water power lost by the diversion cannot be restored.)

2.—Sufficient water power will be developed to meet all requirements in this district for probably 25 years.

3.—National control of St. Lawrence navigation retained.

4.—On completion of the Welland canal, upper lake carriers can proceed to Morrisburg before transferring their grain cargoes.

Physical Features

1.—An international dam to be placed opposite Morrisburg, extending from Clarke's point on the American shore across Clarke's island and Canada island to Mariatown on the Canadian side, having a total length of about 8,000 feet and developing approximately 600,000 horsepower under a 27-foot head.

2.—Regulating sluices between Clarke's point and Clarke's island on the American side and between Canada island and the Canadian bank of the river. The upper pool to be that of lake Ontario regulated level less the river slope from the lake to the site of the dam. The conditions in the lower pool will be equalized by some improvement of section at Murphy's point and farther down stream.

3.—Lift lock and guard, to be built at the Canadian end of the dam in Mariatown to take the place of the Rapide du Plat section of the 14-foot canal now in operation. This part of the work can be constructed without interfering with navigation in the existing canal.

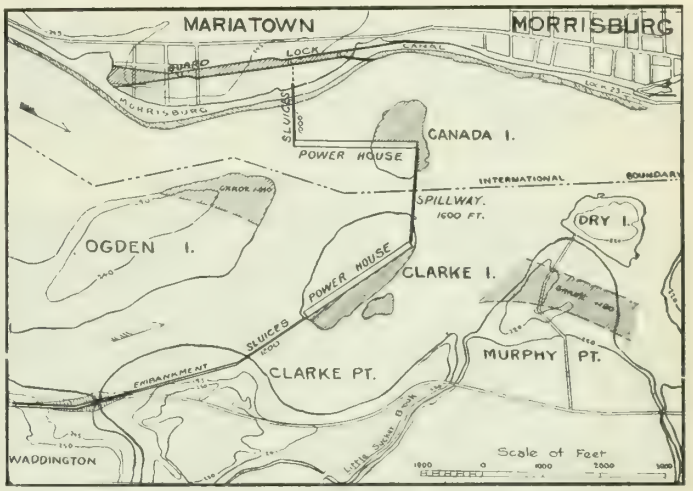
4.—American power house situated on Clarke's island and wholly in the United States will form a part of the dam. Canadian power house with base on Canada island and extending directly upstream lies wholly in Canada. Power houses are both so located to get the best results under winter conditions.

5.—The distance between power houses at the lower end is about 1,600 feet. This forms the spillway section and includes ice sluices and also additional regulating sluices if desirable. The International boundary passes between the two power houses near the centre of the spillway.

6.—Enlargement of section from site of dam upstream to Chimney point to be made during construction of dam and afterwards until sufficient section is obtained to give the most favourable conditions in winter as to ice cover, etc. Excavation will proceed at the critical sections where loss of head is found to be greatest. A certain amount of cutting is required also below the dam, principally cutting through Murphy's point.

Cost Apportioned

7.—Dam, spillway, sluice section and other works, together with the power house, etc., lying in the United States to be built and financed entirely by American interests. Dam, spillway, sluice section and other works, together with the power house, etc., lying in Canada, to be built and financed by the Hydro-Electric Power Commission of the province of Ontario. The location makes this practically an equal division of cost.



Site of Proposed Dam at Rapide du Plat

8.—Land damages and all costs incurred through flowage, etc., due to change of levels to be assumed by the said American interests in the state of New York, and by the Hydro-Electric Power Commission in the province of Ontario.

9.—Cost of locks, entrances, bascule and navigation works required to replace existing navigation facilities to be paid in equal shares by the said American interests and the Hydro-Electric Power Commission. In case the Canadian government should require the lock and approaches to be in conformity with the construction on the new Welland canal, the additional cost over that of a 14-foot waterway is to be a direct charge on navigation.

10.—Excavation and other improvements in the bed of the river and elsewhere for the purpose of enlargement of river section to be assumed in equal shares by the above named power interests.

11.—Maintenance of navigation structures and facilities to be the care of the federal government of Canada. Maintenance of regulation system of sluices, etc., at site of dam to be equally the responsibility of the federal governments of Canada and the United States. Power plants are maintained by the respective power interests.

Control

12.—The regulation of river flow and lake levels to be vested in the hands of an International board of engineers appointed by the two federal governments concerned. Regulation is to be entirely in the interests of navigation and of public safety. The Canadian section of the board of engineers should be headed by the chief engineer of the department of railways and canals.

13.—The Canadian government to own and control the navigation facilities as a part of the present canal system.

14.—The power interests concerned to own and control the distribution of the power resulting from regulation excepting only that portion required for the operation and uses of the local navigation system.

15.—It is suggested that the surveys required and all additional study of river conditions required, be made by the federal governments concerned, the location, design and character of all structures and undertakings being subject to their approval.

16.—The execution of the work must be placed under one definite control, a responsible body of construction engineers of experience. Four years is a generous allowance for completion of the work as outlined and establishing full regulation.

Construction Features

The construction features do not present any extra hazardous or perilous undertakings. All structures are carried to bed rock wherever advisable, the rock being found everywhere at a reasonable depth. On the lock site, elevation of rock is approximately 190, which corresponds closely with grade for the 25-foot channel. Canadian power houses and sluices are on rock from elevation 168 on Canada island to 185 at the north shore. Spillway foundations are at approximately elevation 170. American power house foundations go as low in one place as elevation 150, while the adjoining sluiceway footings will be on rock from elevation 170 to elevation 200, or higher.

The location is excellent for handling the flow of the river during construction. The American power house will be built without cofferdams, and the Canadian power house interferes very little with the natural flow of the river. The spillway section obstructs a small channel of probably less than 5,000 square feet in area.

The lock and canal will be built entirely in the dry without interfering with the present 14-foot navigation. Enlargement of section up to Prescott will begin with the building of the dam but it may be carried on and completed years later if it be found desirable to extend the time for that outlay.

The claim is being repeatedly made that the power developed in the St. Lawrence will pay for the whole deep waterways project. This opinion is shared by Ex-Governor Allan of Kansas, O. E. Fleming, president of the Canadian Deep Waterways and Power Association, J. H. Duthie, secretary of the National Waterways Association of Canada, and others. They contend that the whole construction will not cost Canada one dollar, a statement which will bear many interpretations.

Here at Morrisburg is an excellent opportunity to secure an extensive water power under the most favourable conditions for establishing the above claim. As a business proposition it is not burdened with heavy capital charges due to navigation interests. The conditions are essentially fair, the interests which directly benefit paying the cost of development.

The machinery is already in operation for handling international questions that will arise as to ownership, construction and maintenance. Aside from the actual preparations for and supervision of the undertaking, the federal governments concerned are called upon to finance only in the maintenance of navigation and of stream control.

Discussion on the St. Lawrence Waterway

The meeting of the Montreal Branch, on October 11th, 1923, was devoted to a discussion of the paper on the St. Lawrence Waterway, presented by E. A. Forward, M.E.I.C., on October 4th, 1923.

Discussion opened by Frederick B. Brown, M.E.I.C.

Mr. Brown said that the question of the St. Lawrence waterway, with its combined water powers and navigation, is one of the most vital problems facing the present generation of Canadians; and he thought that the discussion should be extended to all other branches of *The Institute* at least as far west as Winnipeg and perhaps even beyond. A suggestion has been made that *The Institute* should undertake the compiling of a bibliography on this subject and he commended this suggestion.

Modestly disclaiming his own qualifications to adequately discuss this question, Mr. Brown said he wished to present one or two suggestions which he hoped might lead to discussion. Mr. Brown pointed out that the problem is a double one, one of navigation and also of power. There are alternative schemes for both navigation and power which should not be lost sight of in studying this question. He pointed out that the absorption of power per unit of population is constantly increasing. The development of power on the St. Lawrence involved very large blocks of power at one time. He referred to the latent possibilities of power development on the Ottawa river and its tributaries, estimated at upwards of 1,000,000 horse power. He dealt with the question of transmission distances showing that these constituted no bar to the consideration of such alternative projects as he had instanced. The protential power, wholly situated in Canadian territory eliminated all international complications, which had to be faced and straightened out in dealing with the St. Lawrence problem. He thought the discussion should be continued beyond this meeting, and that it should be studied by boards of trade and other bodies, all vitally interested in this enormously important subject.

Discussion by Henry Holgate, M.E.I.C.

(*Read by the Secretary in the absence of Mr. Holgate*)

It is a good sign to see papers like Mr. Forward's coming before *The Institute*, papers bearing on questions of national interest such as this one, must tend towards educating the public on an important question and will also tend to increase the usefulness of *The Institute*. In this sense Mr. Forward's paper is a useful one, and I hope that there will be further contributions of a like nature.

During the past few years, there have been published reams of matter both for and against the improvement of the St. Lawrence river for navigation purposes and of the development of water power, and having read most of what has been written, I can only conclude that the great majority of those who have given some study to the subject have come to the conclusion that navigation should be improved and that water power should be developed.

Treaties clearly define Rights

The study of this question involves first of all a thorough knowledge of the treaties between Great Britain and the United States, so as to understand fully the legal status of the two nations as to the river. Without a complete knowledge of the international legal matters, many writers have fallen into serious errors which might

have been avoided. The treaties clearly define the rights of both countries, and insofar as these arguments go, there is no doubt as to the position occupied by each nation, and provided that neither nation oversteps treaty rights, and we have no reason to expect they will, we know exactly how far each can go.

In a very large degree the two nations are partners in the St. Lawrence river. The United States has been accorded full navigation rights from the Great Lakes to the sea, including the use of the canals, and Great Britain has the rights in all American channels connecting the lakes. From lake Ontario to the 45th degree of latitude, the St. Lawrence is a boundary river, and the boundary between the two countries is defined by treaty and is substantially in the middle of the stream. In this section each country is owner of one-half the water power, but neither can develop its half to the injury of the other owner, so that co-operation is imperative. The St. Lawrence therefore is not a Canadian river, but an international river, and this fact must not be lost sight of.

Below the 45th degree of latitude the river is all in Canadian territory and Canada can deal with the water powers there independently of the United States, but subject to the question of navigation which is international and the consent of the United States would be required, but only as regards navigation, and if navigation interests are fully provided for, the United States would have no ground for objection to power development there.

Before the Cedars Rapids power was developed, it was considered by eminent counsel necessary that the approval of the Waterways Commission would be necessary, and the subject was referred to that body. Meetings were held in the United States and in Canada, and the commission finally gave their approval to the scheme, because it would not interfere with navigation, thus setting a precedent and recognizing the rights of the two nations under the treaties.

Since that time the treaty of 1909 has been entered into between Great Britain and the United States, and which very clearly sets out the respective rights of the two contracting parties, and if to-day any power development above or below lake St. Francis were contemplated, there would necessarily be a reference to the Joint High Commission for approval, and this body under the treaty is the last court of advice, but they would give their decision based solely on the question of interference with navigation.

Ownership of the Water Power

In respect to the ownership of water powers, it is quite clear that the bed of the river is vested in the state of New York and the province of Ontario equally, above the 45th degree of latitude, and entirely in the province of Quebec below this point; the Dominion government and the United States only have jurisdiction over navigation interests, so that the province and not the Dominion would benefit from rentals of land under water and flowing water, the United States and the Dominion being only interested in navigation under the treaties. I have published a pamphlet explaining these features by way of educating the public and many details not here set forth are explained in it.

Now, when we come to details, we do not progress. We must fix our attention on principles. We can leave details to be solved by others later, but we should fix our principles now. There have been several suggestions as to how the power should be developed, but at the present time the discussion on these details is somewhat premature in the sense that the subject has not reached that stage. A decision on the broad principles must be arrived at first. Shall the river be utilized for power production, then shall public or private interests develop the power? Of course, the question of navigation is paramount and everything is subservient to this.

If the power development is to be made under government control, then, the provincial government and the state of New York will be actively concerned and will have to co-operate with the federal governments so as to harmonize navigation and power development. The province may naturally insist on the full potential development not being prejudiced by any navigation scheme that might curtail the ultimate output of power, and the federal authorities will not be disposed to incur undue expense for the purpose of developing power. The studies of the river have not advanced far enough to enable the questions arising out of these conditions to be now decided, but both countries are carefully considering them and no doubt before long enough information will be available to enable conclusions to be reached.

Private Capital available for Development

It is positively stated that private capital is now ready to develop power at Croil island, and that provided agreements can be made with the various authorities these parties are prepared to begin work, and provided for all navigation requirements there. Under proper safeguards, I can see no objection to power being developed by private interests, and in fact in many ways it would be preferable to government construction and operation, except that perhaps in the province of Ontario, where there exists a competent organization, it might be preferable to have the undertaking in the hands of the Hydro-Electric Power Commisssion, which probably can co-operate with other interests, thus embracing both sides of the river.

When the needs of navigation are referred to, it must be borne in mind that the question is not a local one, but in so far as Canada is concerned, it is of importance to the country as far west as Moose Jaw for the handling of grain. It is not either a question of the present capacity of our canals to carry the grain offering at present, but it is a question of carrying it economically and in larger ships. As an investment based on a return on capital to provide a net revenue assuming canal tolls to be paid, and which is not possible, it would be most unsatisfactory and unprofitable, but the benefit would be felt by the producers provided proper control is exercised over carrying rates, and besides the crop could be moved more rapidly.

It will be seen that many broad questions have to be decided before we can profitably discuss details, but I do not say that all these matters should not be discussed now, for it will keep the subject before the public and promote further study, and once public opinion is formed, based on proper information, we may except to advance this great scheme, which I have not the least doubt will be an accomplished fact some day.

Discussion by Dr. Howard T. Barnes.

Dr. Barnes has made a study of the question of ice in the St. Lawrence for thirty years. He thought navigation must be provided for larger lake carriers, and that the river as a passenger route must not be interferred with. Dr. Barnes said the freezing of the river was due to ice formation originating in the big lakes, and that if it were necessary or desirable to keep open-water, it would

be quite practicable to control this condition. He foresaw a very great demand for power, but not for some years. However, it would take several years to make the proper surveys and studies. He stated the question of the ice need never enter as a deterent to the development of the power; and he would be glad at another time to discuss practicable methods of dealing with the question of ice at critical points in the river so as to remove any difficulties on this score.

Discussion by Thos. H. Hogg, M.E.I.C.

Mr. Hogg presented his views purely from the standpoint of an engineer interested in these developments and not as representing the Hydro-Electric Power Commission of Ontario. He said the people in Ontario were mainly interested in the international stretch of the river as far as Cornwall, and the results of careful investigation of this section had been embodied in a report of the engineers of the commission to the Joint Commission some three years ago. He said doubts were expressed as to where adequate study had been given to the power project on the whole river, but that as far as the international section is concerned sufficient data is available for the preliminary study of any power development. Mr. Hogg thought Mr. Forward's estimates as to the future markets for power were far too pessimistic, judging from the experience of the Ontario Hydro-Electric Power Commission, in regard to the development of power at Niagara Falls, which he explained in some detail.

He expressed the opinion that any possible development of the St. Lawrence depended on the co-operation and goodwill between both provinces and between both countries. He referred to the difference of opinions between different engineers and between the people of the two countries, and said that a huge project of this nature needed to be considered with a considerably amount of charity and tolerance. He said that the report of the Ontario Hydro-Electric Power Commission had been made in the best of faith but he admitted that it might not be the best final solution. The final plan adopted might easily be on different lines from any of the reports made to date.

Speaking of the market conditions, there is no question whatever, that no matter what development is undertaken at Morrisburg, the power would be absorbed by the time it could be delivered. The developed power at Niagara would be completely used by 1926, and he saw little possibility of any further development there for some time, at least, not until a new international agreement was drawn. The whole Toronto market, and the eastern Ontario market could be turned over to the St. Lawrence development, setting free the power used in Toronto to-day for use in western Ontario. There were instances of three horse power and even five horse power being used per head of population. He declined to enter into a discussion as to the details of where the development should be, and the nature of the development. The report made to the Joint Commission proposed three schemes:

A — A single stage development at Grand Sault.
B — A double stage development at Morrisburg.
C — A double stage development at Cryslers island and Long Sault.

The report did not give a definite opinion as to which is the best scheme, but gave sufficient data so that any one could form his own conclusions. His own feeling was that the initial development should begin with the reconnaissance that lake Ontario was dangerous for navigation. Considerations of capital necessary and limitations of market appeared to be in favour of the Morrisburg development. At Long Sault more power could be developed than can be absorbed in Canada in a limited time. This means that the extra capacity must be marketed in the United States, with the grave danger of never getting it back for Canada when required.

Discussion by R. W. Reford

Mr. Reford recognized the fact that the day is coming when the St. Lawrence power has to be developed but he thought we were hurrying matters too fast at the moment. We have much power of our own to be developed, which he thought we should develop by private enterprise, but for international power such as that on the St. Lawrence, he was opposed to private enterprise which was likely to be a source of trouble.

The development of the St. Lawrence is going to provide a tremendous quantity of power, more than we could immediately absorb. It would be a mistake to overdevelop and have to find a market for our surplus power in the States, as having once provided that power, and industries and towns having been established as a result of it, it would prove extremely difficult to get it back for Canadian use when required later.

It had been assumed that it is necessary to develop this power in order to get the grain forward in time. As a matter of fact, the grain comes in too fast now; faster than the railways and steamers can handle it. What is wanted is a steady flow, to feed the various ships and railways steadily through the fall and winter months. By such regulation, the farmer would secure better prices than with all the harvest dumped in England during a short time.

He appreciated the fact that cheaper transportation is necessary, but the benefit would be nullified if all the grain were fed at once. This development scheme would involve many millions of dollars, and this country has all the debt it can handle, and we should therefore keep clear of further commitments until we got some of our debts paid off. Mr. Reford said the farmers, when advocating such projects as the Hudson Bay route, and the St. Lawrence waterway, lost sight of the special shipping problems involved. For the Chicago traffic, to do it right, a special type of ship would be required, and it could only make a limited number of voyages, so that the cost of handling the business would be excessive.

Discussion by Thomas Harling

Mr. Harling thought a discussion of this kind very important for the interests involved, because we were told that Ontario is using about all the power now under development. The question appeared to be whether the St. Lawrence power should be developed or that on other rivers.

Years ago, it was said that the grain business could not be done through the St. Lawrence, but we had been building elevators, and are now doubling the elevator capacity in the port of Montreal, and that is a step in the right direction, because we all wanted to see the grain from the northwest come through Canadian ports.

In regard to the grain coming through all at once, nature produces the crop all at one time and the farmer wants to get it out of his hands as soon as possible. Fort William and Port Arthur has a capacity of sixty-five million bushels; the Georgian Bay and Montreal added further capacity of twenty million bushels, but still there is a demand for more capacity for holding grain until it

could be removed. The grain could not be removed until sold, and consequently it accumulated. There is an accumulation of unsold grain in Montreal at the moment. It is in the interests of Canada to have storage capacity in Montreal; the more capacity the better despatch can be given to the steamers.

There is in view 150 million bushels of grain before the close of navigation, and Montreal can only handle 25 million per month or about 50 million before the close of navigation. The other hundred million will probably go through Buffalo and other United States ports. When it reached Buffalo it is lost to Canada.

The distance from the wheat producing districts of Canada or the United States to seaboard was about 2,500 miles; much more than in the case of several other wheat-growing countries. The burden of inland transportation is a very heavy one, and it reflected back on the farmer. The present cost of transporting grain from Port Arthur to Montreal is ten cents a bushel, while it is being carried from Montreal to Liverpool, three times as far, for eight cents a bushel.

The lake rates are high partly on account of shortage of ships and lack of competition, but still more as a result of the expense incident to delays in unloading. It is no uncommon thing for a lake steamer to be in Montreal a week, at a cost of several hundred dollars a day. Anything that could be done to reduce the cost of getting grain from the farmer to the consumer, would undoubtedly benefit the farmer as well as the consumer.

Alternative routes were suggested. The western farmers looked to the Hudson Bay routes. This was due to lack of knowledge, as conditions of navigation make that route impracticable and the money spent on it was absolutely wasted.

The Vancouver route is now being developed. Vancouver is open 365 days in the year. The farmer in the west could ship his grain to advantage by that route, provided storage capacity and ships were available. He believed Vancouver would be developed because cost of water transportation was one-tenth that of rail, consequently shortening the rail haul meant cheapening transportation. The fact that the present rate from Vancouver to Antwerp is twenty-five shillings per ton indicates the possibilities.

Referring to the diversion of water by the Chicago drainage canal, he remarked that they had a steamer in the port of Montreal that day, that would have to sail with cargo one thousand tons short of her capacity, on account of the depth of water, there being only 25 feet 11 inches as against 26 feet 6 inches last year. This meant a heavy loss, and the port of Montreal was vitally interested in seeing that we have enough water flowing down the St. Lawrence for navigation purposes.

Mr. Harling later added some further remarks on the subject of transfer of grain from one class of ship to another. When the completion of the new Welland canal permitted the entrance of the large upper lake steamers to lake Ontario, he suggested the use of pneumatic elevators to transfer the grain to smaller vessels, to pass through the canals to Montreal. This was the practice at the port of Rotterdam, where grain was handled very rapidly.

Discussion by Dr. Milton Hersey

Dr. Milton Hersey, as one of the government trustees of the port of Montreal, had a very great interest in the success of the port; and the shortage of water not only concerned the selfish interests of our shippers, but the general interests of Canada. The water in the channel was to-day a good deal lower than for some years at this period, notwithstanding good rains, and he believed that too much water was being diverted through the Mississippi canal.

When the Harbour Commissioners of Montreal considered any question, it was first in its general effect on Canada, second, in its effect on the province of Quebec, and third and only third, its bearing on the city of Montreal. In Chicago and Duluth he had found visions of ocean steamers loading at those ports, and trading direct with European and other ports: but he agreed with the views of Mr. Reford and Mr. Harling, that it would never be profitable for ocean steamers to extend their trips to the head of the lakes.

He was in favour of the St. Lawrence deep waterways, and also of the development of water powers as soon as we are able, but it would be foolery to undertake such immense expenditures, in view of financial conditions in our country. We have not the money, and if there was no other reason, that would decide the question for a long time to come. The money question would not be so serious to our American friends, with their greater population, but we should go very carefully.

He drew attention to a possible result of the completion of the Welland canal if the St. Lawrence deep waterways are not completed. There was the Oswego canal, and the deepening of that canal to form a route to the Hudson river is being strongly pressed.

He questioned the wisdom of completing the Welland canal, lest the traffic be diverted from lake Ontario through New York, and it become difficult to recapture the trade for the St. Lawrence route.

He hoped a committee would be appointed to study this question, and that Canada would not too quickly commit itself to any arrangement with the United States, and certainly not to any greater financial obligations, to go on with the work just now. Dr. Hersey alluded to the question of freight rates. He had found ten days before, the rate from Duluth to Buffalo was $2\frac{3}{8}$ cents per bushel, while on the same day the rate from Port Arthur to Port Colborne was $4\frac{1}{4}$ cents.

Discussion by A. O. Dawson

Mr. Dawson, representing the Council of the Board of Trade, said that this question was a very live one in the United States, and would have to be faced, and he approved the suggestion that we should study the matter. He said American interests had appointed a man to give his whole time to the advancement of this project, and he had been assured that three quarters of the states of the union had endorsed the scheme.

He know that neither Canada nor the United States would consent to put their waterways in the hands of any private interests; but it might be possible to lease water power rights to these private interests, leaving navigation strictly in the hands of the government. He believed there were private interests ready to finance the whole scheme under some such arrangement.

The farmers in both countries have great power at the present time, and they are terribly dissatisfied with existing conditions. They seem prepared to try any experiment, and we might find ourselves in an awkward position if the Americans come to the conclusion that this work should be proceeded with at once, and we could not see it from the same point of view. The speaker urged keeping an open mind, and studying the question

from all angles, without not refusing sympathetic consideration to any proposals compatible with our fair share of control of the waterways, and not prohibitive as regards financial liability. He deprecated making it a matter of consideration of purely local interests, as opposed to those of the country as a whole.

He recognized many incidental features of the scheme which would be beneficial; at the same time he admitted the difficulty arising from the production of excess power, as regards reclaiming it for home use if once allowed to be exported.

He thought the lowness of the water in Montreal harbour was perhaps not so much due to the Chicago drainage canal, as to the general widespread condition of low water.

Other Speakers

Geo. MacLeod, M.E.I.C., J. Chalmers, M.E.I.C., and S. F. Rutherford, A.M.E.I.C., each spoke briefly on the subject and each urged that the Institute should study the question.

The matter covered so many points that following Mr. Chalmers' suggestion Mr. Rutherford moved a resolution, which was seconded by Mr. Chalmers and carried after some discussion by various members. The terms of the resolution were as follows:

> **"That the Montreal Branch refer the matter of the St. Lawrence waterways to the Council of The Institute to take such action as they may see fit to the end that all information possible be available for the members, and that the Montreal Branch recommend to the Council that it consider appointing a committee to further study the matter in the general interests."**

Reply by E. A. Forward, M.E.I.C.

Mr. Forward, called upon to reply to the discussion, said he wished to refer only to one or two points. He had said the St. Lawrence was a Canadian river. Members clearly understood the international relations, as pointed out in Mr. Holgate's discussion. What he meant was that sentimentally it was a Canadian river; for Canada, it was the river of Champlain and Jacques Cartier; for Americans, it was a river where 700,000 h.p., could be obtained.

He disclaimed any intention of speaking slightingly of department estimates. He was on the whole satisfied with those estimates. What he felt was, that the proposition put before us might undergo changes, and the estimates be greatly increased. He said the department of railways and canals had been asked to do three years work in one year, and no one appreciated more than himself the work they had done.

The construction of the Welland canal means that the St. Lawrence waterway was on its way. Its development presupposed its completion when we are able to carry it out as a country in a manner favourable to Canada and fair to its name. We could not go to our American friends as beggars and ask them to assist us.

The Ontario Hydro-Electric Power Commission's estimate B., covered the proposition of a dam at Morrisburg, as outlined in the paper. The expected head was the same, about 27 feet.

The location of the other dam placed both power houses in American territory which was a thing to which exception might be taken. As to the ice question, by beginning at the upper end, to develop down, we would develop always under the direct conditions.

The aim should be to secure the first development free of any international complications, and the best way to continue friendly with our neighbours would be that we and they should be independent. We should avoid anything in the way of leaving to our successors anything that might be a source of possible discord.

Mr. Forward concluded by expressing his appreciation of the discussion accorded his paper.

Summary by Chairman, John T. Farmer, M.E.I.C.

The chairman in summing up said that we felt we had only touched the fringe of this great question. It was one of the large questions confronting us to-day, the development of our transportation routes coincidentally with our water powers.

The question is in a large degree an engineering one; more than that it is an industrial one, and it has its political phases. There was room for considerable difference of opinion on the engineering question and there was evidently room for further investigation to bring us nearer the truth which we ultimately hoped to reach.

On the industrial side, the contributions of various gentlemen connected with the shipping industry had certainly broadened our discussion of the subject. The question has tended to become a controversial one. There was a danger that people ran away with some particular view of such a question. Such a discussion as had taken place should tend to correct extravagant views. In a question that contained so much of engineering in its fundamentals, it seemed that the engineers were the body of men best qualified to guide and mould public opinion. The project was one that would have to be put through by co-operation on a large scale, and public opinion would be called upon to decide on the nature of that co-operation.

As regards the political questions arising from necessary co-operation between Canada and the United States, the speaker did not think there was cause for pessimism. We had lived on friendly terms with our neighbours for a century, and given time for public opinion to ripen, guided in the right way, there was every prospect that Anglo-Saxon common sense would find a solution.

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Annual General Meeting,

Montreal, January 22nd, 1924,

Ottawa, January 23rd, and 24th, 1924.

The Annual General Meeting will be held, as provided in the By-laws, in Montreal on Tuesday January 22nd, 1924, and will be adjourned to Ottawa, Wednesday and Thurdsay, January 23rd, and 24th, 1924. Details of the programme will appear in the December Journal.

Nominations for Officers' Ballot

Within seven days after the first meeting of the Council in October, the Secretary shall mail to each corporate member of The Institute the officers' ballot, as prepared by the Nominating Committee and the Council.

Notices shall be deemed to have been mailed to members as prescribed by the by-laws if such notices are printed in The Journal of The Institute and mailed by the date prescribed in the by-laws.

The following is a list of the nominees submitted by the Nominating Committee, as required by the by-laws before the first day of October, and as approved by Council at the regular meeting of Council held on October twenty-ninth, additions being made by Council in cases of non-acceptance or of no nomination being made:—

President: Walter J. Francis, M.E.I.C., Montreal, Que., (proposed by Council.)

Vice-Presidents: Zone b—J. B. Challies, M.E.I.C., Ottawa; H. J. Lamb, M.E.I.C., Toronto.

Zone c (two vacancies) — A. E. Doucet, M.E.I.C., Quebec; F. P. Shearwood, M.E.I.C., Montreal; Arthur Surveyer, M.E.I.C., Montreal; K. B. Thornton, M.E.I.C., Montreal.

Zone d — F. A. Bowman, M.E.I.C., Halifax; Alex. Gray, M.E.I.C., St. John; C. C. Kirby, M.E.I.C., St. John; Geo. D. Macdougall, M.E.I.C., Sydney.

Councillors: Victoria Branch: H. M. Bigwood, M.E.I.C., Victoria; J. P. Forde, M.E.I.C., Victoria.

Lethbridge Branch: G. N. Houston, M.E.I.C., Lethbridge; H. W. Meech, A.M.E.I.C., Lethbridge.

Lakehead Branch: F. Y. Harcourt, M.E.I.C., Fort William; W. T. Moodie, M.E.I.C., Port Arthur.

Niagara Peninsula Branch: F. E. Sterns, A.M.E.I.C., St. Catharines; (proposed by Bouncil), F. W. Clark, A.M.E.I.C., Niagara Falls; (proposed by Council.)

Hamilton Branch: R. K. Palmer, A.M.E.I.C., Hamilton, (proposed by Nominating Committee); James J. MacKay, M.E.I.C., Hamilton, (proposed by Council).

Toronto Branch: Wm. Storrie, M.E.I.C., Toronto, (proposed by Nominating Committee); E. G. Hewson, M.E.I.C., Toronto, (proposed by Council.)

Ottawa Branch: K. M. Cameron, M.E.I.C., Ottawa; O. S. Finnie, M.E.I.C., Ottawa.

St. John Branch: C. McN. Steeves, M.E.I.C., St. John; F. P. Vaughan, M.E.I.C., St. John.

Halifax Branch: F. R. Faulkner, M.E.I.C., Halifax; C. H. Wright, M.E.I.C., Halifax.

The branches of *The Institute* not included in the above list are provided with Council representation by election under the previous by-laws.

Award of Leonard Medal

The Leonard Medal for the year nineteen twenty-two has been awarded for the paper on "Coal Measures of Cumberland and Vicinity, Vancouver Island", by J. D. MacKenzie, M.C., B.S., Ph.D., published on page six hundred and sixty-seven of the bulletin of the Canadian Institute of Mining and Metallurgy, June nineteen twenty-two.

In his letter to the President and Council announcing the decision of the Committee, Professor H. E. T. Haultain, M.E.I.C., states:—

> "We regret exceedingly the delay in making this report, but I assure you that it has not been due to negligence; rather the reverse is true. It is because we have taken the matter so seriously that we have found it difficult to come to a conclusion. The papers to be considered cover such a wide range of subjects and of treatment that there is no measuring stick available for satisfactory comparison.
>
> There were several excellent papers but the committee is finally unanimous in the decision indicated above."

There is an element of sadness in the award, as the winner of the medal, Doctor J. D. MacKenzie, M.C., died on Friday, December fifteenth, nineteen twenty-two, in the hospital of the Department of Soldiers' Civil Re-

establishment at Ste. Anne de Bellevue, Que. Death was due to a wound in the right lung received on August thirty-first, nineteen eighteen. Referring to his death the bulletin of the Canadian Institute of Mining and Metallurgy says in part:—

"Doctor MacKenzie was born at Baddeck, Cape Breton, on June 1st, 1888. From his earliest youth it was evident that he possessed the ambition to succeed, and with it the energy and bull-dog courage to achieve his ambition. These characteristics are well illustrated in the short biography of Doctor MacKenzie which appeared in the June 1922 Bulletin. Putting himself through college, he graduated as B.S. from the Massachusetts Institute of Technology in 1911. Then, after one year as instructor in economic geology at Cornell University, he took a post-graduate course in geology at the Massachusetts Institute and obtained the degree of Ph.D. in 1916. Meanwhile he had been appointed assistant geologist on the Canadian Geological Survey in 1912, and this position he continued to hold until he went overseas.

After his discharge from hospital in June 1920, Doctor MacKenzie was appointed associate geologist on the Geological Survey, and was placed in charge of the British Columbian office, in succession to Doctor Camsell."

Some Thought on Engineering Purpose

A notable address was delivered before the Toronto branch on October twelfth by E. J. Mehren, editor, *Engineering News-Record*, of New York. In his official capacity as editor of a great engineering publication he is in an authoritative position to discuss the problems and purposes of the engineering profession. It is regretted that Mr. Mehren's address was received too late to be published in this issue of *The Journal*.

In his address Mr. Mehren discussed first, the problem of research and the part the engineer should play therein, and second, the engineer's professional relation to certain of the outstanding industrial problems of the day. He emphasized the great possibilities of engineering research, and asserted that this instrument should not be accepted passively by the engineer, but that he should be an active propagandist for its general acceptance by industry. As only a few industries are imbued with the research idea it is necessary that the engineer carry to industry the conviction that this new tool deserves to replace the old tool of rule-of-thumb experimentation by rule-of-thumb men, and advocate it as a modern tool productive of greater economies. He suggested for Canada researches into the use of timber and the recovery of metals from ore. He advocated the establishment of strong research committees, oftentimes represented by sub-committees in important local branches, to further the work of the Research Council, and he believed that with the proper research idea in our universities, and research committees in our engineering societies, that we would succeed in carrying our message to industrial leaders and securing for engineering enquiry the resources in money and personnel which are necessary to deepen our knowledge of engineering laws and to convert this knowledge to the convenience and comfort of man.

Referring to the industrial difficulties of the day, Mr. Mehren stated that the engineer has not merely the concern which is that of every well-informed member of the community, but a professional responsibility as well. Being responsible for the basic industrial order of the day, he believed the public rightly looks to the engineer for special activity in finding a solution. One problem was to devise new and better production methods, new processes, simpler and cheaper products, and the other, to work towards a more sympathetic understanding between worker, management and investor of their mutuality of interest. If the engineer cannot shoulder the whole responsibility his intimate contact with industrial functioning and his trained method of inquiry should enable him to bring a larger influence to bear upon the solutions of these problems than that of any other class in the community. There should be developed a greater community of interest between the three elements of our industrial fabric, the worker, the management and the investors, and in the development of such a community of interest the engineer, trained to take a judicial attitude, should bear an important part.

The outline plan now in its experimental stages in the United States, might also apply to Canada. In the United States the building construction industry functions badly; wages, according to the man in the street being exorbitant, and in consequence the cost of building high. A group of men in New York were responsible for the establishment of a conference group that would face the difficulties affecting the industry and attempt to work out their solution. As a result of this there was formed a New York Building Congress in which is represented every branch of the building industry, the owning interests, represented by the real estate men, the architects, the engineers, the general contractors, the sub-contractors, the material dealers and building labour.

While specific accomplishments to date are relatively few, there is a valuable base for further work in the confidence developed between all parties. A notable accomplishment has been the organization of the apprenticeship work by the New York Apprenticeship Commission, under the New York Building Congress, consisting of the representatives of the contractors, the engineers, the architects and of building labour. It was found that the labour organizations were anxious to establish proper apprenticeship schools and to develop a thoroughgoing apprenticeship system. Studies indicated that the labour unions were not at fault for the small number of apprentices, but the employers. It was found that the reason for the shortage was almost entirely that the contractors were unwilling to take the trouble to train young men. This commission has become a clearing house for all young men wanting to enter the building trade, and makes it its business to find assignments for them. In two years the number of apprentices has risen from two hundred to twenty-one hundred. Committees are at work to overcome seasonal employment, and to enforce the Code of Ethics adopted by the Congress, and to gather statistics regarding the functioning of the building industry in New York. Similar work is being started in Boston, Philadelphia, Seattle, and Portland, Oregon.

In concluding Mr. Mehren referred to the engineer's obligation towards research which would bring greater material comforts to mankind, and also to the unique position occupied by the engineer in the industrial fabric, and the opportunities presented in working for an improved order, a more harmonious industrial functioning.

Past President Leonard's Gift to Empire

Colonel and Mrs. Leonard, the donors of the historic mansion No. 10 St. James square, London, wish it to be understood that they have presented the property to the British Empire, and not to Great Britain alone. St. James square, which dates from the reign of Charles II, has a history more Hanoverian than Jacobean, and it was therein that George III, who lost England her American colonies, was born. When Pitt was raised to the House of Lords as Earl Chatham, and who foresaw the separation of the American colonies, recommended the abandonment of coercive measures, the celebrated statesman repaired from his house No. 10 St. James square to the House to attack the unjust and impolitic proceedings of the Ministry. It was at the close of that famous speech that he fainted, and a month later was dead. If that self-same spirit of Pitt still resides within 10 St. James as formerly, the British Institute of International Affairs that in future will be housed therein, could have no more acceptable and notable gift than that given by Colonel and Mrs. R. W. Leonard. Associations such as these make the history of the British Empire more and more glorious. — *Montreal Gazette, October 25th, 1923.*

OBITUARIES

Joseph Emile Carbonneau, S.E.I.C.

Regret is expressed at the death of Joseph Emile Carbonneau, S.E.I.C., which occurred on June 17th, 1923. The late Mr. Carbonneau was in his twenty-seventh year at the time of his death. He was born at Yamachiche, Que., on August 17th, 1896, and when admitted to *The Institute* as Student on November 11th, 1913, he was attending the Ecole Polytechnique, Montreal, from which he graduated in civil engineering in 1916.

Norbert Goodman, A.M.E.I.C.

Norbert Goodman, A.M.E.I.C., died of pneumonia at Shawinigan Falls, Que., in February 1921. Born at Czernowitz, Austria, on August 15th, 1885, he received his high school education at the same place, later attending the University of Vienna from which he graduated in March 1910. After spending two years on draughting and railway work in Austria, the late Mr. Goodman came to Canada. His earliest work in this country was on the Quebec bridge and later surveying in connection with the Lauzon drydock, and subsequently in the draughting office at the Angus Shops of the Canadian Pacific Railway. Mr. Goodman was elected Associate Member of *The Institute* on June 19th, 1914.

William George Bligh

The engineering profession has sustained a distinct loss in the person of William George Bligh who passed away at the General Hospital in Calgary on the October 16th, 1923, in his seventy-ninth year. Few irrigation engineers have attained such a high standard as did Mr. Bligh. His books in particular have been recognized standards in themselves for many years as everyone connected with irrigation engineering will fully realize.

Mr. Bligh came west recently on a visit to his daughter and son-in-law at Cheadle, Alberta, and it was here that he was taken ill. He has visited the west on several occasions in the past as expert in connection with C.P.R., and other large irrigation projects. He was in the public works department of India for thirty-five years and for the last fifteen years has resided in this country.

Mr. Bligh was a Member of *The Institute* until 1920.

THIS MONTH'S CONTRIBUTORS

Electric Arc Welding

J. M. F. Wilson, A.M.E.I.C.

In this month's *Journal*, there appears an article on "Electric Arc Welding", a subject which has claimed a great deal of attention during the last few years. This paper was presented by the author, J. M. F. Wilson, A.M.E.I.C., instructor in electrical engineering at Kelvin Technical High School, Winnipeg, Manitoba, before the Winnipeg Branch of *The Institute* on February 2nd, 1922.

Mr. Wilson was born at Stirling, Scotland, on February 14th, 1880, and received his early education at Stirling High School and the Heriot-Watt College, Edinburgh, obtaining the degree of B.Sc., in engineering from London University in 1906. Mr. Wilson was on the staff of Messrs. Bruce-Peebles, Edinburgh, where he secured his training in electrical work. Subsequently he became assistant engineer at Smithfield Mkts., Electric Station, London, returning to the works as chief electrical tester to Messrs. Vickers, Limited, Sheffield, where he remained from 1903-1905. For the next seven years Mr. Wilson was lecturer and assistant professor in electrical engineering at the Belfast Municipal Technical Institute and in July 1912 came to Canada, accepting the position as Instructor in Electrical Engineering at the Kelvin Technical High School, Winnipeg, Manitoba, which position he still holds.

Mr. Wilson was admitted Associate Member of *The Institute* on April 27th, 1920.

Central Heating Plant of Queen's University and Kingston General Hospital

L. M. Arkley, M.E.I.C.

The necessity of conserving the fuel supply of Canada has been made apparent to all, and every practical suggestion to this end is receiving the careful consideration of engineers throughout the country. Recently there have been a number of investigations made regarding the possibilities of effecting economy in the use of fuel by the establishment of central heating plants. The paper entitled, "The Central Heating Plant of Queen's University and Kingston General Hospital," which was prepared jointly by Professor L. M. Arkley, M.E.I.C., and Lt.-Col. W. P. Wilgar, M.E.I.C., and which appears in this issue of *The Journal*, therefore, deals with a subject of timely interest.

Professor Arkley was born at Leeds, Quebec, in 1875, and graduated from McGill University with the degree of B.Sc., in 1900, receiving the degree of M.Sc., in 1910. He spent two years with the Harbour Commissioners of Montreal as assistant mechanical superintendent and had

five years engineering experience with such firms as E. I. Dupont Company, Wellington Delaware, and Westinghouse, Church Kerr and Company, New York. Professor Arkley was assistant professor of mechanical engineering at Swarthmore College, Pa., for five years and for the same length of time was director of the night school of machine design of the Franklin Institute, Philadelphia. The next nine years were spent at the University of Toronto from lecturer to associate professor of mechanical engineering. For the past three years he has been professor of mechanical engineering and director of the central heating plant at Queen's University, in which capacity he is still engaged. He has also done considerable work as consulting engineer in heating and ventilating and power plant design and operation, having written a number of papers on heating and ventilating problems. Professor Arkley was admitted to *The Institute* as a Student on March 16th, 1899, transferred to Associate Member, October 11th, 1906, and to full Member May 19th, 1914. He is also a member of the American Society of Heating and Ventilating Engineers and of the Society for the Promotion of Engineering Education.

The St. Lawrence Waterway

E. A. Forward, M.E.I.C.

The widely discussed problem of the development of the St. Lawrence river as a deep waterway and power project, was introduced for open discussion by members of *The Institute*, on the occasion of the presentation of a paper entitled "The St. Lawrence Waterway", by E. A. Forward, M.E.I.C., before the Montreal Branch on October 4th, 1923.

Mr. Forward was born at Iroquois in the county of Dundas, Ont., and took up his engineering studies at the School of Practical Science, University of Toronto, graduating with honours in 1897. From 1898 to 1904 he was engaged on construction of the 14-foot enlargement of the St. Lawrence canals, at the Galops, Morrisburg, Farrans Point and Cornwall sections.

In 1905-1906 he took part in the preparation of survey and estimates for the Georgian Bay ship canal and then took charge of construction of a lock and curtain dam on the Red river, Manitoba, until 1909. Subsequently, a report was made to Public Works Department on navigation project for the Lower Saskatchewan river.

In 1910, Mr. Forward associated himself with Messrs. Quinlan and Robertson of Montreal, general contractors, and for ten years was connected with construction works of importance including, Transcona railway shops, Trent and Welland canals, power dam at High Falls on the Du Lièvre, St. Charles river and harbour improvements at Quebec, the building and outfitting of vessels for the Imperial Munition Board, etc.

From 1919 to 1921 he was engaged on various valuation cases including the Grand Trunk arbitration case, and in the later year established a consulting practice covering hydraulic works, foundations and general construction.

Mr. Forward was elected Associate Member of *The Institute* on April 12th, 1900 and transferred to Member, December 9th, 1911.

PERSONALS

H. J. G. McLean, A.M.E.I.C., formerly of Brantford, Ont., is now associated with Chas. Walmsley Company (Canada), Limited, Montreal.

Hector MacNeil, Jr.E.I.C., has been transferred by the Canadian National Railways from Toronto, Ont., to Longlac Cutoff near Longlac, Ont.

W. M. Reynolds, S.E.I.C., formerly of Aurora, Ont., has accepted a position with Morrow and Beatty, of North Temiskaming, Que.

G. W. Coward, A.M.E.I.C., has been appointed assistant divisional engineer with the Entre Rios Railway Company at Basanilbasco, E.R., Argentina.

C. S. Macdonald, A.M.E.I.C., who has been surveying a portion of Churchill river and connecting waterways has returned to Ottawa.

L. Brenot, A.M.E.I.C., has returned to Ottawa upon the completion of land classification surveys west of Red Deer.

J. R. Akins, M.E.I.C., chief of the topographic division, Topographical Surveys Branch, Departement of Interior, is at present visiting the topographic survey parties in the provinces of Quebec, New Brunswick, and Nova Scotia.

W. P. Dale, B.A.Sc., (Toronto '20), A.M.E.I.C., until recently on the inspection staff of the Hydro-Electric Power Commission at Chippawa, has been transferred to the designing staff of the Toronto office.

F. W. S. Kennedy, A.M.E.I.C., recently with Braas Bros., contractors, Niagara Falls, N.Y., is at present at Powassin, Ont., on survey work for the Hydro-Electric Power Commission.

Horace L. Seymour, M.E.I.C., has been appointed to the position of special lecturer in town planning in the Department of Civil Engineering, Faculty of Applied Science, University of Toronto.

Edwin E. Hugli, A.M.E.I.C., has severed his connection with the Hydro-Electric Power Commission of Ontario and has opened an office at 1002 Kingston Road, Toronto, where he will be engaged in engineering and contracting.

J. N. Anderson, A.M.E.I.C., is manager for the Victoria branch of the firm of Wm. N. O'Neil Company (Victoria) Limited. Mr. Anderson was for a time connected with the city engineer's office of the city of Vancouver, B.C.

W. D. Proctor, Jr.E.I.C., has resigned from the staff of McGregor and McIntyre, Limited, to accept a position with the firm of James Proctor and Redfern Limited, consulting engineers of Toronto.

L. S. Tuck, A.M.E.I.C., has accepted a position on the staff of the St. Lawrence Paper Mills, Limited, Three Rivers, Que. Mr. Tuck was for a time mill engineer with the Pejepscot Paper Company of Brunswick, Maine.

Jas. L. Wilson, A.M.E.I.C., is resident engineer on electrical development for the Puebla Tramway, Light and Power Company, Orizaba, Ver., Mexico. Mr. Wilson is a graduate of Dalhousie University.

R. J. Askin, S.E.I.C., who graduated this year in mechanical engineering from Queen's University has accepted a position with the Fort William Paper Company, Limited, at Fort William, Ontario.

G. B. Dodge, M.E.I.C., chief of the special surveys division, Topographical Surveys Branch, Department of Interior, has returned to Ottawa after making a control traverse survey of some of the main waterways northeast of The Pas.

R. L. Weldon, M.Sc., A.M.E.I.C., who has been mechanical engineer for the St. Lawrence Paper Mills, Limited, for the past three years, recently resigned from that company to become designing engineer for the Newfoundland Power and Paper Company, Limited.

A. D. Huether, B.A.Sc., (Toronto '09), A.M.E.I.C., of the engineering staff of the Chippawa-Queenston development, is at present employed on the construction of the addition to the Eugenia Falls plant of the Hydro-Electric Power Comuission.

C. B. R. MacDonald, A.M.E.I.C., has received the appointment of assistant engineer for the Chilian Transandine Railway Company, Limited, Los Andes, Chile, S.A. Mr. MacDonald is a graduate from the Royal Military College of Kingston, Ont.

R. A. Fairbairn, S.E.I.C., is now with the engineering department of The Bell Telephone Company of Canada, Montreal. Mr. Fairbairn received his B.Sc., degree in mechanical engineering from the University of Toronto, this spring.

C. C. Curtis, M.E.I.C., formerly manager of the Cape Breton Electric Company Limited of Sydney, N.S., is now vice-president of the Fall River Gas Works, Company, Fall River, Mass. Mr. Curtis received the degree of B.S. in mechanical engineering in 1907 from the University of Michigan.

W. H. Hunt, A.M.E.I.C., is resident engineer at Gold Coast Harbours, Seccondee, British West Africa. Mr. Hunt was for a time connected with the Grand Trunk Railway as assistant engineer at Edmonton, Alta. He expects to spend some time during the next few months in England and while there his address will be Bank of Montreal, 9 Waterloo Place, London, S.W. 1.

W. A. McLean, M.E.I.C., has resigned as deputy minister of the department of highways, of the proviuce of Ontario. In 1898, Mr. McLean was appointed asistant to the provincial instructor in roadmaking, and since that time he has been constantly in the service of the highways department, his appointment as deputy minister taking place when that post was created in 1917.

W. H. Abbott, A.M.E.I.C., is principal assistant engineer for the firm of Beaubien, Busfield and Company of Montreal. On returning from overseas after a service of almost five years, Mr. Abbott was appointed resident engineer with the Hull Electric Company, Hull, Que., where he gained valuable experience on design and construction work.

G. H. Blanchet, A.M.E.I.C., has recently returned to Ottawa after carrying on the survey of the northern shore of Great Slave lake. During the course of the summer, Mr. Blanchet made a rapid exploration of the waterways extending northeasterly from the eastern end of Great Slave lake for a distance of over 200 miles, his trip taking him well into the Barren Lands.

Murray F. Cossitt, Jr.E.I.C., is located in Newfoundland with the Sir W. G. Armstrong Whitworth and Company, Limited, on the layout and construction of the new town of Corner Brook, Bay of Islands, Newfoundland. Mr. Cossitt has had considerable engineering experience in the province of Nova Scotia, including the surveys and preparation of plans for the St. Margarets Bay power development for the Nova Scotia Power Commission.

E. S. Mattice, M.E.I.C., late of the Phoenix Bridge and Iron Works, Ltd. is now chief engineer for Canadian Vickers, Limited. News of this appointment is contained in a public announcement of the purchase by Canadian Vickers, Limited, of the stock, plant and business of the Phoenix Bridge and Iron Works, Ltd. A. W. K. Massey, A.M.E.I.C., is designing engineer on the staff of the structural steel organization of the company.

R. O. Wynne-Roberts, M.E.I.C., consulting engineer, Toronto, has been nominated by the Nominating Committee as one of the members of the Executive Committee of the Sanitary Engineering Division of the American Society of Civil Engineers for the year 1924. The other nominated members are: Harrison P. Eddy, of Boston, Kenneth Allen of New York, Wesley W. Horner of St. Louis, and Langdon Pearse of Chicago, all well known American engineers.

Gavin N. Houston, M.E.I.C., has opened an office in the Oliver Block, Lethbridge, Alta., as a consulting engineer and is prepared to make reports on or design, and supervise the construction of irrigation and water power, water supply, sewage, highways and highway bridges. Mr. Houston is a graduate of Princeton University and has been engaged in the practice of engineering for the past twenty-five years and was formerly acting commissioner of irrigation for the Dominion and was a member of the Irrigation Council of Alberta.

B. H. Segré, A.M.E.I.C., and C. B. C. Donnelly, A.M.E.I.C., his assistant, are home from a two-year survey on Mackenzie river and delta. Mr. Segré's survey party went down the Mackenzie river early in 1922 going overland from Fort St. John on Peace river to the headwaters of Nelson river, a tributary of the Liard, which in turn empties into the Mackenzie. The survey of Mackenzie river was extended from Fort Norman to the Arctic ocean and in addition several channels of the delta as well as portions of Peel river were surveyed.

Survey Party on the Gold Coast engaged on Takoradi Harbour Scheme

Tribes to which the boys belong, reading from left to right:

Yow	Ashanti	(Orderly)
Thompson	Fantee	(Head Chainman)
Koomson	Fantee	(Instrumentman)
Buta	Kroo	(Cutter)
Galee	Kroo	(Stake Artist)
Benjeman	Fantee	(Rear Chainman)
Sokoyah	Hausa	(Rodman)

Receives Appointment in England

W. Hamilton Munro, M.E.I.C., University of Toronto '04, of Vickers Limited, London, England, has recently been appointed chief of that company's hydro-electric department. He was born in Peterborough in 1882 and was well known in hydro-electric circles in Ontario before the war. After four years' service overseas he joined Vickers, and has been engaged in developing their water turbine business. His department is now carrying out substantial orders in India and New Zealand, and have a good foundation of minor work. Turbines for Canada are also under construction, and for its water turbine work the company is building up a staff of engineers of unquestioned experience largely recruited from Canada.

Mr. Munro will make his headquarters at the Naval Construction Works at Barrow-in-Furness, where, with the assistance of its forges at Sheffield, the company can in its own shops produce all parts of the heaviest water turbines so far put into use, or likely to be called for, and assemble them with high class British workmanship trained in Admiralty work. A turbine testing and research laboratory is also being installed.

W. HAMILTON MUNRO, M.E.I.C.

Canadian Engineers in Africa

In a letter received from Major A. G. Graham, A.M.E.I.C., resident engineer, Gold Coast Harbours, Seccondee, Gold Coast Colony, formerly of Victoria, B.C., he extends kind regards from himself and on behalf of the following members of *The Institute:* — Major J. McGregor, M.E.I.C., Major W. H. Hunt, A.M.E.I.C., Major L. E. Silcox, M.E.I.C., Lieut. J. R. S. Sutherland, A.M.E.I.C., Major E. G. Richards, A.M.E.I.C., Major M. Polet, A.M.E.I.C., and Major A. L. Wilson, S.E.I.C.

He also forwarded a photograph of a survey party employed by him in the Takoradi Harbour Scheme. It gives a vivid impression of conditions under which our members are working in Africa.

Assistant Chief Engineer of Public Works

R. deB. Corriveau, M.E.I.C., has been appointed to the position of assistant chief engineer of the public works department, succeeding K. M. Cameron, M.E.I.C., who has recently been made chief engineer of that department.

Mr. Corriveau was born at West Hoboken, N.J., on January 24th, 1877. He is a graduate of McGill University, having received his degree of B.Sc., from that institution in 1900. During the summers of his university course, he was engaged on railway location and harbour surveys. Following graduation, he entered the Federal services in the Public Works Department, with which he has been ever since.

A. L. Harkness, A.M.E.I.C., Appointed Chief Engineer.

A. L. Harkness, B.A.Sc., A.M.E.I.C., has been appointed chief engineer, of the Robert W. Hunt and Company, Limited, eng ineers, with headquarters at Montreal. Mr. Harkness graduated in civil engineering from the School of Practical Science, Toronto, in 1906, and received the degree of B.A.Sc., University of Toronto, in 1908.

A. L. HARKNESS, A.M.E.I.C.

After a number of years engagement with the Dominion Bridge Company, Montreal, as draughtsman, structural designer and estimator, he was in 1911 transferred to the designing staff of the St. Lawrence Bridge Company, Montreal, on the design of the Quebec bridge, and in August 1914 was promoted to assistant engineer which position he successfully held until the completion of that contract. More recently he has been connected with the building industry on the design of the structural framework on several large buildings in both reinforced concrete and structural steel. Mr. Harkness is also a Member of the Corporation of Professional Engineers of Quebec.

Appointed Assistant Professor

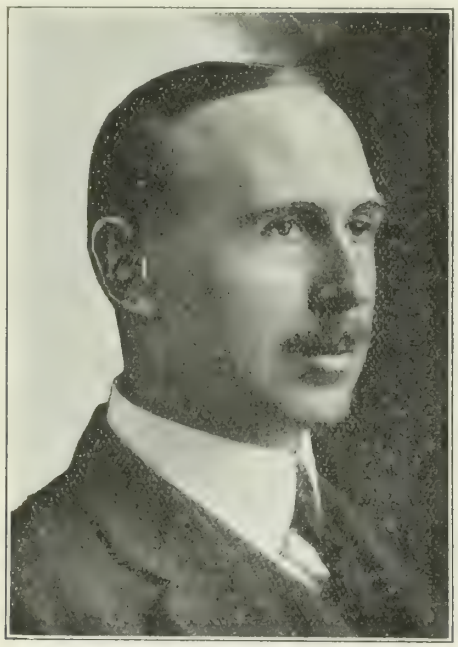
A. E. Macdonald, Jr.E.I.C., has been appointed assistant professor in civil engineering at the University of Manitoba and is in charge of the lecture courses in foundations and structural design, and problems in strength of materials of the third year, as well as classes of the second year.

Mr. Macdonald received his degree of M.Sc., in civil engineering from McGill University in the spring of 1922,

after which he was connected with the city engineer's department at Halifax for that summer, in the fall joining the staff of C. D. Howe and Company, consulting engineers, of Port Arthur. During the present summer he was engaged on the drawing of the plans for the new Bawlf and Stewart grain elevators and Saskatchewan Co-Operative Elevator Annex, erected this summer at Port Arthur. During the erection of the Bawlf and Stewart elevators, Mr. Macdonald spent some time with the Carter Halls Aldinger Company of Winnipeg, (the contractors), as field engineer, having charge of the design of machinery foundation details for both elevators.

Chairman of the Institute Fuel Committee Receives Appointment.

F. A. Combe, M.E.I.C., consulting steam and combustion engineer of Montreal, and chairman of the Fuel Committee of *The Engineering Institute of Canada*, has been engaged to make an exhaustive report on the feasibility of establishing central heating plants in Canada, as announced by the Hon. Charles Stewart, Minister of the



F. A. COMBE, M.E.I.C.

Interior and of Mines. This is in accordance with the policy of the Dominion government to do everything possible towards a permanent solution of the fuel problem, leaving to local administrative bodies the task of dealing with emergency and concrete local problems affecting their own districts.

Mr. Combe's investigation will be conducted under the supervision of the Dominion Fuel Board and it is stipulated in the agreement with him that his report must be completed within six months. He will deal not only with the history of central heating wherever it has been tried out and give descriptions of existing plants in the United States and Canada, but will also pay particular attention to the saving that can be effected by using low grades fuels in these plants. Other phases of the subject to be dealt with will be reasons for failure in unsuccessful central heating enterprises, possibility of combining electric generating and heating service and of using plants for making ice in summer, diagrams and plans of plants, rates, regulations, approximate costs, capital required and probable profits.

Mr. Combe has specialized in central heating work and has been connected with the establishment of several central heating plants including that at McGill University.

Kenneth M. Cameron, M.E.I.C., Appointed Chief Engineer of Public Works Department, Ottawa.

An important appointment in the civil service was announced on October 17th, 1923, by the Civil Service Commission in the promotion of Kenneth M. Cameron, M.E.I.C., as chief engineer of the public works department in succession to the late Arthur St. Laurent. M.E.I.C.

Mr. Cameron was moved up from the position of assistant chief engineer and assumed his duties immediately. Mr. Cameron is a native of western Ontario and received his early education at the Strathroy Collegiate Institute and at London.

After matriculating, Mr. Cameron went to the Royal Military College at Kingston, from which he graduated in June, 1901, with honours, and with the silver medal for general proficiency. In April of the following year, he graduated from McGill University, Montreal, with the degree of B.Sc., in civil engineering. He took up post-graduate work at the same university in hydraulics, was granted the degree of Master of Science, and at the same

K. M. CAMERON, M.E.I.C.

time was demonstrator in hydraulics and in testing of materials.

From April to December of 1903, Mr. Cameron was in the office of the chief engineer of the C.P.R., and then for two years was office and inspecting engineer of the Canadian Niagara Power Company at Niagara Falls. After a term of lecturing, during the seasons of 1905-1906, at McGill University on surveying and geodesy, Mr. Cameron went to the United States, where he received some valuable experience, and was engaged on the following works: April 1906-07, transitman Pennsylvania R.R. main line tunnels under Hudson river, New York; April to December 1907, inspecting engineer, reinforced concrete dam and power station for Bar Harbour and Union River Power Company, Ellsworth, Me.; January to May, 1908, resident engineer for Ambursen Hydraulic Construction Co., on hydro-power and irrigation dams, at Shoshoni and Douglas, Wyoming. On his return in 1908 he did work for Smith, Kerry and Chace, consulting engineers of Toronto, and then joined the public works department, first in the offices at London, later at Sherbrooke, and coming to Ottawa in 1912 as senior assistant in the dredging branch of the department. From Septem-

ber, 1918, up to the present, he has been assistant chief engineer.

Mr. Cameron was admitted to *The Institute* as Student on November 21st, 1901, transferred to Associate Member February 12th, 1907, and to full membership December 21st, 1920, and was chairman of the Ottawa Branch for the year 1922.

ELECTIONS AND TRANSFERS

At the meeting of Council held on October 29th, 1923, the following elections and transfers were effected:—

Members.

KAY, Harry, vice-president and general manager, Charles Walmsley & Co. (Canada), Limited, Longueuil, Que.

MOULTON, Arthur Garland, vice-president and general manager, Thompson-Starrett Company, Limited, Montreal.

Associate Members.

BEVAN, Alexander Braithwaite Bevan, (Ass. City & Guilds of London Inst.), of Outremont, Que.

CUNNINGHAM, Leonard, managing director, Scotia Double Wall Company, Limited, Sydney, N.S.

FREEMAN, John Pelham, drawing office, Dominion Coal Company, Glace Bay, N.S.

HERMANS, Samuel, sales engr., Griswold & Company, Montreal.

RIPLEY, Wilfred Jamieson, B.Sc. (McGill Univ.), squad foreman, dfting office, Dominion Coal Company, Glace Bay, N.S.

Junior.

JOYAL, Jules, B.A., B.S.A., C.E, (Univ. of Montreal), Price Bros. & Co. Ltd., Chicoutini, Que.

Transferred from the Class of Junior to that of Associate Member.

GREENE, Leslie Kirk, B.Sc. (C.E.), (McGill Univ.), (Grad. with Honours, R.M.C.), asst. to Messrs. MacDonald & MacCorquodale, consltg. engrs., London, England.

McCAGHEY, Norman Fraser, asst. engr., Price Bros. & Co. Ltd., Kenogami, Que.

McRAE, Joseph Percy, B.Sc. (Mech.), (McGill Univ.), manager of engrg. and waterworks dept., General Supply Co. of Canada, Ottawa.

Transferred from the Class of Student to that of Associate Member.

PELLETIER, Henri Burroughs, B.Sc. (McGill Univ.), field and office work, Chicoutimi Pulp Company, Chicoutimi, Que.

The following Students were admitted:—

BOULTON, Beverly Knight, 823 University Street, Montreal.

BURCHILL, George Herbert, S.B. (N.S. Tech. Coll.), test dept., Canadian General Electric Company, Peterborough, Ont.

BURTT, James H., B.Sc. (Univ. of N.B.), students engineering course, Canadian General Electric Company, Peterborough, Ont.

FARRAR, Norman, 151 Ash Avenue, Point St. Charles, Que.

FORBES, Robert Clarence, 423 Lansdowne Avenue, Westmount Que.

GARWOOD, John Ronald, 98 Scarborough Road, Toronto, Ont.

GRAHAM, Walter W., 593 Seventh Avenue, Rosemount, Que.

GRAVEL, Louis Philippe, 173 St. Joseph Boulevard West, Montreal.

HAYES, St. Clair Joseph, B.Sc. (N.S. Tech. Coll.), student apprentice, Canadian General Electric Company, Peterborough, Ont.

HAMILTON, Robert McLean Prior, 825 University Street, Montreal.

MacDONALD, William Dollard, B.Sc. (E.E.) (Univ of N.B.). student apprentice, Canadian General Electric Company, Peterborough, Ont.

MARTIN, William Leonard, switchman, Sask. Govt. Telephones, Regina, Sask.

McNALLY, James Osborne, 318 Brunswick Street, Fredericton, N.B.

MILLER, John James Hutchison, 44 Sunnyside Avenue, Westmount, Que.

MILNE, John Williams, B.A.Sc. (Univ. of Tor.), test course, Canadian General Electric Company, Peterborough, Ont.

PHILLIPS, Richard Darrell, B.Sc. (Univ. of N.B.), test dept., Canadian General Electric Company, Peterborough, Ont.

SMITH, Donald Flannery, 322 St. Antoine Street, Montreal.

STEPHENSON, John Gordon, engrg. dept., Canadian General Electric Company, Peterborough, Ont.

STETHEM, John Eric Holt, 832 Dorchester Street, West, Montreal.

WEISBURGH, Casper, 1063 St. Urbain Street, Montreal.

ANNOUNCEMENT OF MEETINGS

Calgary Branch: — *Secretary J. A. Spreckley, A.M.E.I.C., 513–8th Avenue, W., Calgary, Alta.*

Nov. 26th. Address on "Financial Difficulties in Irrigation Development", by D. W. Hays, M.E.I.C.

Dec. 10th. Address on "Notes on Deterioration and Preservative Treatment of Wood", by A. S. Dawson, M.E.I.C.

Niagara Peninsula Branch:—
Secretary-Treasurer, R. W. Downie, A.M.E.I.C. P.O. Box 1163, Thorold, Ont.

Dec. Mtg. "Symposium on Fuel," at Niagara Falls, Ont.

Ottawa Branch:—*Secretary-Treasurer, F. C. C. Lynch, Affiliate E.I.C., Motor Building, Ottawa, Ont.*

Nov. 15th. Evening Lecture on "Operation of the Quebec Streams Commission", by O. O. Lefebvre, B.A.Sc., M.E.I.C., Chief Engineer, Quebec Streams Commission.

Peterborough Branch: — *Secretary, R. C. Flitton, A.M.E.I.C., The William Hamilton Company, Peterborough, Ont.*

Nov. 20th. Annual Banquet.

Dec. 13th. Details to be announced later.

Saskatchewan Branch:—
Secretary-Treasurer, D. A. R. McCannel, A.M.E.I.C., City Engineer's Department, Regina, Sask.

Nov. 8th. Ladies' Night and Social Evening.

Nov. 22nd. Short Addresses by several members.

Dec. 13th. Address on "International Finance", by Professor W. W. Swanson, University of Saskatchewan.

Sault Ste. Marie Branch:—
Secretary-Treasurer, C. H. E. Rounthwaite, A.M.E.I.C., Algoma Central and Hudson Bay Railway, Sault Ste. Marie, Ontario.

Nov. 22nd. General Discussion on "Central Heating".

Toronto Branch: — *Secretary-Treasurer, J. A. Knight, A.M.E.I.C., Hydro-Electric Power Commission, 190 University Avenue, Toronto, Ont.*

Nov. 1st. Address on "Expert Evidence", by Hon. Mr. Justice Wm. Renwick Riddell, — Joint meeting with Toronto Section A.I.E.E., Toronto Section A.S.M.E., Toronto Branch of Canadian Institute of Chemistry and the Society of Chemical Industry.

Nov. 8th. Address on "A Proper Freight Rate for Coal", by M. J. Butler, C.M.G., M.E.I.C., Past President, E.I.C.

Nov. 15th. Smoker in East Common Room, Hart House — Stunts and good fellowship. Address by General Secretary, Fraser S. Keith, M.E.I.C.

Nov. 22nd. Address on "Patents" by Herbert J. S. Dennison, Patent Attorney.

Nov. 29th. Address on "Recent Development of the T. & N.O. Railway", by S. B. Clement, M.E.I.C., Chief Engineer, Temiskaming and Northern Ontario Railway.

All meetings at 8.15 p.m. in Mining Building, University of Toronto.

Vancouver Branch:— *Secretary-Treasurer, P. H. Buchan, A.M.E.I.C., 930 Birks Building, Vancouver, B.C.*

Nov. 15th. Address on "Notes on Recent Developments in Municipal Engineering", by W. B. Greig, A.M.E.I.C., Municipal Engineer, Point Grey.

Winnipeg Branch:—*Secretary-Treasurer, P. Burke-Gaffney, A.M.E.I.C., 406 Fashion Craft Building, Winnipeg, Man.*

Nov. 1st. Address on "Combustion of Canadian Coals", by a representative of the Combustion Engineering Corporation, Limited.

Nov. 15th. and Dec. 6th. Address on "The Economics of Transportation", by Messrs. J. G. Sullivan, M.E.I.C., H. A. Dixon, A.M.E.I.C., J. Sanford Evans, J. W. Porter, M.E.I.C., and Dr. Wallace.

Dec. 20th. Address on "Concrete Mixtures", by W. Walkden, A.M.E.I.C.

The Link-Belt Company has just issued a bulletin No. 042 that will be of interest to consulting and sanitary engineers. This bulletin describes and illustrates the Tark screen, a new type of drum screen for the clarification of municipal and industrial sewage. A copy of the illustrated bulletin describing the Tark Sewage Screen can be obtained by addressing the Chicago or Philadelphia office of the Link-Belt Company

The Rise of The Engineer

Inaugural Address of Professor C. R. Young, M.E.I.C., Chairman, Toronto Branch, The Engineering Institute of Canada, Thursday, October 18th., 1923.

Potiphar Gubbins, C.E.,
Stands at the top of the tree;
And I muse on my bed on the reasons that led
To the hoisting of Potiphar G.

If it be granted that the engineering profession is faithfully represented in the person of Potiphar Gubbins, there should be no purpose other than an historical one served in considering the forces that have directed the engineer thus far in his rising course. But I am disposed to differ with the literary progenitor of Potiphar G.; at least if he would set up his hero as an all-comprehensive type. The engineer is not yet at the top of the tree, and hence musings on the forces that have hoisted him thus far, and that may serve to lift him farther, are more purposeful than on the career of our distinguished colleague, Potiphar Gubbins.

There does not appear in the published views of present-day spokesmen of the engineering profession any indication that the long-hoped for status has been fully attained. On the other hand, many symptoms of unrest and many expressions of dissatisfaction at the rate of upward progress are to be discerned. For the struggle that yet lies before us there should be much that is inspiring in a review of what engineers have already achieved. It is that belief that has shaped the present address.

Beginnings of Civilian Engineering

Prior to about the middle of the eighteenth century skilled civil practitioners in engineering of professional grade did not exist in English-speaking countries. Works of great import to the civilian population had, however, been carried out in Great Britain and Europe by military engineers where defence or communications were involved. This practice of carrying out civil undertakings by army engineers still persists in the United States where that fine body of technical men, the corps of engineers of the United States army, has under its charge the improvement of rivers, harbours and related works.

Before the advent of what might be properly termed the civilian engineer, constructional enterprises of primarily civil purport were often undertaken by untrained and unskilled layman. They were known in those days as "undertakers". It is a matter of record that they often performed, in a business sense, for their backers the service usually rendered by the persons upon whom this solemn designation now exclusively rests. They were the unhappy prototype of the engineering-contractor.

In spite of the lack of technical training possessed by these pioneers in the constructive field, many notable and successful works were carried out by them. Sir Hugh Myddelton, projector and builder of the famous New River, which early in the 17th century solved the existing problem of water supply for the city of London, was a goldsmith without experience in engineering or construction. He was a product of the necessities of the times. Winstanley and Rudyerd, who erected on the Eddystone Rock the wooden lighthouses which in their short service paved the way for the magnificent achievement of Smeaton, were both mercers, with no constructional experience or training. Riquet, a French tax-gatherer, projected and built the Grand Canal of Languedoc across the Iberian Isthmus between the Mediterranean and the Bay of Biscay.

Engineer Quickens Commerce

The foundation of the power of the British Empire has been trade. For centuries England fought valiantly and displayed impressive virility in dynastic wars, but did not become a dominating world power until commerce quickened under the stimulus of a group of remarkably inventive technicians about the middle of the 18th century.

Before that time it was impossible to travel with comfort in any direction in the United Kingdom. Travellers made their journeys on horseback and commodities were transported, where such was deemed practicable at all, on the backs of horses or bullocks. There were only tracks and even they were deep in muck. Domestic commerce was impossible and consequently the trade of the kingdom was for the most part foreign. The early roads when they did come were ill-built and ill-maintained, and one traveller of eminence remarked that in winter it would have cost no more to make the roads navigable than to make them hard. Without the possibility of distributing products, manufacturing could not develop. How little opportunity there was for internal commerce may be judged from the fact that the cost of conveying a ton of goods from Birmingham to London was from £7 to £9. Even this did not express the hopelessness of the situation. In winter so bad were the transport facilities from rural districts that the food supply of large cities was imperilled, and the inhabitants were often in danger of starvation.

Internal water communications were nearly as bad. Although there were many streams that might have been utilized, they were up to that time largely useless for want of simple improvements and the carrying out of necessary connecting canals. On the one hand the technical ability to improve the situation had not yet appeared, and on the other, the ignorance and incredulity of the populace discouraged the operations of those who performed engineering tasks. People had not yet been shown the possibilities of engineering development or the advantages likely to accrue therefrom. The inhabitants of the fens, for example, though shaken with ague, prematurely bowed and twisted with rheumatism, ill-fed and ill-clothed, violently opposed the efforts of enlightened men to drain and make wholesome the noxious areas which had long been their home.

With the middle of the 18th century, however, a stupendous change came about. There was then ushered in what might well be called the Golden Age of the Engineer, extending to perhaps the middle of the 19th century. The first quickening of industry and commerce through the labours of the modern engineer came through the notable improvements in internal water transportation brought about by the genius of James Brindley. This unlettered millwright had been consulted by the young Duke of Bridgewater with respect to a water route for the transport of coal from his estate at Worsley to Manchester. Under Brindley the original Bridgewater canal between Worsley and Manchester was built and later extended to link up with Liverpool. An extensive network of canals followed, and it may well be said that modern industrial England was born with the great works of Brindley. The resulting improvement of transport may be gauged from the fact that with the opening of the canal between Worsley and Manchester the price of coal at Manchester suddenly dropped 50 per cent and a similar reduction of water carriage charges was experienced with the opening of the Liverpool-Manchester link. With the completion of the Grand Trunk canal, the lot of the poor people of Cheshire and Staffordshire was enormously bettered. Whereas formerly they had been isolated for a large part of the year and it was difficult to obtain coal enough to keep them warm, and even necessaries for decent living, the navigation created by Brindley forced carriage charges down to one-quarter of what they had formerly been and created an enormous stimulus to the pottery and related industries. It may well be said that the navigation works of Brindley did a great deal to make many cities and towns, including Liverpool and Manchester, what they are now. During the thirty years following the completion of the first Bridgewater canal, the tonnage of English ships trebled and the sailors employed doubled in number. British maritime predominance owes much to the uneducated millwright, James Brindley.

Services of Engineer Enlarged

A great incentive to the material progress and development of England grew out of the work of Brindley. By strange good fortune there followed him a number of men of extraordinary genius for constructive enterprise and modern engineering born with Brindley grew and thrived.

John Smeaton, the greatest engineering philosopher of his time, an instrument maker with but little experience in engineering, removed for all time through his splendid courage and sound judgment the terror to mariners that surged about the Eddystone rock. The great lighthouse completed by him in the year that Wolfe captured Quebec continued in service until 1882, when it was replaced by a larger structure, and only then by reason of erosion of the rock upon which the original column of masonry rested. Following Smeaton's demonstration of the practicability of constructing stone lighthouses on wave-swept reefs, the coasts of the British Isles were in the next century made as safe for navigation as in the nature of the case they are ever likely to be.

James Watt, one of the most brilliant inventive geniuses that have ever distinguished the engineering profession redeemed for the mine owners of Cornwall many properties that had been, or were on the point of being, abandoned by reason of flooding. Frantic efforts had been made to keep the water level down through the use of the Newcomen engine, but in spite of these the water continued to rise. Watt's engine brought new life to many mining enterprises. It "forked water" as no engine had ever done before, and this with only one-third of the consumption of coal that had been required by the Newcomen engine. The levels were cleared and the miners resumed their opera-

tions to the great advantage of the district and of all England. The engine thus dramatically established as a great instrument of mechanical labour was shortly applied to drive corn and cotton mills, roll and hammer iron and to perform the multifarious kinds of labour for which the power of man, horses, wind and water had hitherto been employed. The stupendous industrial developments growing out of the genius of Watt are beyond the power of the human mind to calculate.

In spite of the voluble opposition of the prominent men of the time, William Murdoch, an assistant of Watt succeeded in what Sir Walter Scott had characterized as the absurd course of trying to light the streets of London with smoke. Sir Humphrey Davy asked whether the dome of St. Paul's was to be used as a gas holder. The enormous benefits conferred upon civilization by the utilization of this natural resource came through the pioneering instinct and the ceaseless perseverance of the engineer, Murdoch.

Up to the time of the quickening of constructional enterprise brought about by the work of Brindley, the state of transportation in the rural parts of the United Kingdom was extraordinarily bad. For example, in the Highlands of Scotland at the close of the 18th century, poverty and indolence were rampant. Emigration threatened to depopulate the country, and it became a matter of national concern as to what might be done to develop and open the district to industry. Thomas Telford, through a masterly survey of the district furnished the starting point for a policy of constructional improvement that conferred incalculable benefits on the Highlands. In eighteen years he constructed no less than 1,130 miles of new or improve roads and built 1,200 bridges. These and related improvements advanced the country a century. According to Smiles, "Agriculture made rapid progress. The use of carts became practicable, and manure was no longer carried to the field on women's backs. Sloth and idleness gradually disappeared before the energy, activity and industry which were called into life by the improved communications. Better built cottages took the place of the old mud biggins with holes in their roofs to let out the smoke. The pigs and cattle were treated to a separate table. The dunghill was turned to the outside of the house. Tartan tatters gave place to the produce of Manchester and Glasgow looms; and very soon few young persons were to be found who could not both read and write English."

The contributions to the material development of the country were continued by John Rennie, the creator of the present London bridge. Following the many futile efforts that had been made since the 17th century to solve the problem of drainage of the fens of Lincoln and Cambridge, and against the unenlightened obstruction of the fen men who clung to their foul and drowned acres, Rennie by the application of sound engineering principles made finally available for healthy habitation the last of the great area of 2,000 square miles that had baffled the inexperience of early undertakers. Commerce was further quickened through the invaluable labours of Rennie in improving the harbours and docks of many English ports. It may truly be said that John Rennie extended in no small degree the sweep of British commerce.

No single engineering achievement transcends that of George Stephenson in applying the power of the steam engine to the haulage of trains. In these days we have no conception of the extraordinary violence of opposition that was set up against Stephenson. It was represented by men, often of the highest station and presumably of great intelligence, that railways, if they were constructed would prevent cows from grazing and hens from laying; that the poisonous smoke emitted from the stacks would kill the birds as they flew overhead and the preservation of pheasants and foxes would be impossible; that houses would be burnt by the sparks from locomotives; that horses would become useless and finally extinct; that hay and oats would be unsaleable; that coach makers and harness makers would be ruined and that coachmen would be without employment; that travel by rail would be dangerous, since the locomotive boilers would burst and blow the passengers to atoms; that the country inns would be ruined; that finally, and strangely at variance with the foregoing pictured terrors, a locomotive could never be got going because of its own weight, and most certainly could never start up against the wind. However, Stephenson persisted that the locomotive was practicable and that the time would come when it would be cheaper for a workman to ride than to walk. This has become more than literally true, for in our economic age it is three times as cheap for the workman to ride by rail as it is to spend his time walking. "Let the country but make the railways and the railways will make the country", said Stephenson.

With the application of locomotive to the haulage of vehicles the most undreamt of things came about. Not only did the employment of horses and men increase by reason of intensified commerce, but the prices of commodities and manufactures fell to a level within reach of poor people. Marvellously enough, the opposing canal interests found that with the railroads an accomplished fact, their own traffic did not lessen, but actually increased.

What Stephenson had done for land transport was done in part by the younger Brunel for ocean traffic. This bold pioneer demonstrated beyond doubt the practicability of regular steamship ocean traffic. A scientific publicist of the time had demonstrated to his own satisfaction, if not to the satisfaction of Brunel, that an ocean steamship could not hope to carry enough coal to propel itself across the Atlantic. Brunel, however, was not deterred by the fallacious doctrine and proceeded with the construction of the greatest vessel of the time, the Great Eastern, which for 41 years held the world's record for size. He it was that proved the soundness of the principle that there is no upward limit of size for ocean vessels, except that dictated by the possibility of obtaining profitable cargo and the restrictions of harbour facilities. He demonstrated the proposition that while the power required to propel vessels increased as the square of the dimensions, their carrying capacity increased as the cube, and on this principle increase in the size of steamships has since proceeded.

Modern cities owe to Sir John Fowler, joint engineer with Sir Benjamin Baker of the great Forth bridge, the application of rapid transit to the solution of traffic problems. He was the engineer of the first tube railway in London, the City and South London line, and demonstrated the practicability of a system of underground transit that has made great cities possible.

To Sir Benjamin Baker and to Sir William Willcocks, modern Egypt may in great part credit its prosperity. Although for 7,000 years the valley of the Nile had economically been largely dependent upon the vagaries of nature, Sir Benjamin Baker through the construction of the great Assuan dam gave to Egypt in a few years one and one-half million acres of fertile lands. The economic benefit conferred upon this country by the works of Baker and those who followed in his steps has been incalculable.

In America there have been striking economic services performed by the engineer. James B. Eads, though his intimate studies of the behaviour of the Mississippi, in effect created the Mississippi navigation and made possible the attainment by the port of New Orleans of the second place in the United States. To A. M. Wellington the soundness of the location of the railways built in the last generation is chiefly due. To Alfred Noble the American public owes much. Against an overwhelming majority of opinion he framed the celebrated minority report of the International Commission of Engineers on the construction of the Panama Canal. He believed firmly that a sea-level canal was impracticable, and so great was the confidence in his opinion that the waterway was actually built as a lock canal against the recommendation of the majority report. To George Westinghouse much of the safety and comfort in rail travel and much of the efficiency of utilization of power is due.

There have been great contributions to the development of Canada through the labours and foresight of her engineers. One needs only to mention two such outstanding figures as the late Sir Sandford Fleming and the late Sir John Kennedy. The soundness of Sir Sandford's views and the value of his advice to this country might well be crystallized in the characteristic incident of the selection of a passage through the Rocky Mountains for the Canadian Pacific Railway. In his famous report on the surveys for the C.P.R., he recommended the Yellowhead Pass on the ground of easy grades and the avoidance of a corner of the great American desert jutting up into Canada. When the Canadian Pacific Railway Company took over the enterprise from the government of Canada it selected the Kicking Horse Pass, partly with desire to keep the American railroads from crossing the border. The grades, however, necessitated on this route, which might be considered as politically located, were such that the government refused to grant the subsidy on eight miles of the line between Hector and Field. To this day the handicap on Canadian transport thus imposed persists, in that basic freight rates are founded on the haulage costs over the C.P.R., rather than on the easier grades of the Canadian National through the Yellowhead Pass.

An instance of sterling labours of a technical character in the development of this country is that of the long service of Sir John Kennedy as chief engineer of the port of Montreal. Against openly expressed doubts he advocated the construction of 1,000-foot piers for that port and time justified his views. The enormous traffic now passing down the St. Lawrence and through the port of Montreal is in very considerable measure based upon the sound judgment and enlightened views of that distinguished engineer who so long guided the constructional policies of the Montreal port authorities.

Continuing the successful labours of the early engineers there are now a great army of soundly trained technical men contributing to the economic and material prosperity of the country. Whereas formerly it was necessary for people in the rural district to be tied to the land, the free movement of the populace has become as a matter of course. Communication through the movement of passengers and commodities and the transmission of messages has brought about a new world, and, what, on the material side, is doubtless a higher civilization. "Those inventions which abridge distances have done much for the civilization of our peoples," said Macaulay. Indeed in some instances improved transport has meant life itself. It is recounted that in 1865-66 during the famine in the Orissa district, in India, there was no lack of grain in the other districts, but on account of the impos-

sibility of transporting it into the stricken areas, a million persons, or one-quarter of the total population of the province, perished from starvation.

Due to the labours of a great army of ingenious engineers, travel has become relatively safe both by highway and by railway. Not many generations ago the passage of the Alps was a perilous enterprise; and what required of Hannibal and Napoleon the most extraordinary expenditure of energy and treasure, now scarcely requires a thought. Passengers and commodities pass through the great Alpine tunnels with perfect security and ease. So great has been the multiplication of safety devices on the better class railroads of the world that in one year not so long ago in Great Britain, there were less people killed on the steam railways than were hanged for murder.

The health and longevity of our people have been matters vitally associated with engineering achievement. While 20 years ago in America typhoid death rates ranged from 15 to 50 per 100,000 and in a number of large and well-known cities this ran as high as 75 to 100, the rate has dropped in recent years to but a small fraction of these figures. In Ontario the rate in cities for 1918 was 4.3 and in 1920 it was 5.5. It cannot be claimed, of course, that all of this remarkable benefit to the race has been brought about by engineers, but it cannot be contraverted that very much of it is due to them.

Safety of life and property against destruction by flood has been in many cases dramatically established by the labours and far-sighted engineers. Ten years ago the most disastrous flood in its history swept down the Miami river in the state of Ohio and wiped out 400 lives and property to the value of $100,000,000. There are to-day in readiness for such a contingency, flood prevention works extending 80 miles up and down the valley which secures for all time immunity from the recurrence of such a disaster.

There have been given to the inhabitants of the earth countless acres of fertile land through the labours of the irrigation engineer. What has been done for Egypt by British engineers has already been recounted. In India, at the present time there are no less than 28 million acres of land irrigated. In the United States, due to the labours of the Reclamation Service, there are 3,200,000 acres comprised in 57 projects. In Canada there are completed, or are approaching completion, projects involving 1,202,000 acres, and additional works completely or partially surveyed would add 2,407,000 acres to this area.

How great the contributions of engineers to the power assets of the country really are may be seen in the striking development of efficiency in power plants in the past few decades. Less than 25 years ago the efficiency of a complete hydro-electric installation was not over 80 per cent, whereas now more than 90 per cent may be realized over a wide range of capacity. How great the development of transmission has been may be gauged from the fact that thirty years ago when the Niagara Falls Power Company constructed its first plant, it was doubted whether the power could be actually transmitted to Buffalo, 28 miles away, for utilization. At the present time delivery of power over a distance of 250 miles from Niagara Falls to Windsor is a matter of course and transmissions of many hundred miles are by no means impracticable.

In recent years the labours of engineers have constituted a steady exemplification of what the biographer of Sir John Fowler calls the "domestication of science for the public service".

Early Status of the Engineer

The modern professional engineer had an origin amongst the humble millwrights of England. Upon these skilled workers the responsibility for constructional enterprises devolved prior to the days when something like a profession of engineering came into being. Brindley, whose notable achievement ushered in a new era in material development in the British Isles, was scarcely able to read or write. He taught himself these arts when he was employed as an apprentice, and was never able to spell correctly or to write better than a half-intelligible letter or report. Books were practically a closed world to him and he lived and died essentially in the world of mechanics. Both Watt and Smeaton were mathematical instrument makers, and by reason of their superior education were able to transcend Brindley in the breadth of their professional achievements. Telford began his constructional career as a stonemason and John Rennie entered upon his life work through the obscure portal of the millwright.

It was to be expected that coming from such lowly origins the engineer would be poorly paid. Brindley through all his long and exacting employment with the Duke of Bridgewater did not receive at any time more than 3s. 6d. a day, and most of the time his compensation did not exceed 2s. 6d. These were days when the engineer must of necessity remain in a low rank of society, and when his scale of living must be adjusted thereto. Thus, we find that Brindley, in a fit of disappointment over his troubles with an engine, records in his diary the illuminating entry "run about a drinking 1s. 6d." Even Smeaton whose intellectual gifts and attainments made him an honoured member of the Royal Society, did not receive at any time more than two guineas a day for his professional services.

It was to be expected that the attitude of cultured and polite circles and of literary men generally would scarcely be cordial to the engineer. Thus, Shakespeare speaks of "mechanic slaves with greasy aprons, rules and hammers", and Dr. Samuel Johnson defined mechanical as "mean, servile". Although Johnson was the most active literary man of his time and expressed opinions on almost every conceivable subject, he did not once comment on the splendid works of Brindley, although they were all completed in Johnson's day. Andrew Meikle, inventor of the threshing machine, a piece of mechanism that has revolutionized agricultural industry was not even mentioned in Scottish biographies of the time. Smeaton was severely criticized by his friends of the Royal Society for undertaking the navvy work of making a road across the valley of the Trent.

Growth of Confidence in the Engineer

With the splendid achievements of the pioneers in modern engineering, it gradually came to be appreciated that there was advantage in securing the services of skilled technical men. It was seen that mishaps of a serious character often came about when the work was entrusted to unskilled persons, and that generally such were avoided when trained men were employed. A notable and classical instance of this was the collapse of St. Chad's church after it had been condemned by Telford, much to the disgust of the church authorities, who turned it over for repair to an incompetent and unskilled person who represented that there was very little at fault with the structure.

It was not long before it was seen that the forecasts of the leaders in engineering were generally sound and that proceeding against the advice of trained and ingenious engineers was unprofitable. James Nasmyth recounts the extraordinary and futile efforts which he made to convince the British Admiralty of the virtue of his steam hammer. Meeting only passivity, he proceeded to instal his hammers in the furnaces and principal foundries of England and sent them abroad to foreign countries, even to Russia. At last, after three years, the Admiralty finally awoke to the fact that a device known as the steam hammer was already in successful operation and that perhaps they should enquire into the matter. On investigation they found that Nasmyth had been telling the truth. John Rennie records a similar experience with the Navy Board in attempting to convince that body of the desirability of steam propulsion for ships of war. His attitude to the official density of this body may be gathered from his comment that "of all the ignorant, obstinate and stupid boards under the crown, the Navy Board is the worst. I am so disgusted with them that could I at the present moment with decency relinquish the works under them which I have in hand I would do so at once". Later, the soundness of Rennie's views was conceded.

It was soon found that while formerly those who imperilled their fortunes in engineering enterprises in the hope of gain were proceeding upon a perilous adventure, there was now a high probability of profiting by following the advice of skilled engineers. Those who had formerly been known as "adventurers" now became known as "investors". The respect to which engineers gradually attained through the successful carrying out of great works is well indicated by the attitude of that distinguished British administrator, Lord Cromer, when speaking of the work carried out in Egypt by British engineers. Said he, "The British engineer, in fact, unconsciously accomplished a feat, which, in the eyes of a politician, is perhaps even more remarkable than that of controlling the refractory waters of the Nile. He justified Western methods to Eastern minds".

Increased confidence in the engineer arose through repeated demonstrations of high integrity in the professional careers of the great leaders. George Stephenson, in recommending a type of rail for the Stockton and Darlington Railway, definitely specified a rail other than the cast iron one on which he held a patent, although he might have profited to the extent of a very considerable sum had he cared to use his own rail. When Sir Benjamin Baker was appointed consulting engineer on the Asyut barrage, he found that unforeseen conditions made it necessary to alter very materially the design of the structure. No prices having been named in the original contract for much of the new work involved, Baker told Lord Cromer that the contract ought in fairness to be cancelled, and, at the same time in the interests of Egypt an arrangement entered into by which the work would be hastened to completion at the earliest possible moment, leaving the question of contractor's profit to him. Without any hesitation, Sir John Aird, the contractor, agreed to leave the matter entirely in Baker's hands, proceeded vigourously with the work and finished it a year ahead of time, with a gain to the country due to the extra year's supply of water of $3,000,000. Thus did high integrity on both sides enormously enhance the reputation of both engineer and contractor and greatly benefit the client of both.

Thomas Telford, when appointed engineer of the Ellesmere canal, was well aware of the fact that he had not that extended experience in earthwork, however skilled he might be in masonry, which he ought to have to undertake such an important enterprise without support. He consequently retained William Jessop to advise him in this regard. Some engineers would have attempted the work entirely on their own responsibility.

Alfred Noble was characterized by J. Walso Smith as the most conscientious engineer that he had ever known. Noble never rendered a snap judgment, even on matters of small importance. He was more anxious to be correct than to appear brilliant. Any advice given or judgment pronounced was always the result of the most careful consideration. He repeatedly refused lucrative engagements for the sole reason that he felt he could not give them the study and attention which they demanded. Compared with this attitude the practice of some immature and irresponsible engineers in undertaking work for which they are not sufficiently experienced is as playing the market with trust funds.

Influence of Engineering Societies

Much of the high prestige now appertaining to the engineer has come through the steady and strong upward guidance of the great engineering societies. The first of these was the Society of Civil Engineers (now known as the Smeatonian Society of Civil Engineers) founded in 1771. It was, however, an exclusive organization composed of the most notable engineers of the time. Initially, it consisted of only seven members and at the end of 21 years of only 65.

Believing that a more comprehensive organization would do much in training and guiding the younger engineers, certain leaders of the profession brought about the foundation in 1818 of that fine organization. The Institution of Civil Engineers of Great Britain. This came upon the profession at a time when there was tremendous activity in the constructional world. It was launched at an opportune moment and exerted a tremendous influence in shaping the young engineers of the time, and in developing standards of professional practice.

In Canada a parallel work has been done by *The Engineering Institute*. Although founded as the Canadian Society of Civil Engineers as late as 1887, it has in its 36 years attained a membership as great as that which it took the Institution of Civil Engineers 70 years to reach.

Profession Versus Business

There is perhaps no question more frequently asked than the time-worn one as to whether engineering is really a profession or not. It has been the ideal of many leading engineers to place engineering on a purely professional basis and to divest it of the characteristics of a business which it has taken on in recent years. One must frankly admit that the results achieved have not been gratifying and that engineering is, if anything, farther from the status of a pure profession than it was a generation ago.

If one were asked to define the essentials of a profession, one might say that properly the professional man should make his services available to such clients as care to consult him, and generally for stipulated fees rather than for a salary. Relations with the client should be on the highest possible ethical basis and no measures should be adopted for the securing of commissions which would not be acceptable in type to those prevailing in the professions of law and medicine. One might enumerate as some specific essentials of an engineering profession, the possession of skill and learning by the practitioner, the maintenance of high ethical relations with the client, and the observance of altruistic motives in his relations with the public.

So basic is the idea of learning in a true profession that one often hears mention of the "learned professions". It is inadmissible for the engineering practitioner to be an ignorant or unlettered man. Although the proprietor of a barber shop or of a shoe shining stand may be operating for the benefit of such customers as may care to patronize him, and for a fixed fee, it cannot be maintained that these callings are in the category of professions, in spite of the recent effort to incorporate barbering in British Columbia as a skilled profession. But on the basis of learning as a requisite, however, one might very properly include in the ranks of the "learned professions", the work of the skilled accountant or auditor, who in his field maintains towards clients relations that are comparable with those maintained by the professional engineer.

A basic essential of professional life is that the relations of the professional man to his client should be those of the most exalted trust and of the most circumspect solicitude for the interests of his employer. Telford, for example, while acting as an engineer for several canal companies declined an appointment as engineer to the Liverpool and Manchester Railway on the ground that it would prejudicially effect the interests of his existing employers. Sir John Fowler was pre-eminently a shareholder's engineer. He restrained his natural impulse to create great and enduring works for monumental purposes and made sure that the interests of the persons who were furnishing the money were primarily observed. The public very properly expects of a professional man a high attitude with regard to public obligations. It expects him not only to further the interests of the people at large, but to prepare himself for the better performance of such service. The appropriate attitude to his profession might very well be put in the words of Francis Bacon "I hold every man a debtor to his profession; from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereto".

Smeaton's attitude in this regard would have fully satisfied Bacon. He held that "the abilities of the individual were a debt due to the common stock of public well-being". Having this in mind, he limited his professional employment so that he might devote a certain portion of his time to self improvement and scientific investigation. He systematically resisted tempting offers to attract him from this settled course.

One must admit that the present status of engineering is that of part profession and part business. The methods of solicitation of new work in engineering are by no means in conformity with those observed by the leaders in the professions of law and medicine. Intensive canvassing and lobbying which characterize the conduct of some engineers in the consulting field at the present time do not well comport with the high ethics of Smeaton and Telford. They are of one and the same type as the methods employed to secure orders for bacon or boots.

The competition that is sometimes introduced by engineers with others who have to all intents and purposes secured a given piece of work, is not that characteristic of a pure profession. Thus, when the plans of an engineer have been accepted and tenders are called thereupon, it may be questioned as to whether alternative designs are properly tolerable without the full prior knowledge and consent of the client's engineer. It is, of course, a common procedure for engineering contractors to submit their own designs in competition with those of the engineer in charge of the work, and the practice is so firmly established that it is not likely to be given up. In essence it is an embarrassing procedure. It in effect proclaims that the client's engineer has insufficiently studied the situation and that he has overlooked the merits of another scheme which might prove cheaper than the one which he recommended. Anything which lessens the confidence of the client in his engineer's complete mastery of the subject may well be considered as questionable ethically, but so far have we proceeded from pure ethics in the practice of engineering that this procedure often excites no comment. Under such conditions it becomes very difficult to frame a comprehensive code of ethics for engineers. When they are operating in part as professional men and in part as men of business it does not seem practicable to establish a purely professional code of ethics that will procure uniform observance by the engineers of the country.

Future of Engineering

We are, therefore, constrained to ask whence is the engineer bound and what is the future of engineering? One may find in the public statements of leaders of the profession for many years back expressions of doubt as to whether society could absorb all of the engineers who were offering their services. Thus, James Walker, one of the early presidents of the Institution of Civil Engineers said in his presidential address in 1841, as follows:—

"While I congratulate the Institution on the increase of its members, I ought at the same time to express my opinion that, from the number of young gentlemen who within the last ten years have studied for, or have entered, the profession, the supply is likely to be at the least equal to the demand, and to caution those who intend entering, or are now studying for it, against confining themselves to the strictly professional part of the usual routine of education. The railways, both during the preliminary surveys and in their subsequent construction and management, in addition to other works of engineering, have given employment to many. But the principal towns are already connected by railways, or engineers and surveyors are now employed in projecting or executing lines where they are yet wanted. Is then the demand for professional gentlemen likely to increase? Is it not likely rather to decrease?"

At that time the total membership of the Institution was 475. There had arisen in the early days of railways in England a phenomenal demand for the services of men with any experience in engineering or surveying. Surveyors and levellers were paid as much as from six to fifteen guineas a day, although many were highly incompetent and had secured what knowledge they knew of the subject from very brief courses of instruction. It is recounted that a peddler of stationery earned five guineas a day and his expenses as an assistant surveyor. A fat and wheezy fellow, long unaccustomed to work, received three guineas a day for work on surveys, and could have had five had he been willing to attempt the hills in a bold piece of country. He preferred three and a level line.

The questions that were raised in the days of James Walker with respect to the absorptive power of Great Britain for engineers might well be raised in Canada at the present moment. There are in this country approximately 12,000 engineers in all grades and departments. At the same time there are in attendance in Canadian engineering colleges about 2,100 students, or about one-sixth as many as all the engineers in the country. One may well ask, if employment on strictly engineering work is to be found for such a large output. In the United

States the situation is still more striking, for although the population of that country is only about fourteen times greater than that of Canada, there are about 50,000 engineering students in the engineering colleges.

Change in the character of employment will constitute the solution of the problem. Whereas fifteen or twenty years ago, construction of railways at a terrific rate afforded employment for large numbers of young engineers, that source has largely dried up and railway employment has to do principally with maintenance and operation. Any group of engineers relying wholly on original construction for employment may be embarrassed during periods of hard times. With a commercial depression, the first thing that is done is to curtail construction and extensions. If, however, the engineer is trained and experienced in problems of operation and management, he may easily pass into executive and administrative positions with perhaps financial advantage to himself. One interesting source of employment of this character now opening up is city managerships. There are in America over three hundred cities and towns governed in this manner and of the managers in charge a substantial portion are trained engineers.

So frequent have been the instance of graduate engineers undertaking work involving a combination of engineering and business that engineering colleges in America have for some years past been undertaking to prepare men for this combined field. Harvard University offers a five-year course in business administration and engineering combined, options being granted in accordance with the department of engineering elected by the student. Yale offers a four-year course in administrative engineering devised for students who expect to fill executive positions in which a knowledge of engineering is required equivalent to that ordinarily gained in any one of the regular courses. The University of Kansas offers a course in engineering and administrative science with two technical options. Pennsylvania State College has regular graduating courses in industrial engineering. New York University has established a four-year course in business and engineering. The University of North Dakota has a four-year course in general industrial engineering with sixty per cent of the time devoted to fundamental subjects in science, mathematics and technical engineering and forty per cent in subjects pertaining to business management, administration and allied topics. Union College offers a combined four-year course in which business and cultural subjects form thirty-five per cent of the total. The Universities of Illinois, Wisconsin, Ohio and Cincinnati maintain co-operative courses in which engineering is combined with economics in the schools of commerce. Although no special department in administrative engineering has so far been established in the University of Toronto, the inclusion of many business subjects in the curriculum has been brought about in recent years. Graduates in every department now have a useful general conception of the commercial field and are deriving therefrom the advantage of increased employability.

Thus, there is undoubtedly a strong trend towards the broadening of employment of the engineer. If it be conceded that a departure from strictly technical lines is legitimate, an immense new field of activity opens out for the young man with a combined training. Experience is showing that a larger and larger proportion of engineering graduates are taking positions in which a combination of business and technology is desirable, and without doubt the time is coming when the technically trained man will make his influence as strongly felt in business as in the specialized fields of engineering enterprise.

Members' Exchange

Engineering Instruments, Gurley transit and level chains and rods, all in good condition. Will accept $259. for the outfit. Apply Box No. 4-E

Great Falls Power Development, Winnipeg River. Upper cofferdam showing holes for loading and placing of dynamite and powder.

EMPLOYMENT BUREAU

Situations Wanted

Mechanical Engineer

Mechanical engineer, S.E.I.C., 1923 graduate, six years tool room experience desires position preferably with a manufacturing concern. Salary not a governing feature provided there is an opportunity for advancement. Location immaterial. Available November first. Apply Box No. 125-W.

Mechanical Engineer

Mechanical engineer, A.M.E.I.C., Registered Professional Engineer of the province of Ontario, with 18 years varied experience, covering design and construction of machinery, tools and special equipment for quantity production, industrial plant and material-handling equipment layouts, structural steel-work, appraisal, purchasing and selling. Desires connection in an engineering or representative capacity. Apply Box No. 126-W.

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Desires permanent position; experienced on the installation and maintenance of machinery and equipment including Diesel engines, and the economical operation of power plants, construction and upkeep of buildings, capable executive, location immaterial; single. Had years of experience with mining and oil industries in Southern States. Open for immediate engagement. Graduate of McGill in mechanical engineering. Address: P.O. Box 305, Ottawa, Ont.

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A.M.E.I.C., and qualified Ontario Land Surveyor. Twelve years experience in construction, location, township and city surveyor and development, desires connecton with engineering firm or contractors, at home or abroad. Knowledge of foreign languages. Apply Box No. 127-W

Recent Graduate

McGill man desires engagement. Would prefer manufacturing plant or other work not confined to laboratory; preferably, but not necessarily, in Montreal district. University course in chemical engineering, and short term experience with number of companies. Box No. 128-W.

Great Falls Power Development, Winnipeg River. Channel excavation below power house, looking from upper cofferdam.

Demolition of Cofferdams below Great Falls Power Development on Winnipeg River

Removal of Upper and Lower Cofferdams used in Construction of Channel at Whitemud Falls

The development of the Great Falls, (Grand du Bonnet) power site on the Winnipeg river by the Manitoba Power Company provides for the installation of six 28,000 h.p. units operating under a head of 56 feet.

In order to secure the head of 56 feet it was necessary to reduce the tailwater elevation 10 feet by cutting a channel through the rock ridge forming Whitemud falls, some two miles below the power house. This is in accordance with the scheme of development of the entire river in Manitoba as formulated by the Dominion Water Power Branch, Department of the Interior, under which scheme it was decided that the most economical concentrations of the lower stretch of the river could best be obtained by including the drop at Whitemud falls with those at Great falls.

Investigations showed that the south side of the river at Whitemud falls provided the best site for the channel and it was finally decided to cut a channel 200 feet wide with bottom at elevation 735. This channel is about 2,000 feet long and involved the excavation of approximately 200,000 cubic yards of rock, and the construction of 3,000 lineal feet of rock-filled timber-crib cofferdam, varying from 10 to 40 feet in depth. Work on the cofferdams was commenced in March, 1922. The first well was unwatered and excavation actively proceeded with in June. From this date excavation continued at a steady rate until the completion of the channel in October, 1923.

To place the channel in operation it was only necessary to remove those portions of the cofferdams across the upper and lower ends of the channel, and as blasting was the method decided upon, these were heavily loaded with dynamite and black powder. Water was let into the channel on October 13th in order to equalize to some extent the pressure on the upper cofferdam, which was loaded with the object of blowing the materials upstream and away from the entrance to the channel. On October 15th both cofferdams were demolished, the lower being blown first. Fourteen thousand pounds of dynamite was used to demolish the lower cofferdam, which contained thirty-five hundred cubic yards of crib and filling. The upper cofferdam, with a maximum depth of forty feet and containing 18,000 cubic yards of crib and filling, was completely demolished with 35,000 pounds of dynamite and 4,000 pounds of black powder.

The channel was designed to lower the tailwater level at the power house 10 feet with the river discharging 20,000 second-feet. After blowing the cofferdams the tailwater was lowered 9.55 feet with a river discharge of 25,000 second-feet.

The general contractors for the power development are the Northern Construction Company, Limited. — Fraser Brace Limited. F. H. Martin, M.E.I.C., is chief engineer and Messrs. Julian C. Smith, M.E.I.C., R. S. Lea, M.E.I.C., and L. J. Hirt, the consulting engineers.

NOTE: — For further details of the complete development see *The Engineering Journal*, September and October, 1922.

Lower cofferdam just before demolition.

Lower cofferdam after demolition.

Recent Visitors to Headquarters

C. J. MacKenzie, M.E.I.C., Saskatoon, Sask., H. E. T. Haultain, M.E.I.C., Toronto, Ont., J. G. W. Campbell, A.M.E.I.C., Truro, N.S., S. O. Roberts, A.M.E.I.C., Ottawa, Ont., Miles Walker, M.E.I.C., St. John, N.B., C. A. D'Abbadie, A.M.E.I.C., Paris, France, F. S. Kuhns, A.M.E.I.C., Ottawa, Ont., Duncan MacPherson, M.E.I.C., Toronto, Ont., George A. Mountain, M.E.I.C., Ottawa, Ont., F. H. Emra, M.E.I.C., Ottawa, Ont., James Adams, A.M.E.I.C., Ottawa, Ont., R. L. Haycock, M.E.I.C., Ottawa, Ont., C. H. Wright, M.E.I.C., Halifax, R. B. Young, M.E.I.C., Toronto, Ont., W. Ray MacCelland, Jr.E.I.C., Dragon, Que., A. A. Outram, Jr.E.I.C., Port Hope, Ont., C. E. Hogarth, A.M.E.I.C., Hamilton, Ont., Geo. Kydd, A.M.E.I.C., Orillia, Ont., Geoffrey Stead, M.E.I.C., St. John, N.B.

Demolition of upper cofferdam.

Demolition of lower cofferdam.

BRANCH NEWS

Niagara Peninsula

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.

The branch opened the fall season on September 15th, with a trip through the various industrial plants at Port Colborne. A very interesting and instructive hour was spent in the plant of the International Nickel Company. Mr. Thompson, assistant manager, cordially welcomed the party. The visitors, in groups of ten or twelve, were guided through the plant by members of the staff who explained the various operations being carried on. The party then proceeded to the government elevator and were fortunate in arriving at a time when one of the large lake freighters was trans-shipping a cargo of grain to a canal boat on the other side of the elevator. The party arrived at the plant of the Canada Furnace Company as a charge was being run off. Mr. Higgon, the manager, had held the charge as long as possible for the benefit of the party. Much interest was shown in the new pigging machine recently installed.

An excellent dinner was served at seven o'clock in the Guild Hall, followed by a sing song. The branch is indebted to the management and the staffs of the various industries for their assistance in making this a successful outing.

Branch Members Enjoy Clam Bake

On October 6th, a number of the members of the branch attended a clam-bake at the summer residence of David Dick Jr. Ideal weather music, sports and an abundant supply of refreshments all combined to make the occasion one to be remembered.

Future Meetings

There will be no meeting in November.

The December meeting at Niagara Falls will be a "Symposium on Fuel". A number of members, each of whom has made a particular study of one class of fuel, will lead the discussion. Anthracite, bituminuous, Alberta, Welsh and Nova Scotia coals, coke, oil and electricity will all be discussed. The committee on the revision of the branch by-laws will report at this meeting.

The January meeting at Welland will cover some phase of electrical development.

The February meeting at St. Catharines will be addressed by G. P. Graham of the Asphalt Association on "Asphalt and its Uses".

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

A meeting of the St. John Branch was held in the Orange Hall on October 18th, with G. N. Hatfield, A.M.E.I.C., presiding. At a short business meeting a report was read by F. G. Goodspeed, M.E.I.C., chairman of the Maritime General Professional Meeting Committee, on this meeting held recently in St. John.

The speaker of the evening, A. F. Blake, refinery manager, Atlantic Sugar Refinery, St. John, gave an address on "Coal Testing and Its Significance". Mr. Blake treated this question from the standpoint of chemistry and showed the importance of a chemical analysis of coal before its purchase.

Coal Testing and its Significance

The two common tests for coal were the boiler and chemical tests. A boiler test requires a carload of coal, takes twenty-four hours of continuous stoking and can only be made after the coal is purchased; all coals must be burned in the same boiler to give comparative results. For a chemical analysis the usual sample varies from ten to thirty pounds, and may be properly selected from mine or stock piles at proper intervals; the advantage lies in the fact that by this method the coal may be tested before purchase. For a chemical analysis the sample is first crushed mechanically and passed through sieves until finally the sample will pass an 80-mesh sieve.

Coal was found on analysis to consist generally of, carbon 60 per cent to 95 per cent, hydrogen 2 per cent to 6 per cent, oxygen, 2 per cent to 20 per cent, nitrogen 0.4 per cent to 2.5 per cent, sulphur 0.2 per cent to 7 per cent, and mineral matter or ash 1 per cent to 3 per cent. The water content was important and the necessity of immediate tests of sample before this water has evaporated was mentioned. The water content was shown to be so much water bought as coal on which freight charges had been paid, and also that additional coal was required to evaporate this water. The price of all coal purchased should be corrected to price of dry coal.

The hydro-carbons were the most important elements in the coal. The volatile matter although not essential from a fuel standpoint, was most important for its by-products, — coal tar from which dyes are derived, and gas used for commercial lighting and heating. On the volatile matter present depends whether a coal will or will not smoke or coke, and also on its length of flame which is a factor in boiler design.

The sulphur is undesirable in coal. The ash resulting from burning may be inherent in the coal or may be rock and slate from faulty mining practice. Coal with over 40 per cent ash would not burn, with over 30 per cent would only smoulder, containing 20 per cent to 30 per cent will burn quite readily, while the best coal has from 3 per cent to 6 per cent ash. Clinker is partly melted coal ash due to the ash fluxing and depends on the presence of lime in the coal. Clinker forms on side walls and grates of furnaces so that in extreme cases with poor coal the boilers become plugged. Chemists run fusing tests to determine this quality in a coal sample.

The laboratory test required to find the heat value of coal by determining its British thermal units was explained in detail. By the use of formula it was shown that in the case of two coals offered for sale at different prices the lower priced coal, by containing less British Thermal Units, might prove more expensive than the higher priced coal. Tests showed that some coals being used for steam purposes were better suited for domestic use and vice versa. The results of all tests are used to determine the cost per million British thermal units which is the basis for determining the quality of coal samples. Water, ash and British thermal units are usually the important contents specified when buying on specification.

After a general discussion a vote of thanks was moved by Geoffrey Stead, M.E.I.C., and seconded by A. Gray, M.E.I.C.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

Mount Allison Appreciates President's Visit

The Engineering Society of Mount Allison University, Sackville, N.B., was favoured by a visit from President Francis of *The Engineering Institute of Canada*, on Friday, September 28th. At an afternoon meeting, Mr. Francis, after complimenting the society on its proportionally large number of student members in *The Institute*, spoke on the essentials of an engineering training, advising all engineering students to pay special attention to their English, both written and spoken, and to their simple mathematics, while at the same time acquiring a thorough grounding in the fundamentals of their profession. He gave some excellent practical advice to the man entering engineering and also to the man who, after commencing an engineering course, finds himself unsuited to that profession. To the latter he commended the course as an excellent preparation for any calling. After the meeting Mr. Francis spent some time in an informal chat with different members of the society.

Mr. Francis was the guest of the faculty at dinner in the university residence, after which he spoke briefly to the whole male student body on the necessity of each individual rendering service to his fellow men, and the reward of such service, both in happiness and substance.

The honour done the Engineering Society by a visit from the President of *The Engineering Institute of Canada*, was greatly appreciated, and certainly Mr. Francis, both officially and personally, will always be very welcome at Mount Allison.

Ottawa Branch

F. C. C. Lynch, Affiliate E.I.C., Secretary-Treasurer.

The Ottawa Branch opened their season's activities with a luncheon meeting on October 18th. The speaker for the occasion was the Hon. J. H. King, M.D., C.M., F.A.C.S., minister of public works, his subject being "Public Service Rendered by the Engineering Profession" Dr. King was minister of public works in the British Columbia government before assuming control of the similar department in the federal government and is consequently thoroughly familiar with engineering problems and their relation to the government service.

Investigation by Dominion Fuel Board

During the past summer investigations were carried on under the Dominion Fuel Board regarding the feasibility of producing a high-grade domestic fuel in Canada from by-product coke ovens. The survey was confined to the acute fuel area of Ontario and Quebec and a detailed investigation was made of the possibilities at Port Colborne, Toronto, Ottawa, Montreal and Quebec. It has been shown that an extensive field exists in these two provinces for the introduction of by-product recovery coke ovens. These ovens produce a coke much harder than the ordinary gas house coke and equivalent to anthracite in heating value.

By-product coke possesses an important advantage over anthracite in that soft coal, the raw material from which it is made, is in plentiful supply. Not only are there large reserves of it in Nova Scotia, but the United States has a surplus production of from 300 million to 450 million tons yearly from which Canada can draw.

Chairman of Proceedings Committee resigns

A. B. Lambe, A.M.E.I.C., has resigned as chairman of the Proceedings Committee of the Ottawa Branch. J. L. Rannie, M.E.I.C., is acting as chairman of this committee for the balance of the year.

Calgary Branch

J. A. Spreckley A.M.E.I.C., Secretary.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

The following programme has been outlined for the first part of the coming winter season.

On November 26th, D.W. Hays, M.E.I.C., will present a paper on "Financial difficulties in irrigation development". This promises to be a most acceptable and opportune subject for consideration, especially as Mr. Hays is an up-to-date specialist in matters pertaining to irrigation engineering in particular.

A. S. Dawson, M.E.I.C., is to speak on December 10th, his subject being one of considerable importance, i.e. "Notes on deterioration and preservative treatment of wood". An account of Mr. Dawson's lengthy observations of and experiences with wooden structures, in connection with irrigation works in particular, will be invaluable information not only to the irrigationist but to every branch of engineering.

Later on announcements will appear concerning the papers to be prepared and read by Junior members of *The Institute*. These papers are in connection with a competition announced this year for a prize to be presented by W. J. Dick, M.E.I.C.

It is hoped that all members of this branch will bear in mind the fact that it is such gatherings as these that assist in keeping the branch together. Apart from the benefit derived from the papers read and subsequent discussion, we must all realize that each individual member receives a very profitable benefit from associating with his fellow members. Let us therefore make special efforts to attend these meetings, not only as an encouragement to those who take so much pains in preparing lecture matter, but also as a mark of appreciation in being associated with an Institute of which we are all proud.

Reconnaissance Survey by Aeroplane

The utility of the aeroplane in connection with survey reconnaissance work was clearly illustrated recently by B. Russell, A.M.E.I.C., of the irrigation staff, Department of Interior, when he flew as a passenger from the High River Air Force Station west to the Rockies and covered the country as far south as Macleod. Mr Russell's trip was made with the intention of locating possible reservoir sites in connection with certain irrigation projects.

He reports that it is quite impossible to judge elevations from a height of 4,000 feet, except perhaps in the mountains where canyons and slopes impress the eye. However, being armed with a map which he had carefully studied beforehand the results of his observations proved of considerable value in defining the futility of certain sites and the suitability of others. One site in particular had not been suggested on the map which was discovered from the air.

This use of the aeroplane is of considerable advantage to the Department in the tremendous saving of time occasioned. The whole trip of 250 miles took about three and a half hours instead of possibly as many weeks by other means.

Omit Flowers

It is a sorry state of affairs when an associate-editor breaks the barriers of his associate-editorship and blossoms forth into verse, but good news is scarce. I make bold to present the following as a proof that the spirit is willing but the flesh is weak indeed. I make no further apology. The most I can expect is commutation from the death penalty.

The Live Wire Engineer

This engineer, from what we hear,
Is a level headed chap.
You can "give him socks" but he takes the knocks,
And doesn't give a rap.
But get his furioso wrath
Worked up, and then you'll find
He's a battling, rattling, roaring, goring
Bull that speaks his mind.

When things go right he's a charming sight,
As calm as Mary's lamb.
He'll make a show, and look as though
He didn't care a d——n.
But woebetide if things are wrong
Or crooked, then bedad,
He's an upright, downright, inside, outside
Terror when he's mad.

He'll play the game, and take the blame
In ten times out of ten.
He's a jocund sport with never a thought
Of doing down his men.
Just watch his keen jujitsu frame,
His pertinacious chin.
He's a hustling, bustling, get there, stay there
Cuss that's bound to win.

From head to feet he can't be beat.
He's generally "fine".
He's all alive from nine to five.
And mostly five to nine.
In field, mine, forest, factory,
He makes himself at home.
He's an active, festive, jestive, restive
Guy with a level dome.

This sounds a dream, for it would seem
Such men as these don't live.
Bear this in mind, and I think you'll find
You've surely got to give
A lot of credit to the boys
Who help you to live de luxe.
They're a chivalrous, corteous, generous, prosperous (?)
Bunch of dependable bucks!

From day to day in every way,
He's bettering our needs.
With comforts here, and improvements there,
Accomplishing great deeds.
Despite each fault he's worth his salt;
Let's raise our hats and cheer
To the civil, mechanical, electrical, chemical,
Etcetera ENGINEER.

Next Please!
W. St. J. M.

Edmonton Branch

W. R. Mount, A.M.E.I.C., Secretary-Treasurer.

At an Executive meeting, held in the Board of Trade rooms on October 11th, 1923, the following officers were elected to carry on the affairs of the Edmonton Branch for the season 1923-1924.

Chairman	R. S. L. Wilson, A.M.E.I.C.
Vice-Chairman	E. Kells Hall, A.M.E.I.C.
Secretary-Treasurer	W. R. Mount, A.M.E.I.C.
Executive	C. A. Robb, M.E.I.C.
	C. C. Sutherland, A.M.E.I.C.
	H. G. Dimsdale, M.E.I.C..
	A. G. Stewart, A.M.E.I.C.
Ex-Officio	E. Stansfields, M.E.I.C.
	R. H. Douglas, A.M.E.I.C.

Halifax Branch

K. L. Dawson, A.M.E.I.C., Secretary-Treasurer.

The meeting of the Halifax Branch held in Halifax on the eighteenth of May, was called to order by the chairman who asked R. W. McColough, A.M.E.I.C., chief inspecting engineer of the Provincial Highway Board to act as chairman for the evening. Mr. McColough spoke briefly of the efforts of the board to improve the roads of Nova Scotia. Then, after referring to the occasions on which the speaker of the evening had been present with us in the past, and to the fact that he was so well known to the engineering fraternity at large and to most of us in a more or less personal way, that he needed no introduction, he gave Colonel Boyden the floor.

In introducing his subject "Concrete specifications in Highway Construction", Colonel Boyden called our attention to the fact that highway construction is now very attractive to the engineer because of the problems it presents. Motor-driven trucks and passenger vehicles with their vast tonnage and large number of passengers are making great demands on highways. Many existing roads are unsuitable for this class of traffic and have to be rebuilt or remodelled. To maintain them as they require large expenditures for repairs. Colonel Boyden has addressed a large number of the branches of *The Institute* and his interesting and instructive remarks on the subject of concrete highways have given rise to much favourable comment. From time to time during the past year, abstracts and in some instances detailed reports of these addresses have been published in *The Engineering Journal*, so that the valuable information presented by Colonel Boyden on this subject has been made available to the entire membership.

H. W. L. Doane, A.M.E.I.C., raised some arguments against the use of concrete surfaces in cold climates, where it spalls or disintegrates from repeated freezing and thawing. Mr. Doane also told of the wrecking of the alignment of curbing at the ends of the transverse walks on boulevarded streets, which was apparently due to the expansion of the concrete in the walk. In addition Mr. Doane asked for an expression of opinion concerning the strength of concrete which had been placed in freezing weather.

W. A. Winfield, M.E.I.C., spoke briefly describing the difference of the concrete surfaces which were in use in the vicinity of Stellarton and Trenton. He presumed that the better quality of the surface near Trenton was due to the greater care exercised in its construction. He told how in this climate where the air is moist cold concrete often

becomes quickly covered with a film of water which in winter freezes and makes the surface very treacherous for pedestrians and horses. This does not happen on bituminous surfaces. Concrete presents a smooth hard surface, perhaps the hardest which can be put on a road. Because of its smoothness it may be slippery in wet weather and because of its hardness it is hard on the feet of horses.

O. S. Cox, A.M.E.I.C., described some experiments to prevent the deterioration of concrete in salt water and asked for an opinion from the speaker concerning the best method for its protection.

In answering these questions Colonel Boyden said the failure of concrete in cold climates was usually due to some error on the part of the constructors, probably an error which would make the surface lack imperviousness. A transverse walk might push out the curbing but the reason would be traceable probably to shrinkage rather than to expansion. As the concrete shrank the joints between slabs would open allowing non-compressible sand or dust to enter. When the slabs returned to normal size the length of the walk would be slightly increased by the thickness of the non-compressible sand between the slabs.

Centre joints are not necessary. Any hard road is hard on a horse. In cases where a horse has his choice on a hill between concrete and brick he will choose the concrete. Even when wet concrete is the most skidproof of all pavements and its upkeep is much the lowest.

Concrete may freeze when plastic and be all right when it thaws and obtains its final set. If any hydration takes place when it is frozen the amount will be very small. When the thaw comes chemical action will begin again. Repeated freezing and thawing will certainly spoil it.

The placing and curing of concrete in salt water is receiving a great deal of attention. The best way to make sure that it will stand is to make it as impervious as is possible even to the extent of providing mass concrete with a specially mixed skin of thickness equal to two or three inches.

Professor Faulkner, M.E.I.C., referred appreciatively to the address which Colonel Boyden had given us last year. Following the lines of this address some interesting experiments had been performed in the testing laboratories of the technical college by the fourth year students which were described to the members of this branch by H. Humphrey, S.E.I.C., at the previous meeting. He thanked Colonel Boyden for the personal pleasure he was getting from listening to his lectures.

On motion of C. St.J. Wilson, A.M.E.I.C., seconded by H. W. L. Doane, A.M.E.I.C., a hearty vote of thanks from the Halifax Branch was extended to Colonel Boyden.

During the short business meeting which followed the lecture the papers committee of the past year consisting of C. A. Fowler, A.M.E.I.C., C. H. Wright, M.E.I.C., and G. S. Stairs, A.M.E.I.C., was re-elected for the ensuing year. Mr. Fowler continues as chairman.

Reminiscences of the Maritime General Professional Meeting St. John, N.B., September 26th, and 27th, 1923.

The St. John Branch possesses engineering skill so complete, provides entertainment so enjoyable, and dispenses hospitality so liberal as to beggar description.

Seventeen members of the Halifax Branch, fifteen from Halifax and two from Amherst, were present and are loudly unanimous in declaiming that the only ones who can possibly feel disappointment of any kind or degree concerning any part of the meeting are those who could not attend or neglected to do so.

The chairman of the Halifax Branch got a chance to give his "Impersonation of Robert Norwood" which some thought he had been persuaded to reserve for students' dinners and alumni banquets. A couple of engineers recently graduated from Nova Scotia Tech., could hardly be restrained from throwing at him nearby pieces of crockery when he began "He's a chap in spotless Khaki". Nevertheless the old saying "what's one man's poison is another man's meat" was again proven correct. Though the repetition of "The Civil Engineer" nearly made nervous wrecks of Bayne and Turnbull it raised the general secretary to the seventh heaven of poetic delight in which he asked for a copy and from which he did not recover before he had printed it in the October number of *The Journal*.

At the big banquet with which the festivities were brought to a close, Bill Chace, the leader of the singing in the main dining salon (just one "o" please) brought to our mind the words used by a garage man in recommending a well known, Canadian-made automobile. He said, "the older she grows and the noisier she gets, the more power she has and the better she runs; and, oh, boy! she has some swell system of lubrication".

Around the two tables in the sun parlor from which the head table was visible through the folding doors were gathered a group of young bloods under the chaperonage of Bill Johnson and a well-known Baptist Deacon from Halifax who had the best self-starter on his vocal organs which ever bore the trademark of the Canadian General Electric Company. After he had started and sung the chorus of "Yes, we have no bananas" for the ninety-ninth time his voice was just as strong, clear and musical as ever, and he was bitterly disappointed when he could not get the orchestra to play "Alouette" the way he was used to singing it. Nevertheless he created a diversion when he led the occupants of the two tables under his direct direction in a lock-step chain around the tables in the main salon.

Yes, we shall have very pleasant recollections lingering in our minds and occurring at odd times of a happy gathering of which the most unpleasant thing was that it had to end. As usual after such a function there are number of inquiries which were left unanswered when our party broke up at the depot in Halifax.

What kept Bill Chisholm up till 2 a.m. every morning?

Why did Tom Locke get up before six o'clock and leave the sleeping-car immediately after it arrived in St. John while the rest of us slept until eight-thirty?

Who were the four who played bridge in the smoking room until three o'clock in the morning? and why did Freddie Faulkner put all the winnings into his own pocket to the absolute neglect of his partner who did all the bidding and provided all the tricks that counted?

Why did Billy McKnight want company when he walked on the streets of St. John at night?

What man, of all those persuaded by F. A. Bowman that they should go has called up F. A. Bowman to thank him for importuning to accept a good time?

The thanks of all are due to the authorities of the Canadian National Railways who did all in their power to make us comfortable while we were travelling.

Toronto Branch

J. A. Knight, A.M.E.I.C., Secretary-Treasurer.
L. W. Wynne-Roberts, A.M.E.I.C., Branch News Editor.

The fall session of the Toronto Branch was opened most auspiciously on Friday October 12th, by a luncheon meeting at the King Edward hotel, attended by more than one hundred engineers representative of all branches of the profession, who gathered to hear a very able and inspiring address by E. J. Mehren, vice-president of the McGraw Hill Publishing Company, and editor-in-chief of the *Engineering News-Record*.

Seated at the head table with the chairman, Prof. C. R. Young, M.E.I.C., were E. J. Mehren and J. Clark Keith, A.M.E.I.C., secretary of the Border Cities Branch, the councillors of *The Institute*, resident in Toronto, and members of the Toronto executive. A welcome was extended to J. Clark Keith, A.M.E.I.C., who as secretary of the Border Cities Branch brought their greetings.

In introducing the speaker, the chairman paid tribute to the Canadian publishers of technical literature and referred to the stupendous developments in other lands where much has been accomplished. Fifty years ago there were no journals and treatises were scanty and imperfect. Engineering literature consisted of the transactions of various societies, but now there existed a vast field of technical literature. In its own distinct field of engineering, said Prof. Young, the Engineering News-Record has no peer in any country or any tongue.

Random Thoughts on Engineering Progress

Mr. Mehren, who took as his subject "Random Thoughts on Engineering Purpose" dealing more particularly with engineering or industrial research, and the professional relation and responsibility of the engineer to industrial problems, said that he might take as his thesis that there is no finality to engineering development, that there still remain unchartered eddies of engineering knowledge, and that only by constant advance, expression and study, can engineers fulfill their purpose of making forces and materials useful to man.

Chairman's Inaugural Address

Despite counter attractions, there was a very good attendance at the mining building, University of Toronto, on Thursday October 18th, to hear the inaugural address of the chairman, Professor C. R. Young, M.E.I.C., who, taking as his subject, "The Rise of the Engineer," reviewed the great achievements of engineers from the eighteenth century to the present day. Professor Young's address is published in full in this issue of *The Journal*.

Following the address, Walter J. Francis, M.E.I.C., president of *The Institute*, spoke of the progress of the work of *The Institute* during the past two months, and mentioned the activities of the Fuel Committee which is co-operating with Ottawa. He congratulated Professor Young upon a very remarkable address. He asserted that the welfare of a community was dependent more upon the engineer than any other citizen, and thought that the engineer should not only educate the public but should tell them on every occasion how good a citizen he was. Mr. Francis agreed with the chairman that the Golden Rule was the maxim to follow and strongly advocated the elimination of competition among engineers.

J. M. Oxley, M.E.I.C., vice-chairman of the branch referred to the fact that the young engineer is now largely engaged in business or industrial lines and that this tended to change or modify the professional tone. J. G. Dalzell, M.E.I.C., regretted that the public has been so often guided on engineering matters by men without engineering qualifications and thought that the members of the profession should take more part in civic affairs.

A hearty vote of thanks to Professor Young was moved by R. O. Wynne-Roberts, M.E.I.C., who deprecated the combination of commercialism and professionalism prevalent to-day and considered that *The Institute* should adopt a pronounced policy in this regard. W. Storrie, M.E.I.C., seconded the motion and expressed to the speaker the appreciation of all present.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.

The first regular fall meeting of the branch was held on October 4th, when a most important paper dealing with the subject of the "St. Lawrence Waterway" was read by E. A. Forward, B.Sc., M.E.I.C. This is a subject that has occupied public attention for some years past, and at the moment is perhaps one of the most timely questions of national and international import. The branch was particularly fortunate in securing the author for the presentation of this subject as he is a man who has devoted many years of his life to the study of it. There was an unusually large and enthusiastic audience and the paper was so well received and deemed of such consequence that a motion was unanimously passed at the meeting to allot another evening for the discussion of it.

The three basic principles emphasized by the speaker were: National ownership from the lakes to the sea; development as and when the occasion demands it, in the interest of Canadian trade and commerce; and the paramount importance of navigation interests over all others in the St. Lawrence.

Prior to the above meeting the membership was advised of the programme for the coming session of which a record for the month of October was recently issued. It is the intention — in compliance with the expressed wish of a number of the members — to print, if possible, advance copies of papers that will be read before the branch in future.

The attention of the members was also drawn to a letter of appreciation and motion of thanks forwarded by the American Society of Mechanical Engineers in connection with their convention held in this city last spring.

Executive Committee Meeting

The Executive Committee of the branch held their first meeting early in September and dealt with a number of matters relative to the conduct of branch affairs. This meeting was interested to learn that the membership of the branch had increased from 965 to 1458 as a result of the re-allocation of territory to the various branches. This increase in membership is for the purpose of voting only. It was decided at the meeting of this committee to re-organize a reception committee which would interest itself in the formal introduction of new members to the existing ones and render aid in the conduct of the various meetings and activities of the branch.

The Fuel Committee of the Montreal Branch is continuing its activities and will supply the local papers this month with two articles relative to the use of different classes of coal and other fuels together with the precautions required to be taken and the relative merits of the obtainable fuels on the market to-day. Warm praise has been received from all quarters on the commendable services they have undertaken to furnish the general public in the period of fuel shortage.

Work on Suburban Roads around Ottawa

Within the past four years over one million dollars has been expended by the Ottawa Suburban Roads Commission on their system of suburban roads entering Ottawa. These roads were formerly old toll roads, and are quite distinct from the provincial highways leading from the city.

The commission is an appointed body consisting of five prominent business men, the work being carried out under the direction of Alan K. Hay, A.M.E.I.C., chief engineer. Funds are derived jointly from the city, county and provincial government.

About eighteen miles of high class paved surface has been laid under contracts; largely made up of a modified type of sheet asphalt on heavy macadam base, and eighteen to twenty-two feet in width. Outlying stretches are surfaced with penetration or surface-treated macadam, maintained by day labour gangs operating with light motor trucks. A very large number of reinforced concrete culverts and short-span bridges have been built. These are designed for a twenty-ton truck live load, and a minimum width across the roadway of thirty feet to take care of future expansion of traffic.

While the larger part of the heavy construction work is done by contract, the commission handles all maintenance work including bituminous surface treatment by day labour, and has recently constructed a new one-story fireproof building to house its extensive road building plant, tools and machinery.

CORRESPONDENCE

CHILIAN TRANSANDINE RAILWAY COMPANY, LIMITED
Los Andes, Chile, S. A.
Sept. 10th, 1923.

The General Secretary,
The Engineering Institute of Canada,
Dear Sir,—

I should have written you before leaving Canada, to tell you that I had left for South America and trust that my neglect to do so has not inconvenienced you. I received a cable offering me a post with this company as assistant engineer, and left in a very great hurry.

You have doubtless read of this railway. It is one of the most interesting in the world, and an engineer's work on it is of a varied and interesting nature. This summer (May to Sept. winter) there will be a lot of snowshed and avalanche construction, and also the construction of some diversions which will be cheaper than putting up sheds. In the Andes the mountains are so much barer than in North America, and as a result avalanches are much more frequent than at home. The ruling dimensions of the line are:—

Gauge	1 metre.
Max. adhesive grade	2½ per cent.
Max. rack grade	8 per cent.
Max. curve adhesive	100 metres radius.
Max. curve rack	200 metres radius.
Length	240 kilometres.
Length of summit tunnel	3,200 metres.
Height of summit tunnel	3,188 metres.

I am delighted to have got down here for I feel there is a big future in South America, particularly for railways.

Would you kindly change my address as above for the despatch of *The Journal*, etc.

With all good wishes to yourself and *The Institute.*

Yours faithfully,
C. B. R. MACDONALD, A.M.E.I.C.

American Society of Mechanical Engineers Officers

The report of the tellers of the results of the election for officers of the A.S.M.E. for 1924 shows:—

President: (One year)	FRED. R. LOW, Editor, *Power*, New York City.
Vice-Presidents: (Two-year term)	GEORGE I. ROCKWOOD, President and Treasurer, Rockwood Sprinkler Company, Worcester, Mass.
	W. J. SANDO, Consulting Engineer, Milwaukee, Wis.
	H. BIRCHARD TAYLOR, Vice-President, Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
	M. L. COOKE, Consulting Engineer in Management, Philadelphia, Pa.
Managers: (Three-year term)	E. O. EASTWOOD, Professor of Mechanical Engineering, University of Washington, Seattle, Wash.
	F. A. SCOTT, President, The Warner and Swasey Company, Cleveland, Ohio.
	E. R. FISH, Vice-President, The Heine Boiler Company, St. Louis, Mo.
Treasurer: (One year)	W. H. WILEY, President, John Wiley & Sons, Inc., New York City.

C.G.S. Arctic Returns to Quebec

The C.G.S. "Arctic", with Captain J. E. Bernier, the veteran navigator, at the helm, recently docked at Quebec after completing her second successful trip to Canada's Arctic islands. The expedition, which was again under the capable supervision of Mr. J. D. Craig, B.A., B.Sc., M.E.I.C., advisory engineer of the North West Territories and Yukon Branch, supplemented the work inaugurated last year.

The "Arctic" covered a distance of about 7,500 miles, the only breaks in the routine being an exchange of courtesies with the Danes at Godhavn and Donald B. MacMillan's party at Etah, Greenland, the latter being the farthest northern point at which the vessel stopped. A feature of the trip was the trial of three Eskimos for murder, a judicial party having been taken north for this purpose.

Mr. Craig is optimistic with regard to the possibilities of the Arctic archipelago, where there are said to be rich mineral deposits together with boundless wealth in furs. It was hoped to establish a police post at Cape Sabine on the Canadian side a few miles farther north than Etah, but ice conditions rendered this undertaking impracticable.

Engineering of Excavation

By Geo. B. Massey.

Reviewed by Professor R. deL. French, M.E.I.C.

In reading over the 370 pages of which this book is composed, the reviewer has concluded that the author's definition of either "excavation" or "engineering" is at variance with his own.

Mr. Massey does not mention at all many of the commonest appliances used in handling earth and rock, such as, pick-and-shovel, ploughs, horse or tractor-drawn scrapers of various types, trench machines like the Carson, etc. Possibly he does not consider that any engineering skill is required in choosing the proper one of these appliances to use in a given case, or he may not consider the moving of earth and rock in relatively small quantities as "excavation". Furthermore, it impresses the reviewer that too large a proportion of this book is padded with detail descriptions of the equipment discussed a great deal of which might have been taken bodily from trade catalogues.

Fifteen chapters cover the design, and to a lesser extent the operation, of large and small shovels, drag line excavators, trench diggers, buckets, the hydraulic giant, hydraulic dipper, bucket and clam shell dredges, scows and barges. Two chapters are devoted to the design and construction of dredge hulls; one to transportation; one to drilling and blasting, and one to boilers, fuel, etc.

The exceedingly interesting and logical treatment of some excavation problems, such as the use of large shovels for stripping work, lead one to believe that Mr. Massey might have improved his book to a great extent had he employed the same methods throughout.

In spite of what appear to the reviewer to be defects, "Engineering of Excavation" is well worth a place in any engineer's library, as it brings together between two covers a mass of information, which, so far as the reviewer is aware, is not elsewhere available in one place. Very liberal use has been made throughout the book of halftone illustrations, and numerous folding plates show the details of certain types of equipment.

The book is published by John Wiley and Sons, Inc., New York.

Publications Received During the Month.

Transactions, Proceedings, etc.

Presented by the Societies

American Society for Testing Materials, Year Book, August 1823. A.S.T.M. Standards Adopted in 1923.

Proceedings of the Institution of Mechanical Engineers, January - April, 1923, Volume 1.

North-East Coast Institution of Engineers and Shipbuilders (Incorporated Volume XXXIX, 39th, session, 1922-1923.

The Institution of Aeronautical Engineers, Minutes of Proceedings No. 5.

The South Wales Institute of Engineers, Proceedings, Volume XXXVIII, 65th session, Jan. 27, 1922-Nov. 25, 1922. (Embracing the Coal-fields of South Wales and Monmouthshire, the Forest of Dean, Gloucestershire and Somersetshire).

The South Wales Institute of Engineers, Proceedings, Volume XXXVIII, Issued Septenber 26th. 1923. Special Engineering Exhibition Number, Part 1, — Engineering Conference, Nov. 20-24, 1922; Part II, — Engineering Exhibition, Nov. 20-29, 1922. (Embracing the Coal-Fields of South Wales and Monmouthshire, The Forest of Dean, Gloucestershire, and Somersetshire).

The South Wales Institute of Engineers, Proceedings, Volume XXXIX, Issued October 9th. 1923. Ordinary General Meeting, Cardiff, March 22nd, 1923 and Swansea, April 27th. 1923. (Embracing the Coal-Fields of South Wales and Monmouthshire, The Forest of Dean, Gloucestershire, and Somersetshire).

The South Wales Institute of Engineers, Proceedings, Volume XXXIX, Issued October 9th. 1923. Institute Summer Meeting, Edinburgh, June 16-23, 1923. (Embracing the Coal-Fields of South Wales and Monmouthshire, The Forest of Dean, Gloucestershire, and Somersetshire).

Technical Books

Presented by Gauthier-Villars et Cie, Editeurs, Paris.

Discours de la Nature de l'Air de la Végétation Des Plantes. Nouvelle Découverte Touchant La Vue, par Edme. Mariotte.

Presented by E. & E. N. Spon, Limited.

Sexton's Boiler Makers' Pocket Book. 7th Edition.

The Engineers' Pocket Technical Dictionary, French-English by Mark Lvoff.

Mechanical Engineering Formulae, by E. W. Huddy.

Presented by John Wiley & Sons, Inc.,

Sewerage, by Folwell. 9th edition.

Elements of Machine Design, by Kimball and Barr. 2nd edition.

Mechanism of the Steam Engine, by James and Dole. Volume 1.

Automatic Sprinkler Protection, by Dana. With supplement III.

Acoustics of Building, by Watson.

Presented by McGraw-Hill Book Company, Inc.

The Electric Furnace for Iron and Steel, by Stansfield.

Presented by Harvard University Press.

Manual of Information on City Planning and Zoning, Including References on Regional, Rural, and National Planning, by Theodora Kimball.

Reports

Presented by State of New York, U.S.A.

Report of the New York State Bridge and Tunnel Commission to the Governor and Legislature of the State of New York, 1923. Legislative Document (1923) No. 108.

Presented by Department of Railways and Canals, Highway Branch Dominion of Canada.

Highway Maintenance Methods and Costs Bulletin No. 3.

Presented by Canada, Dominion Water Power Branch, Department of the Interior.

Surface Water Supply of Canada, St. Lawrence and Southern Hudson Bay Drainage (Ontario) Climatic Year 1921-22. Water Resources Paper No. 38

Presented by Department of the Interior, Canada.

Manitoba, Canada, Its Development and Opportunities by F. H. Kitto, F.R.G.S.

Presented by Tidal and Current Survey, Department of Marine and Fisheries, Canada.

Tide Tables for the Pacific Coast of Canada for the Year 1924. Including Fuca Strait, the Strait of Georgia, and the Northern Coast, With data for Slack Water in the navigable Passes and Narrows and Information on Currents.

Tide Tables for the Eastern Coasts of Canada for the Year 1924. Including the River and Gulf of St. Lawrence, the Atlantic Coast, the Bay of Fundy, Northumberland and Cabot Straits; and Information on Currents.

Presented by Department of Mines, Province of Ontario.

Thirty-First Annual Report of the Ontario Department of Mines, being Volume XXXI, Part VII, 1922. Geology of the Watabeag Area, by Douglas G. H. Wright.

Thirty-First Annual Report of the Ontario Department of Mines, being Volume XXXI, Part VIII, 1922. Iron Formation of Lake St. Joseph, by E. L. Bruce, Eastern Part of Lake St. Joseph, by E. L. Bruce, Area South of the West End of Lake St. Joseph, by E. L. Bruce.

Presented by Department of the Interior, Bureau of Mines, Washington, U.S.A.

Progress of Investigations on Liquid-Oxygen Explosives, by S. P. Howell, J. W. Paul, and J.L. Sherrick. Techincal Paper No. 294.

Comparative Tests of By-Product Coke and Other Fuels for House-Heating Boilers, by Henry Kreisinger, John Blizard, H. W. Jarrett and J.J. McKitterick. Technical Paper No. 315.

Anhydrous Aluminum Chloride, by Oliver C. Ralston. Technical Paper No. 321.

Presented by Department of the Interior, U.S. Geological Survey.

Arsenic in 1922, by V. C. Heikes and G. F. Loughlin. I:6.

Quicksilver in 1922, by F. L. Ransome with a Supplementary Bibliography by Isabel P. Evans. I:11.

Magnesium and its Compounds in 1922, by J. M. Hill and G. F. Loughlin. II:8.

Strontium in 1922, by George W. Stose. II:9.

Fuller's Earth in 1922, by Jefferson Middleton. II:11.

Presented by Officials of the Sanitary District of Chicago.

Statements by Officials of the Sanitary District of Chicago respecting the Diversion of Water from the Great Lakes, Exposed and Refuted, by Sir Adam Beck.

Presented by Canadian Manufacturers Association, Incorporated.

Canadian Trade Index Issue of 1923-1924, Comprising four parts.

Trade Publication

The Under-Feed Stoker Company of Canada, Limited, have issued two bulletins on new equipment; one illustrating the Arrowood system of Pulverized Fuel burning and the other a Lateral Retort Under-Feed Stoker. In addition a small booklet entitled "Coal — The Basic Fuel" has also been prepared for distribution. These bulletins will be supplied upon request.

Preliminary Notice

of Applications for Admission and for Transfer

October 22nd, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in November, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members

FOR ADMISSION

BEAVERS—GEORGE ROBERT, of 106 Weber Street East, Kitchener, Ont. Born at Gosforth, North'd., England, July 11th, 1901; Educ., 2 years scientific course Tynemouth Municipal High School. 1917-21, ap'ticeship in engrg., Wallsend Slipway and Engrg. Co. Ltd., Wallsend-on-Tyne, England. During ap'ticeship attended evening sessions, the Marine School of South Shields. Also private tuition. 1922 (Jan.-June), on sales staff, Messrs. Ross & Greig, Montreal. At present, dftsman., Canadian Blower & Forge Co. Ltd., Kitchener, Ont.

References: A. H. Ross, W. J. Turnbull, S. Shupe.

BROWN—THOMAS ALAN, Jr., of 529 Gilmour Street, Ottawa, Ont. Born at Stratford, Ont., March 10th, 1898; Educ., B.Sc. (Civil), Queen's Univ., 1923; 1921-22 (summers), on primary triangulation, Geodetic Survey of Canada; May 1923 to date, asst. engr., The Hull Electric Co., Ottawa, Ont.

References: G. G. Gale, W. P. Wilgar, A. Macphail, W. L. Malcolm, J. E. R. Ross.

BURGESS—BERT IRA, of 337 Downie Street, Peterborough, Ont. Born at Fairville, N. B., July 18th, 1898; Educ., B. Sc. Univ. of N. B., 1921; 1916 (summer), res. engr's. party, St. John & Quebec Rly.; 1917-19, overseas. Can. Engrs.; 1920 (summer), with New Brunswick Constrn. Co.; July 1923 to date, junior asst. switchboard engr., Can Gen. Elec. Co., Peterborough, Ont.

References: E. R. Shirley, W. M. Cruthers, T. E. Gilchrist, G. R. Langley P. Manning.

CANNING—DOW VERNON, of 337 Downie Street, Peterborough, Ont. Born at Brockville, Ont. June 29th, 1899; Educ., B. Sc., McGill Univ. 1921; 1919 (2 mos.) with Belgo-Canadian Pulp and Paper Co., Shawinigan Falls; 1920 (4 mos.), with Bailey Meter Co., Cleveland, Ohio; 1921-22, test course, Can. Gen. Elec. Co., Peterborough, and from Jan. 1922 to date, junior asst. switchboard engr. with same company.

References: E. R. Shirley, T. E. Gilchrist, W. M. Cruthers, P. Manning, G. R. Langley.

GORDON—HAROLD COWAN MORTON, of Glace Bay, N. S. Born at Leven, Scotland, Oct. 9th, 1899; Educ., B. Sc. (mining), McGill Univ. 1923, Prov. "A" Nova Scotia. War certificate, R.M.C.; During vacations for past five years, and at present, underground and surface surveying, and underground constrn., Dominion Coal Company, Glace Bay, N. S.

References: J. B. Porter, A. L. Hay, J. R. Morrison, S. C. Mifflen, J. A. Fraser, C. M. McKergow, H. M. MacKay.

GRANT—ELMER GORDON, of St. John, N.B. Born at Port Morien, N. S. Nov. 20th. 1891; Educ., Common Sch. Even'g tech. schools, correspondence instr'n, one term in N. S. Tech. Coll. as special student; six years with Dominion Coal Co., Ltd., on power plant; two years watch engr. with Cape Breton Electric Co., Sydney, (first class competency certificate); four years sales engr. Can. Gen. Elec. Co.; at present apparatus salesman at St. John office of above company.

Reference: C. H. Wright, J. B. Hayes, S. C. Webb, C. C. Curtis, P. A. Freeman.

HAGERMAN—BERNARD HARRISON, of Fredericton, N. B. Born at Fredericton, N.B., Oct. 19th, 1901; Educ., B. Sc., Univ. of N. B., 1923; during univ. course summers with prov. highway dept.; 1922 (summer), and since graduation, instr'man, and asst. to res. engr. on highway work in prov. of New Brunswick.

References: B. M. Hill, E. O. Turner, M. W. Black, A. F. Baird, C. McN. Steeves.

HEWARD—FRANCIS STEPHEN BEVERLEY, of 186 Mansfield Street, Montreal, Que. Born at Montreal, August 28th, 1891; Educ., B. Sc.(Mech.), McGill Univ. 1912; 1907-08, survey-irrigation dept., C.P.R., Calgary; 1910-11, ap'tice., machine shop, Robb Engrg. Wotks, Amherst, N.S.; 1911-12, ap'tice machine shop and testing floor, James Howden & Co. Ltd., Glasgow, Scotland; 1912-16, manager for Canada and United States for James Howden & Co. Ltd.; 1918-23, director and works manager, for the above company, also director of the Combustion Engrg. Corpn. Ltd.

References: J. T. Farmer, C. M. McKergow, K. B. Thornton, R. J. Durley, J. C. Kemp, A. Wilson.

INGLIS—THOMAS McFARLANE, of 1400 Robinson St. Regina, Sask. Born at Glasgow, Scotland, Aug. 1st. 1865. Ap'tice'ship as marine engr. with Wm. King & Co. Glasgow, later as journeyman for 9 mos; served as 3rd. 2nd. and 1st. engr. with Messrs. T. Wilson Sons & Co., steamship owners, Hull, Eng. for 20 years, ten years of this time being first engr; came to Canada in 1905, from 1906-23, steam boiler insp'r, for Prov. Govt. of Saskatchewan.

References: H. S. Carpenter, R. N. Blackburn, L. A. Thornton, D. A. R. McCannel, J. N. De Stein, J. M. MacKay.

KEMPTON—JOHN, of Montreal, Que. Born at Sheffield, England, Feb. 4th, 1890; Educ., grammar school, asst. gen. mgr. of coal sales, British Empire Steel Corporation, Montreal, Que.

References: F. W. Gray, G. D. Macdougall, D. H. McDougall, A. P. Theuerkauf, C. M. Odell, H. B. Gillis, F. L. Wanklyn.

LEGRIS—CHARLES ERNEST, of St. Joseph d'Alma, Lake St. John, Que. Born at Arctic, R. I., U. S. A. April 12th, 1886; Educ., B. Sc. (C. E.), McGill Univ. 1911; 1910 (summer), rodman with Chester Thayer, C. E., Providence, R. I.; 1911 (summer), rodman, 1912 (summer), instr'man., Boston Elevated Rly.; 1913 (summer), struct'l. dftsman., Monks & Johnston, engrs. and archts., Boston; 1913 (Sept.-Oct.), demonstrator in astronomy, McGill Univ.; 1914 (summer), struct'l. and concrete dftsman., Stone & Webster, Boston; 1914-15, private practice, civil engrg. and surveying, Arctic, R. I.; 1915-16, town engr., W. Warwick, R. I. Also private practice; 1916-17, private practice, Arctic; 1917-20, instr'man., Western Carolina Power Company, hydro-electric development, Bridgewater, N. C.; 1920-22, asst. engr., with above company; 1922-23, res. engr. with Catawba Mfg. & Elec. Power Co., Charlotte, N. C. [illegible] of city of Charlotte pumping stn. and raising of Rozzelle Ferry Bridge. At present [illegible] with Quebec Development Co., St. Joseph d'Alma, Lake St. John, Que.

References: W. S. Lee, H. G. Cochrane, H. M. Mackay, R. DeL. French, W. G. Mitchell, C. N. Shanly, A. DesRosiers.

LEIGHTON—CHESTER ADAM, of 1639 Comox Street, Vancouver, B. C. Born at Portland, Me., U. S. A., Oct. 25th, 1885; Educ., A. B., Bowdoin College, 1908; 1908-11, rodman, transitman and inspr. for constrn., New York Central and Hudson River R. R. office, and field work in connection with constrn. of tracks, etc.; 1911-14, transitman and field engr. for J. G. White & Co., New York City; 1914-15, asst. [illegible] for Wm. H. Ellis & Sons, Boston, Mass.; 1915-16, asst. supt. for Sperry Engrg. Co., New Haven, Conn.; 1916-18, asst. supt. and supt. for Stone & Webster, Boston, Mass.; 1918-19, industrial supt. for Atlantic Loading Co., New York; 1919-21, [illegible] Machler Co., Philadelphia, Pa.; 1921 to date, [illegible] Company, Vancouver, B. C.

References: W. Smaill, A. D. Swan, [illegible]

MARTHELEUR—LEIE LOUIS of Sydney, N.S. Born at Marcinelle Belgium, Sept. 17th, 1885; Educ. mining and elec. engr., Louvain Univ., 1908. Scientific work Royal Observatory of Belgium at Uccle (Brussels), 1909-10; 1911-19, chief electrician, Acadia Coal Company, Stellarton, N.S., 1919-23, engr. and asst. mgr., Cie de Tramway & d'Eclairage de Tientsin, North China. At present, electrical engr. all coal operations British Empire Steel Corpn., Sydney, N.S.

References: D. H. McDougall, J. S. Whyte, S. C. Mifflen, J. J. McDougall, A. E. Hay, R. S. Kelsch, A. R. Chambers.

MORRISON—GEORGE, of 200 Brookland Street, Sydney, N.S. Born at Aberdeen, Scotland, Sept. 30th, 1879. Educ., diploma, dept. of elec. engrg., City and Guilds of London Tech. Coll., London, 1897, 1897-1902, ap'tice engr., Wm. McKinnon & Son, mech. engrs., Aberdeen, Scotland; 1902-03, engr. in charge, erection of elec. machy.; mtce and converting machinery and switchgear, Witting Bros., London, England; 1903-05, engr. in charge of erection etc., Witting, Eborall & Co., London; 1905-10, supt. of erection dept., Brown, Boveri & Co. Ltd., London; 1910-12, with same company in charge of contract dept.; 1913-23, special engr. with the Canadian Crocker Wheeler Co., later the English Electric Co. of Canada Ltd., St. Catharines, Ont.; At present district manager maritime provinces, English Electric Co. of Canada, Ltd.

References—H. A. Moore, J. S. Whyte, W. B. Macdonald, E. G. Cameron, S. C. Mifflen.

MUNRO—WILLIAM CAULDWELL, of Thorold, Ont. Born at Toronto, Ont. March 26th, 1900; Educ., B. Sc. McGill Univ., 1923; 1919 (summer) with Price Bros. & Co., Kenogami, working directly under Dr. J. S. Bates; 1920-22 (summer), worked in the various depts. in the mills, and since graduation, asst. engr., Ontario Paper Co. Ltd., working on Manicouagan development, 75,000 h.p. hydraulic and pulp mill constrn.

References: J. S. Bates, C. M. McKergow, H. M. MacKay, J. B. Porter, E. Brown, J. R. Donald.

REID—GEORGE GRAHAM, of 34 Victoria Street, Toronto, Ont. Born at Palmerston, Ont., April 28th, 1895; Educ., 2 years, faculty of science, Univ. of Toronto, 1917-18, 1919-20; 1915-17, 1920-21, part 1922, contractor on structural work; for the past three years and at present engineer with A. W. Connor, M.E.I.C., Toronto. (last year in partnership.)

References: A. W. Connor, F. W. Thorold, R. C. Muir, C. W. Cornell, P. Gillespie.

RIDDELL—JOHN MORRISON, of 55 Fairmont Avenue, Ottawa, Ont. Born at Toronto, Ont., March 9th, 1892; Educ., B. A.Sc. Univ of Tor., 1913; 1912, asst. to R. W. E. Loucks, D.L.S. subdivision; 1913, asst. to Jas. Dobie, D. & O. L. S. gen. surveys; 1914, inspr., waterworks dept., city of Toronto; 1914 (Aug.-Nov.), in charge primary triangulation in prov. of Quebec for Geodetic Survey of Canada; 1915, in charge of reconnaissance for primary triangulation connection between Quebec and New Brunswick; 1916-19, overseas. Lieut. & Capt., Can. Engrs.; 1920, on city triangualtion, London, Ont., Geodetic Survey of Canada; 1921, in charge of precise traverse work in Ontario for Geodetic Survey of Canada, and at present, junior geodetic engr., Geodetic Survey of Canada, Ottawa.

References: N. J. Ogilvie, J. L. Rannie, W. M. Tobey, A. M. Grant, J. W. Menzies.

RISLEY—WILFRED CARY, of 154 Whitney Avenue, Sydney, N. S. Born at Piermont, N.H., U.S.A. Dec. 29th, 1877, Educ., B. S. Dartmouth College, 1900; 1905-20, field engr. and supt. of constrn., Dominion Iron & Steel Co.; 1920-23, supt. of mtce. railways and shipping terminals, British Empire Steel Corpn., Sydney, N.S.

References: D. H. McDougall, C. D. Macdougall, C. M. Odell, A. P. Theuerkauf, J. S. Whyte.

SHARON—MAURICE WILLIAM, of Regina, Sask. Born at St. Thomas, Ont. Nov. 1st, 1875; Educ., Collegiate Institute, St. Thomas, Ont.; 1894-97, with John R. Long & Son, architects, St. Thomas; 1897-98, mech. dept., Michigan Central Rly.; 1898-99, C.P.R.; 1899-1900, Moran Bros., engrs. and shipbuilders, Seattle, Wash.; 1900-05, topog'l branch, Dept. of the Interior, Ottawa; 1905-09, dept. public works, Regina; 1909-13, practising architect, Regina; 1913-23, chief architect, dept. of public works, prov. of Sask., Regina.

References: D. A. R. McCannel, J. M. Patton, R. N. Blackburn, H. S. Carpenter, A. P. Linton, L. A. Thornton, S. S. Kennedy.

HILL—SHERWOOD NORMAN, of Ottawa, Ont. Born at London, Ont.., March 22nd. 1881; Educ., grad., mining engrg., school of practical science, 1904, C. E, Univ. of Toronto, 1914; 1901-02, (summers), railroad constrn. work. Ont. land surveys 1903 (summer), roadways' dept., city engrs' staff, Toronto; 1904 to date, with topographical surveys, Dept. of the Interior, asst. office engr., asst. to T. S. Nash, D. L. S., M. E. I. C., Ottawa.

References: T. Shanks, A. M. Narraway, T. S. Nash, G. H. Blanchet, E. S. Martindale, G. H. Herriot.

STEVENS—FREDERICK, of Walkerville, Ont. Born at Watford, Hertfordshire, Eng. May 2nd. 1885; Educ., I.C.S. course in structural engr'g. and pvte. study; 2 years in shop of Hamilton Bridge Works Co., Hamilton, Ont; 1902-09, general shop work on structural steel, bridge, steam shovel and locomotive constrn. Canada Foundry Co., Toronto; 18 mos. in office and 6 mos. resident on constr'n of C.P.R. Company's elevator at Port McNicol, Ont. for Can. Bridge Co., Ltd., Walkerville, Ont. and 3 mos. with Structural Steel Co., Ltd., of Montreal in charge of erection of G. T. Central station train shed at Ottawa and building for Canada Cement Co., at Hull, Que. as resident engr. and in general charge of work (1911); 1912, made model of Quebec Bridge for St. Lawrence Bridge Co.,Ltd.; 3½ yrs. with St. Lawrence Bridge Co., Montreal organized ten-plate dept., assisted in operation of plant as a foreman and was responsible for co-operation of depts. until June 1915; June 1915-March 1919, overseas with Can. Overseas Rly Constrn. Corps, promoted to Corporal in charge of steel bridge section, arrived in France, Aug. 26th. 1915, awarded Military Medal, promoted to C.S.M. served continously in France until Jan. 1919, discharged in Canada, March 27th. 1919; 1919 to date checker on bridge and structural steel work, Can. Bridge Co. Ltd., Walkerville, Ont.

References: G. F. Porter, C. M. Goodrich, S. E. McGorman, H. W. McMillan, A. P. Richardson, A. L. Harkness, J. W. Seens, LeRoy Wilson.

THOMAS—EDWARD ARNOLD, of 55 Queen Street, St. John, N.B. Born at Runcorn, Cheshire, England, June 21st, 1880. Educ., Silcoat's College, Wakefield, Yorks. 1902-03, Manchester Technical School, 1903-04, ordnance survey, British Isles, 1905-08, rodman, gen. asssistance, including instrument works, drftng., cost analysis, St. John Water Works, Loch Lomond extsn.; 1908-12 asst. engr., dept. public work office of res. engr., St. John Harbour and River, 1912-15 asst. in charge to res. Engr., St. John Harbour, 1915-19 overseas, Lieut. & Capt., C.M.R.; 1920-22, asst. engr., office of engr. public works, St. John Harbour, March, 1922 to date, asst. in charge of the Courtenay Bay staff, under the engr. public works, St. John Harbour.

References: H. G. Hunter, G. G. Murdoch, C. McN. Steeves, H. F. Bennett, A. Gray.

WALL—EDWARD WALTER, of 1048 Sherbrooke Street East, Montreal, Que. Born at Easthampton, Mass., August 28th, 1888. Educ., Sc. B. in C.E., Brown Univ., 1910; 1910, gen. engrg. work for town of East Providence, R.I. and with Frank T. Westcott, C.E., North Attleborough, Mass., on survey work; 1910-11, mtce. of way dept., New York, New Haven and Hartford Railroad, Providence, R.I., on location and plotting of public and private sidings; 1911 Oct.-Nov., with same R.R. as inspr. on constrn. of new abutments to the Boston and New York main line bridge at Westerley, R.I.; 1911-12, constrn. engr., in charge of all lines and levels and quantities upon the erection of the Vineberg bldg., for the Atlas Constrn. Co. Ltd., Montreal; 1912-14, constrn. supt., and from 1914 to present date, gen. supt. in charge of all constrn. work for same company.

References: C. M. Morssen, C. J. Desbarats, F. E. Field, F. Y. Dorrance, W. H. Wardwell, L. A. Amos.

WOOTTON—ALLEN SHAKESPEARE, of 975 Park Road, Vancouver, B.C. Born at Brackley, Northants, England, July 26th, 1873; Educ., Magdalen College School (Oxon), Associate in Arts, Univ. of Oxford; 1891-96, pupil and asst. to late Joseph Newman, C.E., England. Design and constrn. of waterworks, sewers, highways, bridges and bldgs.; 1896-1900, engr. and surveyor to several large estates in England; 1900-04, borough surveyor and watefworks engr., South Molton, England; 1904-10, town surveyor and waterworks engr., Bradford-on-Avon, Eng.; 1911-13, supt. of waterworks, New Westminster, B. C.; 1913 to date, chief engr. to Board of Park Commissioners, Vancouver.

References: G. A. Walkem, C. Brakenridge, A. E. Foreman, W. Smaill, N. J. Ker, P. Philip, A. G. Dalzell.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

DANAIS—PIERRE, of Baie Saint Paul, Charlevoix, Que. Born at Baie Saint Paul, Apr. 25th. 1890; Educ., B. Sc., Queen's Univ., 1917 and graduate of Lavel Univ; during course, summers were spent working with land surveyors; 1917, leveller on water power development at Chicoutimi under Edouard Lavoie; 1918-1920, pvte. practice and worked with land surveyors; 1920-1921, engaged in railroad preliminaries as dftsman, topographer and transitman, under J. F. Grenon A.M.E.I.C.; 1921-23, erecting engr. for Quebec Highway on Montreal-Sherbrooke road, for five mos. directing the concrete work, later appointed divisional engr. for counties of Rouville, Iberville and Missisquoi, during summer engaged at the works and during winter dftng. in the office, under A. Paradis, Dist. Engr. and Gabriel Henry, A.M.E.I.C., at present general supervisor of the works above mentioned.

References: G. Henry, J. F. Grenon, J. Tremblay, St. G. Harvey, H. Warren.

NEILSON—STANLEY ALEXANDER, of 353 Westhill Ave., Montreal, Que. Born at St. Thomas, Ont. Sept. 6th. 1895; Educ., B.Sc., McGill Univ. May 1916; 1912 (summer) timekeeper Alberta Central Rly.; 1913, (summer) rodman Central Rly. of Canada; 1916 (summer) dftsman. with C.D. Howe, Grain Elevator Engineer, Regina, Sask.; Sept. 1916-Apr. 1917, demonstrator, engrg. subjects, McGill Univ.; Apr. 1917-May 1918, res engr. Hull Electric Co. Hull., Que., in charge track and paving constrn. m'tce., etc.; May 1918-Feb. 1919. Lieut. Can. Engrs. at St. Johns, Que and Seaford, Sussex, Eng.; Feb. 1919-May 1920, asst. to outside plant engr. Bell Telephone Co., of Canada, working on standardization of outside plant materials, constrn. methods, foreign wire relations, etc.; May 1920-March 1921, advtg. solicitor for Engineering Journal; Mar. 1921-Mar. 1922, dftsman, Canadian Laco Lamps, Ltd. Montreal, Que. working on design and constrn. of machinery for manufacture of tungsten lamps; Apr. 1922, to date with Walter J. Francis & Co., consltg. engrs., Montreal Que. as asst. engr. on hydro-elec. power development surveys, plans, estimates, investigations, reports, etc.

Reference: W. J. Francis, F. B. Brown, G. G. Gale, G. M. Hudson, E. Klein, L. B. Kingston, F. S. Keith.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

KIRBY—GUY HURLSTON, of Kenogami, Que. Born at Cookshire, Que., March 31st, 1895; Educ., B.Sc.(elec.), McGill Univ. 1922; 1915-19, overseas, C.E.F.; 1919-20, elec. mtce and repairs, experiments in electro-chemistry, etc., Price Bros. & Co. Ltd.; 1922, dtvn. plant engr's. office, eastern dtvn., Bell Tel. Co. of Can., asst. field engr., acting toll line engr.; At present, charge of high voltage transmission line contrn., supt. of transmission line dept., Price Bros. & Co. Ltd., pulp and paper mills, Kenogami, Que.

References: C. V. Christie, G. M. Hudson, S. E. Oliver, E. Vinet, H. V. Bignell, G. F. Layne, W. G. Mitchell, F. L. Darrell.

Trade Publication

Portland Cement Association, are distributing a pamphlet entitled "Concrete Data for Engineers and Architects" which is prepared as an aid in the making of good concrete. The principles set forth in this booklet are based on data compiled from many thousands of tests made at the Structural Materials Research Laboratory, which is maintained jointly by the co-operation of the Lewis Institute and the Portland Cement Association. The subject matter is well illustrated and contains a number of interesting tables which, with the other data given, should prove most valuable to those interested in principles of concrete making as developed by Professor D. A. Abrams, M.E.I.C. This booklet may be secured upon application to the Publicity Department of the Canada Cement Company, Limited, Montreal, Que.

Oil Burner Manufacturers Form Association

The American Association of Oil Burner Manufacturers, a national organization of both home and industrial oil burner manufacturers, was recently formed in Chicago. Broadcasting accurate data concerning oil burning and the oil burner industry is one of the Association's principal aims. Wallace C. Capen, Home Appliance Corporation, St. Louis, was elected president, and Leod D. Becker, Editor of Fuel Oil for Heat and Power, Galesburg, Ill., was made acting secretary. Temporary headquarters will be maintained at 518 Bank of Galesburg Building, Galesburg, Illinois, and Room 605, 20 E. Jackson Blvd., Chicago. The Association will gladly answer inquiries from interested individuals or firms concerning all kinds of oil burning.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

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Harrison W. Craver, Director
Engineering Societies Library,
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A

AERODYNAMICS

PLANE TABLES. The Aerodynamic Plane Table, A. F. Zahm. Nat Advisory Committee for Aeronautics, Report No. 166, 1923, 10 pp. 11 figs. Describes plane table for accurate and expeditions geometrical measurement of models in an aerodynamic laboratory, and for miscellaneous truing operations.

AERONAUTICAL INSTRUMENTS

CONTROL-SURFACE-POSITION RECORDER. An Instrument for Recording the Position of Airplane Control Surfaces, K. M. Ronan. Nat. Advisory Committee for Aeronautics—Technical Notes, no. 154, Aug. 1923, 4 pp., 3 figs. on supp. plate. Describes instrument which makes a continuous record of angular position of an airplane in steady flight and during acrobatics; has proven useful in researches into stability and controllability.

RECORDING TACHOMETER. The N. A. C. A. Recording Tachometer and Angle of Attack Recorder, H.J.E.Reid. Nat. Advisory Committee for Aeronautics—Technical Notes, no. 156, Aug. 1923, 3 pp., 4 figs. on supp. plate. Description of airplane-flight apparatus for use in conjunction with a recording galvanometer employed for obtaining continuous records of angle of attack and engine speeds.

AERONAUTICS

RESEARCH. Making America Independent in the Air. Mech. Eng., vol. 45, no. 9, Sept 1923, pp. 513-520, 17 figs. Inception of National Advisory Committee for Aeronautics, its organization for research and results it has achived at Langley Field laboratory. Wind-tunnel testing; instruments for determining magnitude and distribution of stresses in aircraft; flight testing of airplanes; test airplanes; oil-engine design.

Relation between Aeronautic Research and Aircraft Design, Joseph S. Ames. Roy. Aero. Soc.—Jl., vol. 27, no. 152, Aug. 1923, pp. 381-404, 23 figs. Wilbur Wright lecture, delivered May 31, 1923.

Standardization of Methods of Research, Richard Glazebrook. Flight, vol. 15, no. 26, June 28, 1923, pp. 347-350, 2 figs. Progress of research in various countries, especially on models carried out in wind tunnels of different designs.

AIR COMPRESSORS

LOSSES. Wastage in Compressed-air Systems, F. Johnstone Taylor. Eng. & Min. Jl.-Press, vol 116, no 8, Aug. 25. 1923, pp. 331-332, 6 figs. Meter an effective aid in checking power losses; describes different types.

AIR PUMPS

STEAM-CONDENSING PLANTS. Development of Air Pumps for Steam Condensing Plants, W. A. Dexter, Inst Mar. Engrs.-Trans., vol. 35, July 1923, pp 77-120 and (discussion) 120-130, 27 figs. Description of different types of pumps and their uses.

AIRPLANE ENGINES

HEAVY-OIL. The Heavy-Oil Aero Engin, J. L. Chaloner. Gas & Oil Power, vol. 18, no. 215, Aug. 2, 1923, pp. 181-183, 2 figs. Discusses progress and prospects of heavy-oil airplane engine.

REVOLVER-TYPE. The Revolver Type Engine. Autocar, vol. 51, no. 1450, Aug. 3, 1923, p. 189, 2 figs. A design which was tried in France ten years ago and which has now been produced by Edouard Lafge in form of a 300-hp. aero engine with 16 cylinders arranged in two horizontally opposed rings or magazines of eight each, principles upon which it works, embodying novelty and simplicity, increase thermal efficiency.

AIRPLANES

AIRFOILS. The Effect of Airfoil Thickness and Plan Form on Lateral Control H. L. Hoot. Nat Advisory Committee for Aeronautics, Report No. 169, 1923, 11 pp., 23 figs. Description of tests carried out on six model airfoils in wind tunnel to determine effectiveness of ailerons, and results obtained.

MAIL. The Aeromarine Night Mail Plane. Aviation, vol. 15, no. 10, Sept 3, 1923, pp. 274-275, 2 figs. All-metal fuselage, high-lift wings, and Liberty engine are distinguishing features of new airplane.

The Curtiss Night Mail Plane. Aviation, vol. 15, no. 10, Sept 3, 1923, 272-273, 2 figs. Powered with C6 163-hp. engine; performance and weights; characteristics and special features.

WINGS. Thrust Centres and Maximum Load of Wings ((Les centres de poussé et les portances maxima des ailes),) W. Margoulis. Aéronautique, vol. 5, nos. 49 and 50, June and July 1923, pp. 254-259 and 292-300, 15 figs. Effect of profile of carrying surfaces on longitudinal stability; recent Göttingen experiments on wing profiles; Joukowski profile; transformation of Joukowski formula; wing profiles proposed by Mises and Tchapliguine; thrust centres; effect of number and disposition of wings.

AIRSHIPS

RIGID. New Type of Rigid Airship, H. K. Ihrig. Aviation, vol. 15, no. 10, Sept. Sept. 3, 1923, p. 283, 1 fig. Proposed type with external helium chambers and internal hydrogen chambers.

ALCOHOL

DENATURED. Denatured Alcohol in Canada, Ross E. Gilmore. Can. Chem. & Metallurgy, vol. 7, nos. 5 and 6, May and June 1923, pp. 116-118 and 155-158. Also Chem. & Industry, vol. 42, no. 34, Aug. 24, 1923, pp. 802-808. Complete summary of composition, use and consumption of denatured alcohol with review of regulations in United States and Great Britain; recoverability and toxicity; denatured alcohol in Great Britain and United States; industrial alcohol for motor fuel; quality and price.

ALIGNMENT CHARTS

PRACTICAL CONSTRUCTION. Practical Construction of Alignment Charts, R. T. Livingston. Power Plant Eng., vol. 27, no. 18, Sept 15, 1923, pp. 933-935, 5 figs. Study of various types of charts for various purposes

ALLOYS

BRASS. *See Brass.*

BRONZE. *See Bronze.*

RESEARCH. Research and Control Methods in Metallurgy (Méthodes de recherche et de contrôle dans la métallurgie de précision), Pierre Chevenard. Société des Ingénieurs Civils de France—Procès-Verbal, no. 13, June 22, 1923, pp. 451-457. Deals with a series of alloys of special physical and chemical properties produced at Imphy works of Commentry-Fourchambault Co., including invar, elinvar, platinite—which can be welded to glass etc., and describes methods of testing.

AMMONIA COMPRESSORS

SINGLE-ACTING. Performance of Single Acting Simple Ammonia Compressor, and Tubular Condensers, Refrig. Eng., vol. 10, no. 1, July 1923, pp. 14-21. Discussion of paper by George A. Horne, printed in same journal, Nov. 1922. (See reference in Eng. Index 1922, p. 35.)

ANEMOMETERS

RECORDING. A Component Anemometer, Kyotoku Fuji. Japanese Jl. Physics—Trans., Abstracts, vol. 1, nos. 9-10, 1923, pp. 101-106, 5 figs. partly on supp. plates Construction and operation of an anemometer recording continuously two rectangular components of wind velocity.

APPRENTICES, TRAINING OF

FOUNDRY. Training Foundry Apprentices, H. A. Frommelt. Foundry, vol. 51, nos. 17 and 18, Sept 1 and 15, 1923, pp. 689-691 and 737-739, 2 figs. Educational system with both practical and theoretical branches established by Falk Corporation, Milwaukee, Wis.

Training Foundry Apprentices in France, H. M. Lane. Iron Age, vol. 112, no. 12, Sept. 20. 1923, pp. 733-734, 1 fig. Making directors of molding-machine operators and foremen; much of work done in green sand rather dry.

ASBESTOS

QUEBEC, CANADA. The Quebec Asbestos Industry, Norman R. Fisher. Can. Min. Jl., vol. 44, no. 33, Aug. 17, 1923, pp. 649-655, 9 figs. Describes Johnson's mine; production record, occurrence, characteristics of asbestos; mining methods, milling methods; crushing, drying, grading etc

ASPHALT

MIXTURES. Factors Controlling Behavior of Asphalt Mixtures, Jacques C. Morrell and Lester Kirschbraun. Chem. & Met. Eng., vol. 29, no. 9, Aug. 27, 1923, pp. 362-364, 5 figs. Physical properties of mixtures of solid and liquid hydrocarbons widely used in industry.

AUTOMOBILE ENGINES

CARBURETORS. *See Carburetors.*

LUBRICATION. Dilution of Crankcase Oil is Serious Factor Even in Summer, A. Ludlow Clayden. Automotive Industries, vol. 49, no. 9, Aug. 30, 1923, pp. 415-417, 3 figs. Average of 10 to 15 per cent of fuel in lubricant in hot weather greatly reduces viscosity. Oxidation which strikes under side of hot piston head encouraged by mixing. Keeping oil cool and free from dirt.

TESTING. How One British Laboratory Conducts Tests of Automotive Engines, Harry R. Ricardo. Automotive Industries, vol. 49, no. 11, Sept. 13, 1923, pp. 527-531, 5 figs. Experimental work shows that unsatisfactory performance is due chiefly to poorly designed combustion chambers which give rise to detonation, incomplete burning of fuel and to excessive mechanical losses, faulty distribution required overrich mixtures.

On the Testing of Engines, H. L. Ricardo. Automobile Engr., vol. 13, no. 179, Aug. 1923, pp. 250-255, 14 figs. Apparatus proposed and methods of testing

AUTOMOBILE FUELS

ALCOHOL. Alcohol the Motor Fuel of the Future, C. C. Green. Chem. Age (Lond.), vol. 9, no. 215, July 28, 1923, pp. 84-85. Description of sources and manufacture of alcohol, tabulated comparison of characteristics of alcohol, petrol and benzol, with deductions drawn therefrom, results from practical experiences in use of an alcohol mixture in modern motor car.

See also Alcohol.

LIGNITE AND PEAT PRODUCTS. Substitute Automotive Fuels Obtained from Lignite and Peat, P. M. Heldt. Automotive Industries, vol. 49, no. 11, Sept. 13, 1923, pp. 536-537. Low temperature distillation system applicable to these as well as coal, both used extensively in Europe, lubricating oils are obtained, but quality has been unsatisfactory; experiments made in Germany and other countries.

AUTOMOBILE MANUFACTURING PLANTS

CITROEN, PARIS, FRANCE. Features of a French Automobile Plant. Iron Age, vol. 112, no. 11, Sept. 13, 1923, pp. 672-673, 3 figs. Citroen plant in Paris installs tube and billet mills, rapid handling of cars by paint drying system.

CONVEYING BODIES TO ASSEMBLY. Conveying Automobile Bodies to Assembly. Iron Age, vol. 112, no. 7, Aug. 16, 1923, pp. 406-407, 3 figs. Efficient handling through tunnel under Cleveland street, both vertical and horizontal movement.

FORD RIVER ROUGE PLANT. Ford Principles and Practice at River Rouge. John H. Van Deventer. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 151-159, 26 figs. Manufacturing and assembling body parts.

QUALITY ENGINEERING DEPARTMENT. Standards of Quality Are Maintened by Special Department, W. L. Carver. Automotive Industries, vol. 49, no. 8, Aug 23, 1923, pp. 376-378. Details of quality engineering department inaugurated at plant of Packard Motor Car Co. for maintenance of uniform, standard quality throughout entire production and constant study and investigation from every angle toward any improvement consistent with standards of engineering, manufacturing and service departments; how it operate and what it accomplishes.

AUTOMOBILES

BRAKES. Four-Wheel Brake Developments. Auto-car, vol. 51, no. 1452, Aug. 17, 1923, pp. 296-298, 5 figs. Magnetically operated brakes for front or rear wheels; improved methods of four-wheel brake application.

Proper Study of Weight Distribution Essential to Correct Brake Design, P. M. Heldt. Automotive Industries, vol. 49, nos. 6, 7, 8, and 9, Aug. 9, 16, 23 and 30, 1923, pp. 258-260, 322-324, 370-373 and 424-426, 2 figs. Discussion of important phases of brake design. Aug. 9: Inaccuracies in calculating efficiency of various brake elements. Aug. 16, Advantages and disadvantages of transmission brakes. Aug. 23: Major problems involved in four-wheel brake design. Aug. 30: Pressure is more evenly disrtibuted over surface of band brakes.

Quality of Brakes Has Marked Effect on Capacity of Highways, W. S. James. Automotive Industries, vol. 49, no. 9, Aug. 30, 1923, pp. 412-414, 4 figs. Minimum stopping distance is usually controlled by friction between tires and road and proportion of weight on wheels which are braked. Slippery road surfaces and unsafe brakes reduce number of vehicles per hour arteries can handle.

PARTS MANUFACTURE. Addition of Simple Fixtures Lowers Manufacturing Costs. Automotive Industries, vol. 49, no. 8, Aug. 23, 1923, pp. 380-382, 8 figs. Economic problems of parts manufacturing plant; considerable flexibility in equipment often necessary; efficiency can be increased without raising overhead expense; special grinding process simplifies work on horns; describes methods found useful.

SIGNAL AND TAIL LIGHTS. Electric Signal and Tail Lights for Cars. Elec. Ry. Jl., vol. 62, no. 9, Sept. 1, 1923, pp. 333-334, 4 figs. Use of an inside shell, fitted with glass of different colors, which can be rotated between lamps and lens, permits a variety of indications to be given.

SUSPENSION. Suspension of Vehicles (Quelques remarques sur la suspension des véhicules), P. Lemaire. Technique Moderne, vol. 15, nos. 8, 9, 10 and 11, Apr. 15, May 1, 15 and June 1, 1923, pp. 241-243, 265-273, 300-307 and 327-331, 24 figs. Dynamic and geometric laws of motion; formulas and calculations; characteristics of springs; movement of axles and parts suspended; movement of chassis during running; definition of comfortable riding; amplitude of oscillations and their absorption; experimental verification; measuring coefficient "comfortable"; etc.

WHEELS. Comparative Merits of Steel Dics and Wood Wheels for Automobiles, J. W. White. Soc. Automotive Engrs.—Jl., vol. 13, no. 8, Sept. 1923, pp. 207-241 and (discussion) 211-212, 3 figs. Problem of whether, in comnection with disc wheel, a five or four-wheel set will be preferred generally; disk-wheel-tire inflation; disk and wood-wheel comparisons; essential technical features of disk wheel that require careful study; resiliency and fatigue; energy for acceleration; noise; steel for disk wheels; finish.

Wire Wheels, W. W. Davison. Soc. Automotive Engrs.—Jl., vol. 13, no. 3, Sept. 1923, pp. 201-204 and 233, 5 figs. Discusses spoke breakage, chief difficulty in use of wire wheels for heavy cars during pioneer days; spoke design; triple-spoke system; greater tire mileage, easy tire change, and quicker get-away obtained with wire-wheel-equipped car; driving parts.

AVIATION

AERIAL TRANSPORTATION. Air Transport, W. Sefton Brancker. Inst. of Transport—Jl., vol. 4, no. 9, July 1923, pp. 357-366 and (discussion) 367-384. Value of air transport; its relation to other forms of transportation; economic, safety, and other factors.

LIGHTING FOR NIGHT FLYING. Artificial Illumination for Landing Fields, Charles Stahl. Aviation, vol. 15, no. 11, Sept. 10, 1923, pp. 302-304, 7 figs. Notes on lighting requirements for night landing; airplane searchlights; long-range beacon light; illuminating the fields.

B

BAGASSE

FUEL VALUE. Increasing Fuel Value of Bagasse, H. Sornay. La Planter & Sugar Mfr., vol. 71, no. 6, Aug. 11, 1923, pp. 113 and 114. How to avoid use of another fuel than bagasse, improving quality of bagasse; bagasse drying; etc.

BALANCING

ROTATING MACHINERY. Mechanical Balance of Rotating Machinery, Philip G. Bernholz. Power Plant Eng., vol. 27, no. 17, Sept. 1, 1923, pp. 891-892, 1 fig. Deals with medium-size and medium-speed machines, taking running balance.

BEARINGS

ANTI-FRICTION. Tracing Anti-Friction Bearings to their Origin, Philip C. Gunion. Belting, vol. 23, nos. 1 and 2, July and Aug. 1923, pp. 36, 38, 40, 42, and 30 and 32, 4 figs. July: Principles of modern bearings used by ancients; wheels and pulleys, babbitt metal, function of lubricant. Aug.: Development of ball and roller bearings.

BEARINGS, BALL

QUALITY RESEARCH. Research Finds Answers to Questions About Ball Bearing Quality, H. G. Freeland. Automotive Industries, vol. 49, no. 8, Aug. 23, 1923, pp. 368-369. Metallurgist claims after tests it is next to impossible to procure steel which is entirely free from defects; experiments with forming and forging process; says strains set up during forging can be removed by annealing.

BEAMS

CONCRETE, TORSIONAL STRENGTH. Torsional Strength of Rectangular Sections of Concrete, Plain and Reinforced, C. R. Young. Am. Architect & Architectural Rev., vol. 124, no. 2425, Aug. 1, 1923, pp. 121-125, 6 figs. Exact method of analysis, torsion of reinforced concrete beams, torsional stress, reinforcement, tests on concrete sections, University of Toronto test specimens, test results, conclusions.

REINFORCED CONCRETE. New Type of Pre-Cast Concrete Construction, F. M. Mc-McCullough. Eng. and Contracting Buildings, vol. 60, no. 1, July 25, 1923, pp. 175-178, 4 figs. Results of tests of reinforced-concrete beams. Reprinted from Carnegie Tech. Jl.

BEARINGS, THRUST

MICHELL. Michell Bearings for Tunnel Shafting, Engineering, vol. 116, no. 3005, Aug. 3, 1923, p. 157, 11 figs. Notes on application of Michell principle to lubrication of tunnel shafting of S. S. Philoctetes.

BELT DRIVE

FUNDAMENTALS. Fundamentals of Transmission of Power by Belting, Louis W. Arny. Indus. Management (Lond.), vol. 10, no. 3, Aug. 9, 1923, pp. 73-84, 2 figs. Pulley grip and elasticity essential to efficiency of a belt; large influence of arc of contact.

LUMBER MILL. Typical Belt Drives in Lumber Mill of Latest Design, W. A. Scott. Belting, vol. 23, no. 2, Aug. 1923, pp. 21-23, 8 figs. Practice of Sugar Pine Lumber Co., Pinedale, Cal.; large number of big and heavy leather belts used, while rubber conveyor belts are also in service.

BELTING

LEATHER, TESTS OF. How a Leather Belt Transmits Power, J. Edgar Rhoads and R. R. Tatnall. Iron Age, vol. 112, no. 8, Aug. 23, 1923, pp. 484-485, 4 figs. Considerations of tension on two sides of belt, relation of speed and friction to power.

BLAST-FURNACE GAS

BURNERS. Blast Furnace Gas Burners. Practical Engr., vol. 68, no. 1901, Aug. 2, 1923, pp. 61-62, 5 figs. Describes burners made by Power Gas Economy Co., Glasgow.

UTILIZATION. Utilization of Blast-Furnace and Coke-Oven Gas (Sur l'utilisation des gaz de hauts fourneaux et de fours à coke), Lucien Mauge. Métallurgie, vol. 55, nos. 23, and 24, June 7 and 14, 1923, pp. 823-825 and 859-860. Characteristics of these gases, use for boiler firing, firing of Martin furnaces, use of mixture of both gases; coke-oven gas for synthetic ammonia by Claude process.

BLAST FURNACES

CHARGING. Variation of Ratio of Coke and Determination of Price of Raw Materials in the Thomas Pig Iron Blast Furnaces (Variation de la mise au mille de coke et détermination du prix des matières premières dans les hauts-fourneaux en fonte Thomas), P. Presles. Revue de Métallurgie, vol. 20, no. 7, July 1923, pp. 457-468. Calculations of quantity of coke for ores of different character and for different composition of coke, cost per ton of smelting under varying conditions.

OPERATION. The Use of Hot, Dry, Humid or Superoxidized Air in Gas Producers, Cupolas and Blast Furnaces (Remarques diverses au sujet de l'emploi de l'air chaud, de l'air sec ou humide et de l'air suroxygéné dans les gazogènes, cubilots et hauts fourneaux), J. Seigle. Revue de Métallurgie, vol. 20, no. 7, July 1923, pp. 481-489, 1 fig. Varying conditions desired in each case, gas producers and furnaces.

BOILER FEEDWATER

DE-GASSING. The Kestner System of Purification, Evaporation and De-Gassing. Power Engr., vol. 18, nos. 208 and 209, July and Aug. 1923, pp. 262-264 and 309-311, 9 figs. In Paul Kestner's system of boiler feedwater purification a small percentage of boiler contents is continuously blown down, being carried to softening apparatus, thus heating up raw water and shortening time required for elimination of salts. Kestner evaporator.

SALT ELIMINATION. Concentration Salinity Indicators for Measurement of Surface-Condenser Leakage and Distilling Plant Operation, C. A. Jones. Am. Soc. Naval Engrs.—Jl., vol. 35, no. 3, Aug. 1923, pp. 526-538, 12 figs. Apparatus and methods developed to eliminate salt from boiler feedwater.

BOILER FIRING

TEMPERING COAL. The Tempering of Coal, Thomas A. Marsh. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 369-379, 4 figs. Conclusions drawn from investigations, reports to questionnaires, and discussion.

BOILER FURNACES

AIR PREHEATING. Air Preheater Types and Application, Johnstone Taylor. Power Plant Eng., vol. 27, no. 18, Sept. 15, 1923, pp. 928-930, 5 figs. Review of British attitude towards benefits derived from use of preheater air for boiler furnaces.

Ljungstrom Air Preheater. Chem. & Met. Engr., vol. 29, no. 8, Aug. 20, 1923, pp. 326-327, 3 figs. Carries heat continually in mechanical way from flue gases to incoming air, compact in design, simple in operation and permits ready application to existing plants or new installations.

General Factors Governing Design of Arches, Zuce Kogan. Power Plant Eng., vol. 27, no. 18, Sept. 15, 1923, pp. 930-932, 2 figs. Analysis of action of arches and factors involved in their design.

FORCED DRAFT. Should Draft Over the Fire Be Controlled? L. M. Eliot. Steam Power, vol. 2, no. 5, June 1923, p. 10, 1 fig. Outline of conditions which must be met in determining most economical draft over fire for any boiler using forced draft.

GAS EXPLOSIONS IN. Gas Explosions in Boiler Furnaces and Flues (Les explosions de gaz dans les foyers et carneaux de chaudières), Victor Kammerer. Société Industrielle de Mulhouse—Bul., vol. 89, no. 5, May 1923, pp. 317-325. Presence of explosive mixtures in boiler furnaces and rules to follow for avoiding explosions and consequent damage.

BOILER OPERATION

COMBUSTION-CONTROL APPARATUS. Present State of Combustion Control (La tecnica del controllo della combustione allo stato presente). Industria, vol. 37, nos. 5, 6 and 8, Mar. 15, 31 and Apr. 30, 1923, pp. 94-96, 113-114 and 149-150, 19 figs. Deals with manometers, water, steam, and gas meters, thermometers, pyrometers, pyroscopes, apparatus for analysis of products of combustion, etc.

GRAPHIC CONTROL. Graphic Control Applied to Steam Generators (Le contrôle graphique individuel appliqué aux générateurs de vapeur), H. Carra and F. Reymond. Chaleur & Industrie, vol. 4, no. 38, June 1923, pp. 511-513, 4 figs. on supp. plate. Charts showing avoidable losses in steam generators, and their application.

OIL-FIRED, AUTOMATIC CONTROL FOR. Automatic Control for Oil Fired Boilers, S. B. Derby. Power Plant Eng., vol. 27, no. 17, Sept. 1, 1923, pp. 875-876, 2 figs. Scheme used in plant of John B. Stetson Co.which has given satisfactory results.

TEMPERATURE CONTROL. Temperature Control for Boilers, F. D. Potter. Combustion, vol. 8, no. 5, June 1923, pp. 374-376, 3 figs. Presents chart and table showing relation between temperature and CO_2.

TROUBLES. Boiler Troubles from the Operating Man's Standpoint, Carl J. Smith. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 349-353. Deals with troubles encountered in operation and maintenance of steel-mill boilers.

WATER-TUBE BOILERS. Recent Water Tube Boiler Practice A. G. Pratt. Steam Power, vol. 2, no. 7, Aug. 1923, pp. 5, 10, and 12. Improvements in design enabling more efficient operation; use of pulverized coal for boiler firing.

BOILER PLANTS

HEAT AND POWER LOSSES. Power Problems of Vital Interest to Executives, James T. Beard. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 170-176, 7 figs. Heat and power losses, and how to prevent them

TEST CODE FOR. Test Code for Stationary Steam-Generating Units. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 548-558 and 565. Preliminary draft of another code in series of 19 being formulated by A.S.M.E. Committee on power test codes.

BOILERS

DESIGN. Boiler Design and Furnace Maintenance, William Sidney Corner. Indus. Australian & Min. Standard, vol. 70, nos. 1805 and 1806, July, 5 and 12, 1923, pp. 17-19 and 56-58, 5 figs. Particulars of some boiler installations; boiler settings; arch maintenance; side walls, etc.; baffles; secondary combustion; water-cooled backs; firebricks. Abstract of paper read befoer Instn. Engrs., Australia.

HEATING, FUELS FOR. Comparative Tests of By-Product Coke and Other Fuels for House-Heating Boilers, Henry Kreisinger, John Blizard, H. W. Jarrett, and J. J. McKitterick. U. S. Bur. Mines, Technical Paper 315, 1923, 21 pp., 10 figs. Results of tests made to compare by-product coke, bituminous coal and anthracite as fuels for small boilers. One of series of reports disseminating information regarding fuels best adapted for heating houses. Bibliography.

HIGH-PRESSURE. High Pressure-Steam Boilers, D. S. Jacobus. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 335-347, 3 figs. Describes development and operation of series boilers; in latest boilers for high-pressure and high-temperature superheated steam built by Babcock & Wilcox Co. superheater is placed above series of tubes in drop-leg and below main body of tubes of boiler.

JOINTS STANDARDS. Standards for Tongue and Groove Joints. Power Plant Eng., vol. 27, no. 17, Sept 1, 1923, pp. 877-878, 1 fig. Recommendations by Olaf E. Oleson for standardization of flanges and bolting for steam service.

OIL BURNING, CONVENTION TO. War Department Turns to Fuel Oil, W. W. Bowman. Power, vol. 58, no. 9, Aug. 28, 1923, pp. 327-329, 3 figs. A high record of gross and net combined boiler and furnace efficiency test with varying loads.

BRAKES

AIR. Electric Road Operation and Maintenance of Air Brakes, F. A. Miller. Pacific Ry. Club—Jl., vol. 7, no. 3, June 1923. pp. 28-32 and (discussion) 33-36, History of development, applications to different types cars; maintenance and handling.

The Development of the Air Brake for Steam Road and Traction Uses, V. Villette. Pacific Ry. Club—Jl., vol. 7, no. 3, June 1923, pp. 3, 5, 7, 9, 11, 13, 15, 17, 19-24, 6 figs. Historic paper outlining air-brake development; relation to steam railroads and traction service; many different types; locomotive equipment; traction brake equipment

FREIGHT-TRAIN. Continuous Brakes for Goods Trains. Engineer, vol. 136, no. 3530, Aug. 24, 1923, pp. 192-194, 3 figs. Position it occupies in different countries other than United States. Table showing capital spent on automatic-vacuum-brake-fitted goods stock, and anticipated savings if fully operated.

BRASS

EXTRUSION. Swaging Brass Articles—Role of Extrusion (L'emboutissage des pièces en laiton—Rôle de l'écrouissage). Albert Portevin. Revue de Métallurgie, vol. 20, no. 5, May 1923, pp. 320-329, 25 figs. Successive stages of swaging; effect of manufacturing methods on miscrostructure; calculating tools for cartridge cases; etc.

BREAKWATERS

TORONTO, CANADA. Rapid Progress on Toronto Breakwater. Contract Rec. & Eng. Rev., vol. 37, no. 32, Aug. 8, 1923, pp. 763-767, 14 figs. Further details of piece of marine construction protecting 3½ miles of shore; consists of pre-cast concrete blocks on rock filled cribs, capped with mass concrete.

BRIDGES, CONCRETE

DESIGN. Standard Bridge Practice of the Michigan State Highway Department, C. A. Melick. Concrete, vol. 23, nos. 1 and 2, July and Aug. 1923, pp. 3-10 and 69-71, 15 figs. July: Standard abutments; standardization of designs; type of structure. Aug. Width of roadway; unit stresses used, provision for wider roadways

BRIDGES, HIGHWAY

ECONOMIC PROBLEMS. Economic Highway Bridge Problems, Lewis M. Gram. Eng. & Contracting (Roads & Streets), vol. 60, no. 2, Aug. 1, 1923, pp. 238-243, Life of structure and initial cost; capacity and life period of bridge; difficulty of making roadway fit traffic; economic position; permanency of bridges from material standpoint. Paper presented before Mich. Conference on Highway Eng.

LOADING. Proposed Loading for Highway Bridges, Harold D. Russey. Am. Soc. Civ. Engrs. Proc., vol. 49, no. 6, Aug. 1923, pp. 1031-1037, 4 figs. Discussion of highway-bridge loads with proposed new loading system for use in highway bridge design

BRIDGES, LIFT

BASCULE. A Bascule Bridge of New Type and Its Construction, Thomas E. Brown, Jr. and William G. Grove. Eng. News-Rec., vol. 91, no. 10, Sept. 6, 1923, pp. 374-377, 7 figs. Features of highway bridge at Mystic, Conn., in which counterweight rotates through a considerably smaller angle than span, varying effect of length of hanger link maintains balance, toe locks eliminated

BRIDGES, RAILWAY

CONCRETE, PRECAST. Two Precast Concrete Bridges on Lackawanna R.R., M. Hirschthal. Eng. News-Rec., vol. 91, no. 10, Sept. 6, 1923, pp. 384-388, 9 figs. One carrying railroad at Millburn, N. J., made up of heavy slabs replaced under traffic lighter steel structure, other 48-ft. footbridge over three-track right-of-way.

GIRDERS. Rock Island Uses Long Girders in New Bridge. Ry. Age, vol. 75, no. 9, Sept. 1, 1923, pp. 389-392, 7 figs. Problems encountered in renewing structure without interference with train movements. Ten large through plate girders to be placed in double-track bridge of Chicago, Rock Island & Pacific over Sylvan Slough.

VIBRATION. The Vibration of Bridges, C. W. Lloyd Jones. India Ry. Board. Tech. Paper no. 233, 1923, 16 pp. Fourth report of Indian Railway Bridge Committee containing Appendix 6 B of report. Notes of author's interviews with engineers in United States giving their opinions on impact allowances in railway bridge design.

BRIDGES, SUSPENSION

VENEZUELA. Suspension Bridges in Venezuela (Algunas anotaciones sobre los puentes colgantes de Venezuela) M. Silveira. Revista del Colegio de Ingenieros de Venezuela, Vol. 1, no. 3, Mar. 1923, pp. 40-47, 2 figs. Mathematical details and calculations of the new highway bridges in course of construction according to the system of Luis Velez.

BRONZE

CASTING. Effect of Heat Treatment on Release of Stress in Bronze Castings, Robert J. Anderson and Charles H. Eldridge. Am. Inst. Min. & Met. Engrs.—Trans., no. 1259-N, Aug. 1923, 13, pp. 8 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, p. 428. Results of experiments carried out in Bur. of Mines in studying effect of heat treatment on release of internal stresses in bronze castings; experiments on cast bronze rings of nominal composition 87:7:5: 1 copper-tin-zinc-lead showed that heating for 1 hr. at 550 deg. cent. was sufficient for removal of internal stresses up to 11, 200 lb. per sq. in.

BUILDING CONSTRUCTION

JAPAN. Special Stiffening of Tokio Buildings. Iron Age, vol. 112, no. 11, Sept. 13, 1923, pp. 685-686, 1 fig. Much more bracing steel used than in American buildings of same type; all parts tied together to resist distortion.

C

CABLES, ELECTRIC

AERIAL. Installation of Aerial Cables, F. A. Westbrook. Elec. World, vol. 82, no. Sept. 15, 1923, pp. 534-536, 10 figs. Methods of placing cable in position; construction equipment used; special installation for corners, dead-ends and crossings; protection of cable and provision for future extensions.

CAISSONS

SINKING. Concrete Caissons Sunk in Place for Wharf and Seawall, Frank G. White. Eng. News-Rec., vol. 91, no. 7, Aug. 16, 1923, pp. 252-254, 7 figs. Seawall for China Basin terminal no San Francisco Bay consists of caissons 57 ft. deep connected by concrete arches placed in precast sections.

CAR LIGHTING

BATTERIES, REPAIR OF. Battery Repair Methods on the C. B. & Q. Ry. Age, vol. 75, no. 9, Sept. 1, 1923, pp. 379-381, 7 figs. New system results in more efficient service and marked economy of operation; overway track system expedites handling of batteries.

CARBURETORS

KEROSENE. Self-Contained Kerosene Carburetor Developed in England. Automotive Industries, vol. 49, no. 9, Aug. 30, 1923, pp. 436-437, 2 figs. Exhaust-heated manifold not needed with new product which is smaller than other units of this type and is similar in some respects to Packard fuelizer. Engines fitted with self-contained kerosene carburetor claimed to consume less fuel and produce more power. Abstract from Engineering.

See also Motor Trucks.

CARGO HANDLING

BRITISH AND AMERICAN METHODS. "Cargo Handling at Ports. British and American Methods Compared, Bryson Cunningham. Indus. Management (Lond.), vol. 10, nos. 2 and 3, July 26 and Aug 9, 1923, pp. 48-50 and 81-82. Tidal influence; burtoning; quay crane; overside delivery; conveyors; coal handling; grain handling. See also Inst. Transport—Jl., vol. 4, no. 9, July 1923, pp. 405-414 and (discussion 414-422, 5 figs.)

CAST IRON

GRAPHITE FLAKES IN. Graphite Form in Gray Iron, J. W. Bolton. Foundry, vol. 51, nos. 16 and 17, Aug. 15 and Sept. 1, 1923, pp. 658-664 and 699-703, 39 figs. Author offers proof that forms of combined carbon determine first arrangement of graphite flakes; distinguishes between two forms of graphite flakes and names these "primary" and "secondary." Points out some of simpler foundry applications of microscopic study based on actual problems; effects of operating conditions must be considered when drawing conclusions from metallography.

SYNTHETIC. Manufacture of Pearlitic Grey Cast Iron in the Electric Furnace. Foundry Trade Jl., vol. 28, no. 363, Aug. 2, 1923, pp. 95-96, 4 figs. Synthetic production of cast iron, and especially pearlitic iron, in electric furnace at Brown, Boveri & Co.'s works in Baden. Translated from article by Dr. H. Frei in Die Giesserei for July 12, 1923.

CASTINGS

REPAIR. Repairing Broken Castings, Walter J. May. English Mechanic & World of Sci., vol. 118, no. 3046, Aug. 10, 1923, pp. 35-36, 5 figs. Welding, brazing, soldering, riveting, and other methods

CEMENT

SILICA. Silica Cement, E. N. McGee. Am. Ceramic Soc. Jl., vol. 6, no. 8, Aug. 1923, pp. 896-903, 1 fig. Discusses composition, requirements and specifications for first-quality silica cement, and describes adequate control tests for determining its suitability; investigation of bonding qualities

CEMENT MILLS

DRY PROCESS. Phoenix Company's Birmingham Plant Completed in Record Time. Rock Products, vol. 26, no. 17, Aug. 25, 1923, pp. 19-25, 25 figs. New 1,500,000 bbl. plant completed in seven months, proximity to fuel and raw materials, cheap power, small amount of labor required, and low machinery maintenance costs will make possible an unusually low production cost

CENTRIFUGES

DEVELOPMENTS. Centrifugal Separation. Chem. & Met. Eng., vol. 29, no. 11, Sept. 10, 1923, pp. 459-464, 7 figs. Contains following articles: Is There a Centrifugal Solution for Your Production Problem? Lee H. Clark. A New Field for the Centrifuge. Oliver C. Ralston

CHAIN DRIVE

APPLICATIONS OF. Field of the Silent Chain Drive in Power Transmission, D. I. Wheeler. Belting, vol. 22, no. 6, June 1923, pp. 30-38, 1 fig. Discusses four classes of application, the line-shaft, individual machine, auxiliary unit, and miscellaneous. D

DIRECTION OF CHAIN TRAVEL. Direction of Chain Travel in Silent Chain Drives, D. I. Wheeler. Belting, vol. 23, no. 2, Aug. 1923, pp. 56 and 58, 5 figs. Light strand on bottom preferable when conditions are normal, as in belt drives; abnormal conditions, however, will require tight side on top

CHIMNEYS

FOUNDATIONS. Chimney Foundations, W. Wallace Christie. Power, vol. 58, no. 12, Sept. 18, 1923, pp. 459-460. Describes proportioning of foundations for various conditions, both favorable and otherwise.

SIZES. The Determination of Chimney Sizes, Alfred Cotton. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 537 and 569, 21 figs. Describes simple and orderly system for determining sizes of chimneys, and presents charts giving static draft and maximum capacity of chimneys up to 500 ft. high and 25 ft. diam., from which working draft and capacity are found by means of fundamental curve, other charts give factors for various atmospheric temperatures for altitudes, and for approximate work based on boiler horsepower. (Abridged.)

CHROME-NICKEL STEEL

CHANGE POINTS IN. The Change Points in Some Nickel Chromium Steels, W. T. Griffiths. Iron & Steel Inst.—Advance Paper, no. 7, for Meeting, Sept. 1923, 31 pp. 19 figs. partly on supp. plates. Investigation to ascertain effect on position of point of varying relative proportions of carbon, nickel and chromium in these steels, other variables being kept as constant as possible.

CLAY

BENTONITES. The Properties of Some Clay-Like Materials of the Bentonite Type, H. G. Schurecht and H. W. Douda. Am. Ceramic Soc.—Jl., vol. 6, no. 8, Aug. 1923, pp. 940-948, 3 figs. Evidence indicates that bentonites are mixtures of two or more materials rather than one; properties.

BRIQUETTING. Manufacturing Fuel by the Pure Coal Briquette Process, C. H. S. Tupholme. Chem. & Met. Eng., vol. 29, no. 10, Sept. 3, 1923, pp. 401-403, 2 figs. Method of low-temperature carbonization which depends for success on preparation of coal prior to carbonizing; results of tests on coke thus obtained and figures on producing costs.

COMPARING HEAT VALUE. Effective B.t.u. and Cost Determine Value of Coal A. Berment. Power, vol. 58, no. 12, Sept. 18, 1923, pp. 448-450. New method proposed for comparing heat values effective to furnace of different coals; cost delivered and effects of moisture and ash are considered; using best coal as standard, other grades of coal are compared, and their relative values as fuel determined.

COAL

DISTILLATION. Potentialities of Low-Temperature Distillation in the Conservation of Out Fuel Resources, V. Z. Caracristi. Chem. Age (N. Y.), vol. 31, no. 8, Aug. 1923, pp. 361-365, 3 figs. Economics and applications of low-temperature distillation; low-temperature coke; applications in central power plants and factory power plants.

MICROSCOPY. A Preliminary Report on the Microscopy of Anthracite Coal, Homer G. Turner and H. R. Randall. Jl. of Geology, vol. 31, vol 4, May-June 1923, pp. 306-313, 11 figs. Results of investigation which had as its purpose treatment of anthracite so that its microscopic features could be easily discerned.

SCREENING. Screening and Washing of Coal (Le classement et le lavage des charbons Leur intérêt pratique, leur technique), M. Berthelot. Métallurgie, vol. 55, no. 31, Aug. 2, 1923, pp. 1107-1108. Coal treating plants and their operation; washing apparatus, recovery of fines, etc.

COAL HANDLING

BRIDGE CONTROL. A System of Coal and Ore Bridge Traverse Control for Protection Against Wind and Skewage Hazards of Skew Type Direct Current Bridges, P. R. Canney. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 425-447, 12 figs. Points out common and special hazards resulting from traversing operation, and describes system of control designed to afford protection against such hazards.

CONVEYORS FOR POWER PLANTS. Coal Conveyors for Modern Power Plants, J. E. Borland. Power Plant Eng., vol. 27, no. 18, Sept. 15, 1923, pp. 917-921, 6 figs. Coal-handling equipment for storing, reclaiming and distribution to boilers.

LOADING MACHINES. Good Results Secured with Loading Machines. Coal Industry, vol. 6, no. 8, Aug. 1923, pp. 351-353, 4 figs. West Virginia mine secures large tonnage with loading machines; iron pipe and conveyors used to transport coal down mountain side.

COAL MINING

ELECTRIC POWER. The Purchase and Use of Electric Power in Coal Mining, Clifford L. Harrod. Coal Mine Management, vol. 2, no. 7, July 1923, pp. 43-50 and 56, 8 figs. Account of organization of Indiana Coal Operators Power Assn., purpose of which is to represent mines in their relation with central stations; prepare and present matter before Public Service Commission& and to check measuring purchased power and audit power bills; work of association.

COAL WASHING

CLEANING AND CLASSIFYING TANK. Factors Which Influence the Operation of Cleaning and Classifying Tank, J. F. Hardecker. Coal Industry, vol. 6, no. 8, Aug. 1923, pp. 358-359, 1 fig. Describes tank which cleans, classifies and concentrates fine coal in one operation; discussion of physical phenomena.

COILS

SELF INDUCTANCE OF. On the Calculation of Self Inductance of Coils Wound on Square Forms, Yasujiro Niwa. Researches of Electrotechnical Laboratory, Tokyo, Japan, No. 126, June 1923, 19 pp. 8 figs. partly on supp. plates. Range of application in which formula for calculation of self inductance of coils with square cross section can be used with allowable error; Esau's criterion on author's formula; formula for self inductance of solenoid with similar concentrated windings at equal intervals.

COMBUSTION

GASEOUS. Gaseous Combustion at High Pressures: New Experiments. William A. Bone Gas Jl., vol. 163, nos 3141, 3142 and 3143, July 25, Aug. 1 and 8, 1923, pp. 363-365, 415-416 and 475-477, 14 figs. Features of combustion of hydrogen and carbon monoxide in air; high-pressure experiments; carbon-monoxide-air and hydrogen-air pressure curves; combustion of carbon monoxide.

SURFACE. Surface Combustion and Its Application. W. M. Hepburn. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 497-512, 11 figs. Exposition of particular principles and applications employed by Surface Combustion Co.

CONCRETE

AGGREGATES. Pit-Run Aggregate for Concrete, G. M. Williams. Can. Engr., vol. 45, no. 9, Aug. 28, 1923, pp. 268-269, 2 figs. Use of pit-run for aggregate now permitted in many localities; characteristics of aggregate used in Saskatchewan. Are Stone Screenings Suitable for Concrete?, Duff A. Abrams. Contract Rec. & Eng. Rev., vol. 37, no. 32, Aug. 8, 1923, pp. 772-775. Characteristics of aggregate; details of tests. Good concrete can be made with screenings as fine aggregate, provided material is graded so as to be free of excess dust and extremely coarse particles and that too much water is not used.

VARIABLES IN. Variables in Concrete from the Construction Standpoint, Walter P. Bloecher. Highway Engr. & Contractor, vol. 9, no. 2, Aug. 1923, pp. 45-48, 4 figs. Discusses variables in concrete, and gives some results of job testing.

CONCRETING

COLD WEATHER. Building Lake Placid Club at 50 deg. Below Zero. Concrete, vol. 23, no. 2, Aug. 1923, pp. 59-60, 8 figs. Entire work enclosed by shed lined with tar paper in which temperature was kept at a temperature of 40 to 58 deg. above zero.

CONCRETE CONSTRUCTION REINFORCED

STEEL FORMS, USE OF. Why Steel Forms Were Successful on One Concrete Job. Raymond C. Reese. Eng. News-Rec., vol. 91, no. 8, Aug. 24, 1923, pp. 302-305, 5 figs. Construction of new group of reinforced-concrete buildings for Hupp Motor Co., at Detroit, Mich., showed that use of steel forms for concrete floors and columns made for speed, economy and neat appearance.

CONCRETE MIXERS

STANDARDIZATION. Standardization of Horizontal Non-Tilting Drum Concrete Mixers. Good Roads, vol. 65, no. 5, Aug. 1, 1923, pp. 43-44. Provisions for standardization approved by joint committee on construction equipment in session with members of Asso. Gen. Contractors and representatives of mixer manufacturers.

CONDENSERS, STEAM

SURFACE. Determining Efficient Operation and Causes of Low Vacuum in Surface Condensers, S. Thomas. Power, vol. 58, no. 11, Sept. 11, 1923, pp. 416-417, 1 fig. Excessive air leakage quickly found by applying operating readings to accompanying chart, discusses checking proper amount of cooling water and conditions of tubes.

CONVEYORS

STEEL-BELT. New Wisconsin Pulverizing Plant has Steel Conveyor Belt. George M. Earnshaw. Rock Products, vol. 26, no. 17, Aug. 25, 1923, pp. 37-40, 11 figs. Description of new pulverizing plant of Waukesha Lime & Stone Co., which is connected with crushing plant by steel-belt conveyors.

COPPER METALLURGY

LEACHING. The 2000-Ton Leaching Plant at Anaconda, Mont., Frank Cole. Anode. vol. 9, no. 8, Aug. 1923, pp. 1-5. Description of plant constructed in 1914 to recover copper and silver values from accumulated copper concentrartor tailings.

CORROSION

ALUMINUM. The Effect of Water Glass on the Corrosion of Aluminum by Alkalis. Metal Ind. (Lond.), vol. 23, no. 7, Aug. 17, 1923, pp. 125-126. Experimens carried out to determine effect of water glass on corrosion of aluminum by alkalis; action of potassium sulphide; effect of heat on protective coating of water glass.

COST ACCOUNTING

INDUSTRIAL. Industrial Cost Accounting for Executives, Paul M. Atkins. Am. Mach., vol. 57, nos. 19, 20, 22 and 26, Nov. 9, 16, 30 and Dec. 26, 1922, pp. 727-729, 733-755, 833-835 and 991-996 and vol. 58, nos. 1, 7, 9, 11, 15, 19, 21 and 25, Jan. 4, Feb. 15, Mar. 1, 15, 29, Apr. 12, May 10, 24 and June 21, 1923, pp. 39-41, 257-261, 337-341, 407-410, 481-484, 541-455, 697-699, 765-768 and 897-900, 44 figs. Nov. 9: Outline of problem. Nov. 16: Setting selling prices; controlling methods of manufacture and expense; determining profitable lines. Nov. 30: Elements of manufacture costs; direct material, labor and charges; burden. Dec. 28: Business functions and their organization; designation by economic symbols; organization chart. Jan. 4: Organization manual; contracts and duties of cost department. Feb. 15: Production control. Mar. 1: Material records and control; determining maximum and minimum quantities; purchasing, receiving and issueing material. Mar. 15: Pricing of material; simplifying inventory problem; methods of pricing. Mar. 29: Recording value of material; voucher register for stores purchased; accounts to be operated for materials withdrawn. Apr. 12: Calculation and distribution of payroll; systems of rating piecework; recording time elapsed on job. May 10: Classification of expenses; expense manual and its operation. May 24: Depreciation and other fixed charges; controlling and subsidiary accounts; preparation of journal entries. June 21: Manufacturing expenses; recording wages and salaries. Continued in vol. 59, nos. 1, 2, 4, 5, 7, 8, 10 and 12, July 5, 12, 26, Aug. 2, 16, 23, Sept. 6, 1923, pp. 15-17, 53-55, 143-145, 175-177, 259-262, 297-299, 377-379 and 449-452, 8 figs. July 5: Composition and disposition of administrative and selling expenses; outside service costs; analysis of advertising. July 12: Classification, recording and controlling of expense accounts; use of expense ledger. July 26: Budgeting of expenses; uses and development of expense schedules; scheduling of maintenance, power, supply, wage and salary costs. Aug. 2: Interest as element of cost; influence of attidude of executive. Aug. 16, Expense distribution; step-ladder and direct distribution methods of allocating expense. Aug. 23: Earned and unearned burdens. Sept. 6: Direct labor charge and hour methods of allocating burden. Sept. 20: Machine rate method of allocating burden.

UNIFORM. Value of Uniform Cost Accounting. S. I. Whitestone. Elec. Times, vol. 64, no. 1660, Aug. 9, 1923, pp. 143-144. Establishing cost-accounting service for trade associations.

CRANES

GIRDERS FOR. Geometric Study of Rigid Supporting Girders (Contribution à l'étude géométrique du portique rigide), D. Wolkowitsch. Technique Moderne, vol. 15, no. 15, Aug. 1, 1923, pp. 462-468, 8 figs. Methods of calculation of rigid supporting girders for cranes and hoisting machinery.

CRYSTALLIZATION

METHODS. Crystallization. Chem. and Met. Eng., vol. 29, no. 11, Sept. 10, 1923, pp. 495-499, 2 figs. Contains following articles: Survey of Methods, George T. Walker; Vacuum Pan Evaporation in the Sugar Industry, Carl F. Huttlinger.

CYLINDERS

THIN, WALL STRESSES IN. Stress Induced by Increasing Load—Specially in a Cylinder Wall Subjected to Internal Explosion, Tetsuji Surgihara. Tohoku Imperial Univ.—Technology Reports, vol. 3, no. 3, 1923, pp. 57-65, 4 figs. Thin cylinder subjected to sudden explosion of gases in it is treated; numerical examples show that in case of aero-engine cylinder effect of increased pressure on stress induced in cylinder wall is very small.

D

DAMS

EARTH, FAILURE OF. Failure of Apishapa Earth Dam in Southern Colorado. Eng. News-Rec., vol. 91, no. 9, Aug. 30, 1923, pp. 357-358, 5 figs. Dam near Fowler, Colo., 115 ft. high above river bed goes out after stream of water breaks diagonally through upper portion.

EARTH-FILL. Rapid Construction of Earth-Fill Dam in California. Charles H. Richards. Eng. News-Rec., vol. 91, no. 9, Aug. 30, 1923, pp. 340-343, 5 figs. Description and construction data of Henshaw Dam on San I. is Rey River, San Diego County, Cal., which was designed and built in eight months; built for San Diego County Water Co. to impound water for domestic and irrigation supply.

MULTIPLE-ARCH. Improved Type of Multiple-Arch Dams, Fred A. Noetzli. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 6, Aug. 1923, pp. 1065-1092, 13 figs. Describes dam in which each buttress per consists of double walls stiffened by cross-walls, purpose of which is to eliminate tendency of high buttresses to buckle; example is given which shows that multiple-arch dams of improved type may be built with safety to heights much greater than heretofore has been considered feasible.

Stresses in Multiple-Arch Dams, B. F. Jakobsen. Am. Soc. Civ. Engrs. Proc., vol. 49, no. 6, Aug. 1923, pp. 1093-1131, 42 figs. Present methods of determining stresses are said to be too approximate and show compression at places where considerable tension actually exists; correct analytical and graphical methods of determining point of application of water pressure and centroid of arch given; stresses resulting from shrinkage of buttresses and swelling of arches.

DIE CASTING

ALUMINUM. Producing Aluminum Die-Castings at Hamilton, L. J. Robinson. Can. Foundryman, vol. 14, no. 8, Aug. 1923, pp. 20-21, 4 figs. Data on operations and processes involved in making of aluminum die castings at plant of Tallman Brass and Metal Ltd., Ontario.

DIES

FAN BASES. Drawing and Perforating Dies for Fan Bases, Robert Barry Hickey. Machy. (N. Y.), vol. 30, no. 1, Sept, 1923, pp. 7-11, 9 figs. Procedure in designing dies for electric fan base.

SELF-OPENING. Evolution of the Self-Opening Die. O. S. Marshall. Am. Mach., vol. 59, no. 8, Aug. 23, 1923, pp. 301-303, 9 figs. Four stages of evolution; early experiments with split dies; Sellers bolt-threading machine; modern self-opening diehead.

DIESEL ENGINES

COMPRESSORLESS. Investigation on the Diesel Engine (Untersuchungen an der Dieselmaschine), Kurt Neumann. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 25, June 23, 1923, pp. 755-761, 12 figs. Comparative tests on atomizing by compressed air for compressorless operation.

FOUR-STROKE. Increasing the Efficiency of the Four-Stroke Diesel Engine (Leistungserhöhung der Viertakt-Dieselmotoren), W. Riehm. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 31, Aug. 4, 1923, pp. 763-766, 11 figs. Details of experiments and results obtained; by pre-compressing air efficiency may be increased 30 to 35 per cent with suitable fuel connsumption; exhaust gases may be used for pre-compressing.

POWER-COSTS REDUCTION WITH. Oil Engines Reduce Power-Plant Costs, L. H. Morrison. Power vol. 58, no. 12, Sept. 18, 1923, pp. 455-457, 5 figs. Additions of two Diesels at 1600-kw. municipal plant, Freeport, N. Y., effected saving of $19,000 a year, based on costs with existing steam units.

DIRECTION FINDING

RECEPTION, BY. Radio-Telegraphic Direction-Finding by Reception. Engineering, vol. 116, no. 3010, Sept. 7, 1923, pp. 305-307. Review of discussion of practical systems of direction finding by reception, by R. S. Smith-Rose and R. H. Barfield based on observations made on three practical types of systems.

DRAWINGS

CHECKING. Checking Outline for Tool Drawing, Herbert W. Cable. Am. Mach., vol. 59, no. 8, Aug. 23, 1923, p. 300. Presents suggestive outline for checking drawings developed by author.

DRILLING MACHINES

MULTIPLE-SPINDLE. Straight Line Multiple Spindle Drill Heads. Eng. Production, vol. 6, no. 131, Aug. 1923, pp. 350-353, 8 figs. Details of entirely new range of appliances designed by George Hey of Adamant Eng. Co. Luton.

PORTABLE. 3-Ft. 9-In. Portable Universal Drilling Machine. Engineering, vol. 116, no. 3009, Aug. 31, 1923, p. 266, 1 fig. Is of wide adaptability and a very serviceable tool; constructed by William Asquith, Ltd., Halifax.

DRYING

METHODS. Drying. Chem. & Met. Eng., vol. 29, no. 11, Sept. 10, 1923, pp. 488-494, 7 figs. Contains following articles: Applications of Drying Equipment, L. R. Christie: Drying at Atmospheric Pressure through Use of Fans, J. M. Matthews; Vacuum Drying, Graham Devine.

DRYDOCKS

FLOATING. The Southampton Floating Dock. Shipbldr., vol. 29, no. 156, Aug. 1923, pp. 69-74, 7 figs. Is of sectional box type, consisting of seven sections, which together are capable of lifting and accommodating vessel of 60,000 tons, displacement.

DYNAMOMETERS

CAMPBELL-TWAMLEY. Campbell-Twamley Dyanmometer, William A. Twamley. Army Ordnance, vol. 3, no. 19, July-Aug. 1923, pp. 47-48, 2 figs. Self-contained unit of hydraulic-cylinder type, in which oil is used as the medium; comprises four principal parts, the chassis, the hydraulic cylinder, the measuring device, and the recording instrument.

E

EDUCATION, ENGINEERING

PRACTICAL TRAINING. Training of Engineers (Zur Ingenieurerziehung), G. M. Strobl. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 32, Aug. 11, 1923, pp. 785-788. Importance of training manufacturers; proposes centralization of manufacturing at individual points in Germany; cites examples of American; amelioration of student's distress.

ELECTRIC FURNACES

ARC. Arc Furnace Operation Flexible, J. L. McK. Yardsley. Foundry, vol. 51, no. 17, Sept. 1, 1923, pp. 694-698 and 709, 6 figs. Six-ton Ludlum electric furnace installed for production of steel and iron castings and melting down nickel-steel scrap; problems in locating, equipping, and operating the furnace.

CONTROLLING POWER INPUT. Controlling the Power Input to Furnaces, E. B. Dawson. Forging Stamping Heat Treating, vol. 9, no. 8, Aug. 1923, pp. 340-342, 6 figs. Discusses various methods used for controlling power input to resistance furnaces used for smelting, melting, refining and heat treating.

DEVELOPMENT. The Electric Furnace (Le Four Electrique), Maurice Perrin. Fonderie Moderne vol. 17, Feb. 1923, pp. 33-40. Historical review of development of various types of arc furnaces.

ECONOMY. Electrical Heating for Industrial Purposes, Hamlyn Drake. Practical Engrs., vol. 68, no. 1902, Aug. 9, 1923, pp. 81-82. Sums up advantages of electric furnace which, it is claimed, more than compensate for greater fuel cost per B.t.u.

INDUSTRIAL APPLICATIONS. The Industrial Applications of the Electric Furnace, E. W. Lewis. Engineering, vol. 116, no. 3009, Aug. 31, 1923, pp. 257-259. Design; iron-ore smelting, steel manufacture, fixation of atmospheric nitrogen and ammonia oxidation, automobile industry, calcium-carbide manufacture, glass annealing and silica industries, etc.

INTERNALLY HEATED. Internally Heated Electric Furnaces. Electricity, vol. 37, no. 1707, July 27, 1923, pp. 389-390, 2 figs. Describes new furnaces of Automatic & Elec. Furnaces, Ltd., Eng., built on unit principle with inside or exposed heating coils, designed to permit construction of electric furnaces of unlimited size.

IRON-ORE REDUCTION. The Direct Reduction of Iron Ores in the Electric Furnace, William Mason. Elec. Rev., vol. 93, no. 2384, Aug. 3, 1923, pp. 190-191, 1 fig. Details of Chaplet Neo-Metallurgic arc furnace, which works similarly to small blast furnace.

MELTING. Capacities of Electric Melting Furnace, Frank W. Brooke. Fuels & Furnaces, vol. 1, no. 5, Sept. 1923, pp. 355-357. Factors affecting capacity; choosing electrical capacity.

PHENOMENA OF. Electric Furnace Phenomena, Edward T. Moore. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 529-582, 33 figs. partly on supp. plates Account of investigations on standard 6-ton counterweight-type Heroult furnace; tests were conducted at works of Halcomb Steel Co.., Syracuse N. Y. Includes appendices on oscillograph, high-speed photography, measurement of rectified current, temperature around electric furnaces and electrodes, cooling water, resistance of electrodes and electrode joints, etc.

SIZE AND OPERATING COSTS. Size of Furnace Affects Costs, Larry J. Barton. Foundry, vol. 51, no. 18, Sept. 15, 1923, pp. 742-743. Conditions which govern selection of size of furnace; operating costs for large and small installations, based on output; little difference is found in costs per ton.

STEEL. Electric Furnace Demonstrates Flexibility in Steel Foundry, J. L. McK. Yardley. Elec World, vol. 82, no. 10, Sept. 8, 1923, pp. 479-484, 4 figs. Successful results obtained during good and bad operating, conditions; location of furnace, selection of auxiliaries, acid vs. basic linings and detailes operating results.

ELECTRIC DISTRIBUTION SYSTEMS

OVERLOAD PROTECTION. Selective Overload Protection, E. Vedovelli. Elec. World, vol. 82, no. 7, Aug. 18, 1923, p. 326, 2 figs. Extensive study made of European practice in regard to protection of lines and apparatus; formula for oil-circuit-breaker design. Abstracted from Revue Generale de l'Electricité.

ELECTRONS

EMISSION THEORY. Theory of Electron Emission, Saul Dushamn. Am. Electrochem. Soc., Advance Copy no. 12, for metg. Sept. 27-29, 1923, pp. 125-140, 3 figs. Nernst heat theorem applied to evaporation of electrons; discusses problem of efficiency of elcetron emission, and effect of field strength on emission.

ELEMENTS

HAFNIUM. Notes on the Chemistry of Hafnium, G. Hevesy. Chem. News, vol. 127, no. 3301, July 20, 1923, pp. 33-34. Results of investigation confirming, near relation between chemical properties of hafnium and zirconium.

ELECTRIC LOCOMOTIVES

DIRECT-CURRENT. New Express Electric Locomotive for the Paris-Lyons-Mediterranean Railway. Ry. Gaz. vol. 39, no. 6, Aug. 10, 1923, pp. 192-193, 2 figs. Data on 1500-volt d.c. locomotive designed to be capable of hauling heavy trains on grades of 1 in 33, and on curves minimum radius of 395 ft.

EUROPEAN. Mechanical Parts of European Electric Locomotives, H. A. Kjelsberg. Ry. Elec. Engr., vol. 14, no. 8, Aug. 1923, pp. 243-244, 2 figs. Clearances and other physical limitations said to greatly affect design of motive power; details of frames, brakes, drive, equalization; general features.

MAINTENANCE. Electric Locomotive Maintenacce on the New Haven, H. Y. Morris. Ry. Elec. Engr., vol. 14, no. 8, Aug. 1923, pp. 245-248, 6 figs. Inspections made at Stamford on basis of 2500-mile service; heavy repairs made at Van Nest shops.

ELECTRIC MOTORS A.C.

AIR GAP. Notes on the Air Gap of induction Motors, H. Waddicor. Elec. Rev., vol. 93, no. 2384, Aug. 3, 1923, pp. 189-190, 1 fig. Notes on dimensions of gap; causes of ununiformity; equalization of air gap when rotor is eccentric and when stator is eccentric; periodical measurement of machines.

WINDING DIAGRAMS. Checking up winding Diagrams, A.C. Roe. Indus. Engr., vol. 81, no. 9, Sept. 1923, pp. 439-446 and 467-468, 10 figs. Tells how to lay out and to check winding diagrams for lap-wound induction motors.

ELECTRIC RAILWAYS

BATTERY-CHARGING PLANT. Boston & Maine Installs Battery Charging Plant. Ry. Elec. Engr., vol. 14, no. 8, Aug. 1923, pp. 239-242, 10 figs. New plant has capacity to take care of charging of ten cars at one time.

CONCRETE, USES ON. Concrete on Electric Railways, D. A. Tomlinson. Elec. Traction, vol. 19, no. 8, Aug. 1923, pp. 388-393, 11 figs. Methods, designs and uses of concrete on modern traction systems; track construction; paving base; types of tracks; etd.

CURRENT COLLECTION BY CONTACT SYSTEM. Contact System for Collecting Large Currents. Ry. Elec. Engr., vol. 14, no. 8, Aug. 1923, pp. 229-231, 6 figs. Single pantagraph used to collect 5400 amperes at 58 mi. per hr. without sparking.

ENERGY CONSUMPTION REDUCTION IN. Energy Consumption Reduced in St. Louis, Benjamin F. Thomas, Jr. Elec. Ry. Jl., vol. 62, no. 9, Sept. 1, 1923, pp. 321-324, 6 figs. Tests made on United Rys. of St. Louis result in installation of meters on 1420 cars, definite factors found for traffic and temperature variation, completed installation has resulted in peak loads as well as overall energy reduction.

ELECTRIC TRANSMISSIONS LINES

CONSTRUCTION. Study of Most Economic Conditions for Construction of an Electric Line (Etude des conditions les plus économiques pour l'établissement d'une ligne électrique), L. Mager. Revue Generale de l'Electricité, vol. 14, no. 4, July 28, 1923, pp. 125-129, 1 fig. Method for determining minimum cost for installation of a transmission line only taking height of poles and of poles per km. as variables and assuming all other variables as known.

MATERIALS. Noteworthy Progress in the Preparation and Putting in Operation of Transmission Line Materials (Progressi notevoli da realizzare nella preparazione e messa in opera dei materiali di linea), G. B. Sella. Telegrafia e Telefonia, vol. 4, nos. 1 and 2, Jan.-Feb. and Mar.-Apr. 1923, pp. 4-34 and 55-77, 38 figs. Telegraph and telephone lines. Mechanical and electrical considerations of lead, effect of atmospheric agents and chimney smoke, protection of aerial conductors, diameter of wires, insulators, fixing of wire to insulators, preservation of poles, etc.

ELECTRIC WELDING

RAILS. Electric Rail Welding (Elektrische Schienenschweissung). Elektrotechnischer Anzeiger, vol. 40, nos. 102, 103, 104, 105 and 106, June 27, 28, 30, July 3 and 4, 1923, pp. 715-716, 721-722, 737-738, 739-740 and 745-746, 39 figs. Development of new method of electric fishplate welding as practised by Accumulator Works Corp., Berlin, and its advantages over former method of butt welding, or direct welding of rails together, practical tests of welds made, microscopic examination of structure.

ELECTRIC WELDING ARC

CAST IRON. Arc Welding Cast Iron, C.J. Holslag. Welding Engr., vol. 8, no. 8, Aug. 1923, pp. 21-23 and 29. Various methods of making arc welds on cast iron with cut studding, use of carbon arc.

CYC-ARC PROCESS. Cyc-Arc Welding Automobile Engr., vol. 13, no. 179, Aug. 1923, pp. 245-249, 9 figs. Possibilities of process for automobile construction.

INGOT STRIPPER RAM. Arc Welding an Ingot Stripper Ram. A. M. Candy. Forging and Stamping. Heat Treating, vol. 9, no. 8, Aug. 1923, pp. 351-352, 1 fig. Describes welding of ram 10 in. in diam. which was broken off 3 ft. from lower end.

PORTABLE PLANT FOR. Rail Bonding. Ry. Gaz., vol. 39, no. 7, Aug. 17, 1923, p. 225, 1 fig. Describes portable engine-driven plant manufactured by Alloy Welding Processes Ltd., London, Eng., for Union of So. African Rys., primary purpose of which is bonding of railway lines, but which can be used for any other electric arc-welding repair or construction work.

ELEVATORS

CABLES. Strength of Use Elevator Cables, C. W. Willits. Power, vol. 58, no. 12, Sept. 18, 1923, pp. 451-454, 5 figs. Results of over 150 tests made on worn cables and 43 tests made on wire taken from these cables.

EMPLOYEES' REPRESENTATION

NATIONAL ECONOMIC LEAGUE REPORT. Employees Participation In Management. Ry. Age, vol. 75, no. 8, Aug. 25, 1923, pp. 333-334. Report of special committee of Nat. Economic League on employee representation.

ENGINEERING

DEVELOPMENTS IN GREAT BRITAIN. British Engineering Developments and Practice, Mark Meredith. Nat. Engr., vol. 27, no. 9, Sept. 1923, pp. 420-422. Utilization of waste heat water-tube boilers, pulverized fuel; developments in coal-gas manufacture.

ENGINEERS

LICENSING. Licensing of Engineers Declared Unconstitutional in Pennsylvania. Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, pp. 413-414. Judge Samuel E. Schull, in Court of Quarter Sessions of Monroe County, Pa., handed down a decision on July 2, declaring Pennsylvania law for licensing of professional engineers and land surveyors to be in violation of Constitution of State of Pennsylvania and also of 14th amendment of Constitution of United States; quotes in full part of decision referring to unconstitutionality of act.

ENGINEHOUSES

TURNTABLES. The Development of the Continuous Turntable, Otis E. Hovey. Ry. Age, vol. 75, no. 7, Aug. 18, 1923, pp. 295-298, 7 figs. American Bridge Co.'s newest design and comparison with earlier types.

EVAPORATORS

CALCULATION. Study of Evaporating Apparatus (Etude sur quelques appareils d'évaporation), Association des Chimistes—Bul., vol. 60, no. 10, Apr. 1923, pp. 406-422, 1 fig. Describes experiments with tubular evaporators, including boilers; evaporating 110,000 kg. per day; develops for mulas to express mathematically velocity of liquid and steam in ascending; volume of liquid displaced in forced circulation; speed necessary for heat transmission to give a good evaporation at minimum cost of power.

VACUUM. Low Pressure Vacuum Evaporators, C. A. Jones and A. M. Charlton. Am. Soc. Naval Engrs.—Jl., vol. 35, nos. 2 and 3, May and August., 1923, pp. 329-356 and 539-544, 14 figs., partly on supp. plates. Modified Lillie evaporator, which uses "film" or "rain" evaporation. Description of system and its advantages.

F

FANS

CENTRIFUGAL. Centrifugal Fan Types ("Typification" des ventilateurs centrifuges), A. Lambrette. Technique Moderne, vol. 15, nos. 12 and 13, June 15 and July. 1, 1923, pp. 364-368 and 397-405, 34 figs. Classification of fans; characteristics, properties, advantages and drawbacks of each type; selection of proper type for given purpose; design and construction.

MINE. The Design of Mine Fans, D. W. Rees. Colliery Guardian, vol. 126, no. 3267, Aug. 10, 1923, pp. 333-334. Attempt is made to summarize principles of fan design, which can be further amplified by further testing; outline of proposed method of testing.

FILTERS

WATER, CONCRETE BOTTOM FOR. Concrete Bottom for Mechanical Water Filters, A. L. Gammage. Eng. News-Rec., vol. 91, no. 11, Sept. 13, 1923, pp. 430-431, 1 fig. Metal strainer and air wash replaced by concrete channels, half cylinders and spheres giving high-velocity wash.

FIRECLAYS

HEAT EFFECTS IN. The Heat Effects on Fire Clays and Their Minerals, Shinjo satch. Tohoku Imperial Univ.—Science Reports, vol. 1, no. 3, June 1923, pp. 157-201, 122 figs. partly on supp. plates. Results of investigation carried out with object of improving glass melting pot and tank block used for melting glass, as well as fire brick of which glass melting kiln is constructed. Thermal expansion and contraction; endothermal and exothermal reaction of raw clay, determination of dehydration point of clay with thermo-balance; change of microstructure of clay by heating; erosion of clay substance in contact with molten glass, microstructure of stone, string or cord.

FIRE FIGHTING

FACTORY BRIGADE. The Advantages and Organization of a Works Fire Brigade, Eric N. Simons. Indus. Management (Lond.), vol. 10, no. 5 Sept. 6, 1923, pp. 121-123. Emphasizes advisability of modern works or factory possessing its own trained fire brigade for dealing with outbreak of fire in its early stages.

FLOORS

CONCRETE. Analysis of "Two-Way" Flat Slabs, E. F. Rockwood. Eng. & Contracting Buildings, vol. 60, no. 1, July 25, 1923, pp. 155-157, 3 figs. Method following closely Joint Committee report and Chicago ordinance.

FLOTATION

COAL. Can Expel Water from Wet Slack by Oils and Pressure; Much ash Leaves the Coal with the Water, C. H. S. Tupholme. Coal Age, vol. 24, no. 8, Aug. 23, 1923, pp. 277-278. Describes two methods of separating coal particles from associated water, in rendering concentrates from froth flotation system of coal washing suitable for industrial purposes.

FLUE-GAS ANALYSIS

DEVELOPMENTS. Recent Developments in Flue-Gas Analyses, E. H. Lockwood. Power, vol. 58, no. 12, Sept. 18, 1923, pp. 461-462. Flue-gas computations reduced to simple formulas based on gas analysis, computing percentage of excess air, formula for checking Orsat analysis.

FOUNDRIES

COSTS. Foundry Costs Simplified, Alfred Baruch. Foundry, vol. 51, nos. 16, 17 and 18, Aug. 15, Sept. 1 and 15, 1923, pp. 653-656, 710-713 and 749-750, 3 figs. Aug. 15: Methods for arriving at and distributing indirect expense, expense orders are classified numerically, general expenses determined on actual basis for distribution. Sept. 1: Methods outlined for determining burden charge, blanket rate being the one most often used. Sept. 15: Steps taken in carrying through order to clarify details given in previous articles.

Foundry Costing, Thomas Bancroft. Foundry Trade Jl., vol. 28, no. 364, Aug. 9, 1923, pp. 113-115. Fundamental principles are advocated such as could be adopted by foundry trade in general.

ELECTRIFICATION. The Complete Electrification of the Foundry Industry, Leonard W. Egan. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 381-424, 7 figs. Discusses possibilities of electrified methods and systems as applied to process of molding, together with reasons why.

STEEL. Steel Foundry Reflects Growth, John D. Knox. Foundry, vol. 51, no. 17, Sept. 1, 1923, pp. 704-709, 9 figs. Experience of executives of Blackwood Steel Corpn. gained over a period of many years is crystallized in building plant layout and equipment installed in new electrical steel foundry in West Virginia.

Steel Foundries and Co-operative Research, W. J. Corbett. Iron Age, vol. 112, no. 11, Sept. 13, 1923, pp. 675 and 731. Results achieved among five electric plants in operation, costs and merchandising, new uses for thin castings.

FUEL ECONOMY

POWER PLANTS. Super-Power Plants and Coal Conservation, Egbert Douglas. Nat. Engr., vol. 27, no. 9, Sept. 1923, pp. 409-413. Discussion of fundamental principles of fuel conservation and relation of heat and power requirements.

FUELS

UTILIZATION. Work of the Utilization Committee. Eight Report (Travaux de la commission d'utilisation du combustible, Huitième Rapport). Société d'encouragement pour l'Industrie Nationale—Bul., vol. 435, no. 3, Mar. 1923, pp. 195-209. Fuel Economy in Sugar Factories, by E. Sommier; Steam Economy in the Sugar Industry, by Eugene Caron. See also Industrie, vol. 4, nos. 36 and 37, Apr. and May 1923, pp. 333-335 and 434-437.

WASTE, ECONOMIC COMBUSTION. The Economic Combustion of Waste Fuels, David Moffat Myers. Steam Power, vol. 2, nos. 4, 5 and 6, May, June and July 1923, pp. 8, 10 and 12; 7, 12 and 14; and 7, 12 and 14. May: Principles involved in increasing efficiency of combustion; maintenance of high temperature; mixing of air and fuel-bed gases; sawdust and wood waste. June: Composition of hog feed; furnace for burning sawdust. July: Furnace for burning tanbark.

See also Bagasse; Oil Fuel; Pulverized Coal.

FURNACES, HEAT TREATING

TRUCK PLANT. Heat Treating Equipment in a Truck Plant. Am. Mach., vol. 59, no. 11, Sept. 13, 1923, pp. 415-416, 2 figs. Kinds of furnaces used at Moreland Motor Truck Co. plant, Burbank, Cal.; their arrangement and sizes; carbonizing and heat treatment for different steels used in transmission.

G

GAS PRODUCERS

CENTRAL-TYPE. Central-Type Producer Plant in the Municipal Gas Works of Potsdam (Germany) (Zentralgeneratorgasanlage im Gaswerk Potsdam), B. Meyer. Gas- u. Wasserfach, vol. 66, no. 29, July 21, 1923, pp. 426-430, 8 figs. Details, operating results and economy of vertical-retort plant equipped with dentral producers for gasification of lignite briquets with low-temperature recovery.

DEVELOPMENTS. Improvements in Gas Producers (Perfectionnements apportés aux gazogènes), C. Clements. Arts et Metiers, vol. 76, no. 33, June 1923, pp. 601-616, 8 figs. Describes construction, operation, heat balance, application, etc., of various types.

WOOD-REFUSE. Finding a Use for Waste Wood, Johnstone Tavlor. Power, vol. 58, no. 11, Sept. 11, 1923, pp. 419-420, 2 figs. Discusses advantages of gas producers using waste products; tests on producer-engine units; gas analysis.

GAS TRUBINES

PUPLETT. An Intrenal Combustion Turbine. Autocar, vol. 51, no. 1452, Aug. 17, 1923, p. 281, 1 fig. Puplett design effectively water-cooled; simplicity of construction gives low production cost.

GASWORKS

TESTING. Gasworks Testing, O. and H. W. Allan. Gas World, vol. 74, no. 2038, Aug. 11, 1922, p. 99, 2 figs. Two methods for ascertaining characteristics of gas near point of manufacture. Apparatus and conduct of tests.

GASES

SPECIFIC HEATS. Specific Heats of Gases and Vapors (Les chaleurs spécifiques des gaz et des vapeurs), Aimé Witz. Revue Générale des Sciences, vol. 34, no. 14, July 30, 1923, pp. 425-435. Historic development and experimental results; present state of question and work yet to be done.

Variation of Specific Heat of Gases With Temperature (La variation de la chaleur spécifique des gaz avec la température d'après les travaux les plus récents), H. Muraour. Chimie & Industrie, vol. 10, no. 1, July 1923, pp. 23-29, 1 fig. New specific heat values obtained at Nernst laboratory, and examples of application on industry. Bibliography.

GEAR CUTTING

HOBBING. Universal Gear Hobbing Machine, Machy. (Lond.), vol. 22, no. 568, Aug. 16, 1923, pp. 632-634, 6 figs. Describes machine designed for hobbing all types of spur, spiral, and bevel gears up to 2 module, output capacity being exceptionally good, produced by Mikron Co., which is a good example of modern Swiss machine-tool design.

INSTRUMENT GEARS. Cutting Instrument Gears, Franklin D. Jones. Machy. (N. Y.), vol. 29, no. 12, and vol. 30, no. 1, Aug. and Sept. 1923, pp. 951-955 and 25-27, 18 figs. Aug.: Production of small gears by means of hand-operated and automatic machines of formed-cutter and hobbing tuypes. Sept.: Application of hobbing process and production of small pinions in rod form.

KNITTING-MACHINE PARTS. Cutting Slots in Knitting Machine Parts, Fred R. Daniel. Machy. (N. Y.), vol. 30, no. 1, Sept. 1923, pp. 44-46, 5 figs. Describes gear-cutting machines and methods at plant of Leighton Machine Co., Manchester, N. H., manufacturer of knitting machines.

GEARS

TEETH, STRENGTH OF. Factors Governing the Strength of Gear Teeth, Douglas T. Hamilton. Am. Mach., vol. 59, no. 8, Aug. 23, 1923, pp. 287-291, 3 figs. Velocity; accuracy, methods of mounting; measurements and allowance for blacklash.

GOLD METALLURGY

AMALGAMATION. Fundamentals of Amalgamation, A. W. Allen. Eng. & Min. Jl.—Press, vol. 116, no. 7, Aug. 18, 1923, pp. 275-280, 5 figs. Review of practical aspects of gold-recovery process.

H

HANDLING MATERIALS

LABOR-SAVING EQUIPMENT. Formulas for Computing Economies of Labor-Saving Equipment. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 564-565. Committee of A.S.M.E. Materials Handling Division studies problem of evaluating labor saved by improved processes; practical application of formulas devised.

METHODS. What It Pays to Know about Material Handling, W. T. Spivey. Factory, vol. 31, no. 3, Sept. 1923, pp. 303-306, 4 figs. Pneumatic, hydraulic and steam-jet methods.

PIERS. Material-Handling Problems in Pier Design, Carroll R. Thompson. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 525-530 and (discussion) 530 and 569, 7 figs. Review of proceedings of several material-handling symposiums held by A.S.M.E. to discuss material handling in its relation to port development. (Abridged.)

HARDNESS

HERBERT PENDULUM TESTER. The Mathematical Theory of the Herbert Pendulum Hardness Tester, Wm. J. Walker. Engineer, vol. 136, no. 3532, Sept. 7, 1923, pp. 244-245, 1 fig. Critical discussion of theories set forth in E. G. Herbert's article published in same journal (June 29, 1923).

HEAT TRANSMISSION

BUILDING MATERIALS. Transmission of Heat in Building Materials. Times Trade & Eng. Supp. (Timber Trades Section), July 28, 1923, p. 477. Abstract of report describing experiments made at Nat. Physical Laboratory on transmission of heat through various walls and building materials.

HEATING, GAS

RADIANT HEATER. Regarding Radiant Heaters, Geo. W. Jones, W. P. Yant and L. B. Berger. Gas Industry, vol. 23, no. 8, Aug. 1923, pp. 272-275, 1 fig. Combustion products from a radiant-type natural-gas heater and suggestions regarding its operations.

HIGHWAYS

FINANCING STATE. Financing Construction and Maintenance on a State Highway System, A. B. Fletcher. Good Roads, vol. 65, no. 5, Aug. 1, 1923, pp. 39-42. Problem in Massachusetts and California; pay-as-you-go plan; bonding plan; motor-vehicle fees.

HOISTS

BLAST-FURNACE SKIP. Single Bucket Blast Furnace Skip Hoist Characteristics, A. C. Cummins and A. R. Leavitt. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 449-466, 5 figs. Calls attention to principal features claimed for each of four types of drive, and presents test data secured while checking over actual performance of number of hoists to corroborate various points of superiority which each type is said to possess.

HOUSING

WORKMEN'S DWELLINGS. Construction of Workmen's Dwelling at Mulhouse in 1922 (Un mot sur les constructions de maisons ouvrières à Mulhouse en 1922), Camille de Lacroix. Société Industrielle de Mulhouse—Bul., vol. 89, no. 5, May 1923, pp. 326-330, 7 figs. on supp. plates. Design of various types, single and in groups.

HYDRAULIC TURBINES

AUTOMATICALLY REGULATED. Automatically Regulated Turbines for Medium Water Heads for Agricultural Electrification (Note sur la réalisation de turbines autorégulatrices permettant l'exploitation automatique de chutes de puissance moyenne, en vue d'alimenter des réseaux ruraux d'énergie électrique), L. Barbillion. Houille Blanche, vol. 22, no. 182, May-June 1923, pp. 93-96, 5 figs. Describes old and modern types of Fourneyron turbines; direct and indirect regulation; describes some recent installations of self-regulating turbines.

EFFICIENCY, DETERMINATION OF. Calorimetric Method for Determining the Efficiency of Hydraulic Turbines. Mech. Eng., vol. 45, no. 9, Sept, 1923, p. 545, 2 figs. Consists in merely measuring difference in temperature of water entering and leaving turbine and head employed. Translated from Génie Civil, vol. 82, no. 25, June 23, 1923, pp. 604-605.

HYDRO-DYNAMIC THEORY. Fundamentals of a New Hydro-dynamic Theory of Hydraulic Turbines (Fondamenti di una nuova teoria idrodinamica delle turbine idrauliche), Aristide Prosciutto. Ellettrotecnica, vol. 10, nos. 12 and 13, Apr. 25 and May 5, 1923, pp. 245-251 and 270-275, 13 figs. Theories of hydraulic turbines, and details of new theory based solely on general hydrodynamic equations for relative motion with cylindrical and curvilinear co-ordinates, calculations; introduction of curvilinear co-ordinates; theory of Lorenz turbine, as special case of new theory, etc.

HYDRO-ELECTRIC DEVELOPMENTS

QUEBEC. Hydro-electric Possibilities of Quebec, Julian C. Smith. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 397-400, 3 figs. Potential and actual hydro-electric development and its probable rate of growth in future.

SAGUENAY DISTRICT, CANADA. Power Development in the Saguenay District. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 383-387, 8 figs. Construction of power plants and storage works, proposed dams.

HYDRO-ELECTRIC PLANTS

AUSTRALIA. The Carranballac Hydro-Electric Plant, B. A. Smith. Indus. Australian & Min. Standard, vol. 70, no. 1805, July 5, 1923, pp. 13-16, 5 figs. Details of power plant and electrical equipment of power scheme for Carranballac Estate, which is situated in Western District Plains of state of Victoria, for providing power for house lighting and heating, wood cutting by circular saw, sheep shearing, pumping, milking, etc.

ENGLAND. The York Hydro-electric Undertaking. Elec. Rev., vol. 93, no. 2386, Aug. 17, 1923, pp. 249-251, 8 figs. Inauguration of Linton Lock Station said to be largest of its kind in England. Difficulties met in construction, details of plant. See also Electrical Times, vol. 64, no. 1660, Aug. 9 1923, p. 131, 3 figs.

YORK'S Hydro Electric Station. Times Trade & Eng. Supp., vol. 12, no. 265, Aug. 4, 1923, p. 499, 1 fig. Station erected to supplement electricity supply of city of York by utilizing power of River Ouse. See also Engineer, vol. 136, no. 3528, Aug. 10, 1923, pp. 148-150, 10 figs.

OPERATION. The Operation of Hydro Electric Stations, Ralph Brown. Power, vol. 58, no. 10, Sept. 4, 1923, pp. 364-366, 5 figs. How to obtain, from equipment available, maximum output with minimum consumption of water.

VERMONT. Detailed Estimate of the Cost of Davis Bridge Development. Elec. World, vol. 82, no. 11, Sept. 15, 1923, pp. 532-533. Estimate of cost of one of largest hydro-electric plants in East, probable overall expenditure of nearly $4,000,000.

WALES. Hydro-Electric Station at Caerwyd, North Wales. Engineering, vol. 116, no. 3009, Aug. 31, 1923, pp. 279-280, 10 figs. Data on small hydro-electric plant recently constructed near Caerwyd, on Treston stream, where an impounding reservoir has been constructed holding over 1,000,000 cu. ft. water; plant comprises two turbines, one 21 in. in diam. developing 140 b.hp., and one 12 in. developing 27 b.hp.

I

ICE PLANTS

OIL-ENGINE-DRIVEN. An Oil-Engine-Driven Ice Plant. Power, vol. 58, no. 10, Sept. 4, 1923, pp. 375-377, 3 figs. Describes 50-ton ice plant of Red Bank, N.J., Pure Ice Mfg. Co. equipped with two 100-hp. Fairbanks-Morse semi-Diesel engines, each direct-connected to a Worthington compressor.

OPERATING SYSTEMS. Diamond Ice Company Power Plant, J. K. Marquis. Nat. Engr., vol. 27, no. 9 Sept. 1923, pp. 417-420, 5 figs. Combination of absorption and compression systems of refrigeration in use at plant of Diamond Ice Co. of Knoxville, Tenn. How reconstruction and overhauling of plant increased capacity and efficiency.

INDUSTRIAL MANAGEMENT

BUDGETARY CONTROL. The Control of an Industry in the Business Cycle, Howard Coonley Taylor Soc.—Bul., vol. 8, no. 4, Aug. 1923, pp. 128-136, 5 charts. Describes system of budgetary control of sales, purchases, receipts, and expenditures, employed by Walworth Co.

CONTROL SYSTEM. Visualized Management Control, Chester B. Lord. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 319-322, 2 figs. Describes system of management control developed by author which can be applied to any kind of varying conditions and factors and in any place.

COST CONTROL. The Province of the Controller, John B. Guernsey. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 323-326. Preparing formal plans and holding to them.

MANAGER, REQUIREMENTS OF. Some Fundamentals of Management, Alvan T. Simonds. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 297-299. Requisites of good business manager.

PAPER INDUSTRY. Management Engineering in the Paper Industry, R. B. Wolf. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 401-403. Measurement of performance a factor in good management; industry should be organized to encourage rather than repress individual development.

POWER-SERVICE MAINTENANCE. Some of the Ways Procedure in Maintenance Work Can be Audited By the Maintenance Department to Improve Standards of Power Service, Arthur J. Whitcomb. Indus. Engr., vol. 81, nos. 1, 4 and 9, Jan., Apr. and Sept., 1923, pp. 11-15 and 66, 181-186 and 426-436, 16 figs. Means of auditing incoming and outgoing electrical material, such as repairs, spare parts, etc. Power service or power distribution auditing. Accounting of work of electrical department. Accounting or record of electrical equipment.

PRODUCTION CONTROL. Controlling Production Without a Planning Department, Kenneth W. Stillman. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 160-162, 3 figs. Describes system whereby small plant can eliminate manifold wastes attendant upon haphazard production, without going to expense of installing separate planning department.

PRODUCTION ROUTING. Increased Profits Through Control of Costs, R. W. Darnell. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 301-304. Production routing. Cutting costs by better production routing; routing sheet; maintenance of routings; avoidance of temporary changes.

PROGRESS CHART. The Progress Chart and the Bonus Method, B. A. Franklin. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 327-332, 8 figs. Points out that progress record or chart as illuminating and explanatory picture, with bonus for reward, fits best the ordinary demand and gets best results that are humanly possible.

PURCHASING AGENT AND ENGINEER. Purchasing Agent and Engineer, W. E. Irish. Taylor Soc.—Bul., vol. 8, no. 4, Aug. 1923, pp. 150-157 and (discussion— 157-160. Discusses possibilities of bettering relationship between purchasing agent and engineer.

SALES AND PRODUCTION, TIE-UP OF. The Tie-up of Sales and Production, L. J. Conger Taylor Soc.—Bul., vol. 8, no. 4, Aug. 1923, pp. 137-140. Discusses three problems of proper co-ordination and tie-up between sales and production; (1) Satisfactory and scientific budgeting of sales possibilities; (2) efficient and workable budgeting of production; (3) proper control of balance between sales and production budgets.

TIME STUDY. *See Time Study.*

INDUSTRIAL ORGANIZATION

THEORY OF. Theory and Technical Side of Organization (Théorie et technique élémentaires d'organisation), J. Cabanel. Revue Générale de l'Electricité, vol. 13, nos. 25 and 26, June 23 and 30, 1923, pp. 1059-1067 and 1103-1106, 12 figs. Objects and purpose of organization; Taylor system of scientific management; elementary theory of human work, cost and sale price; methods for quantity production; calculation of labor and machines required; etc.

INDUSTRIAL PLANTS

EQUIPMENT, SELECTION OF. The Selection of Modern Plant Equipment, Paul M. Atkins. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 176-179. Factors of importance that are often overlooked.

INDUSTRIAL RELATIONS

NATIONAL POLICY. An Engineering Statement of Economic Principles, W. R. Ingalls. Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, pp. 395-398. Labor and distribution of wages; duties and privileges of management; artificial restriction of production; legislation's influence on labor.

INSULATING MATERIALS ELECTRIC

VARNISHES. Composition and Aging of Insulating Varnishes, H. C. P. Weber. Am. Electrochem. Soc., Advance Copy no. 16, for meeting Sept. 27-29, 1923, pp. 167-170, 1 fig. It has been shown that during drying and oxidation of varnishes, conducting materials are formed which produce appreciable lowering of insulation resistance of electrical apparatus, gives values to show that amount of these "low resistance materials" is proportional to amount of oil in varnish, and that there is a noticeable difference in amount produced by different oils.

INSULATORS, HEAT

BAGASSE LUMBER. Insulating Lumber from Sugar Mill Bagasse, Alan G. Wikoff. Chem. & Met. Eng., vol. 29, no. 9, Aug. 27, 1923, pp. 360-362, 6 figs. Insulating lumber of great commercial value has been developed from extracted sugar-cane fiber, now used only as fuel in order to get rid of it.

BALSAM WOOL. Balsam Wool, Howard F. Weiss. Chem. & Met. Eng., vol. 29, no. 12, Sept. 17, 1923, pp. 534-536, 4 figs. New heat insulation developed by disintegrating waste wood and rearranging fibers so as to obtain maximum of dead air cells, material has lower thermal conductivity than balsa, lightest material wood.

SLAG WOOL. Designing and Operating a Slag Wool Plant, Herbert Lang. Chem. & Met. Eng., vol. 29, no. 9, Aug. 27, 1923, pp. 366-367, 1 fig. Discusses manufacture of insulating mat filtering material from smelter slag.

INTERNAL COMBUSTION ENGINES

EXHAUSTING INTO LOW PRESSURE TURBINES. Internal-Combustion Engine Exhausting into Low Pressure Turbines, F. Modugno. Shipbldg. & Shipg. Rec., vol. 22, no. 10, Sept. 6, 1923, pp. 294-296, 2 figs. Deals with our present experience and particularly with that obtained by utilizing in low pressure turbines the exhaust gases from exhausters. Method. Paper read before Inst. Naval Architects.

POWER DETERMINATION. Exact Determination of the Power of Explosive Engines (Détermination précise de la puissance des moteurs à explosion). Paul Jouet. Journal de la Marine, vol. 41, no. 2105, July 28, 1923, pp. 349-350, 6 figs. Explains construction of curves showing power, efficiency, speed as function of ignition, etc., and use of these curves in management of engines.

RAILWAY TRACTION, APPLICATION TO. Application of Internal Combustion Engines to Railway Traction (Application du moteur à hydrocarbures à la traction sur voies ferrées). E. Brulle. Revue Générale des Chemins de Fer, vol. 42, nos. 4 and 5, Apr. and May 1923, pp. 272-305 and 387-414, 130 figs. Use of explosive engines for mines, street cars, railway, etc., their operation and advantages; hydraulic, mechanical, electric electro-mechanical, and compressed-air transmissions; etc.

See also Aeroplane Engines, Automobile Engines, Diesel Engines, Oil Engines; Semi-Diesel Engines.

IRRIGATION

ALBERTA, CANADA. The Lethbridge Irrigation Enterprise in Western Canada, F. S. Dyke. Engineer, vol. 136, nos. 3527 and 3528, Aug. 3, and 10, 1923, pp. 114-116 and 146-147, 24 figs. System is designed to irrigate 105,000 acres in Southern Alberta; details of construction work and effect of a heavy flood.

IRON

ELECTROLYTIC. Electricity in Metallurgy. Iron Age, vol. 112, no. 12, Sept. 20, 1923, p. 756. Electric blast furnaces; properties, composition and uses of French electrolytic iron. Translated and abstracted from Revue de Metallurgie, July.

ELECTROLYTIC, CORROSION OF. Corrosion of Electrolytic Iron, W. E. Hughes. Chem. & Met. Eng., vol. 29, no. 12, Sept. 17, 1923, pp. 536-537, 2 figs. Argument for necessity of using pure iron as basis for research experiments.

PRODUCTION DIRECT FROM ORE. Making Iron from Ore by a New Electrolytic Process, E. C. Kreutzberg. Iron Trade Rev., vol. 73, no. 9, Aug. 30, 1923, pp. 595-598, 7 figs. Describes Eustis process, which produces iron averaging over 99.9 per cent pure; results of tests made on iron produced by this method, cost of production, etc.

IRON ALLOYS

IRON-CARBON. Effect of Silicon on Equilibrium Diagram of System Carbon-iron near Eutectoid Points, H. A. Schwartz. Am. Inst. Min. & Met. Engrs.—Trans., no. 1264-S, Aug. 1923, 6 pp., 4 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, p. 423, 1 fig. Results of studies concerning effect of silicon on location of eutectoid points.

K

KILNS

TUNNEL. The Suitability of the Tunnel Kiln for Burning Refractories, A. F. Greaves-Walker and S. M. Kier. Am. Ceramic Soc.—Jl., vol. 6, no. 8, Aug. 1923, pp. 891-895. Report of Committee on Fuel Conservation on Tunnel Kilns.

L

LABOR

LEGISLATION. Recent Labour Legislation. Int. Labour Rev., vol. 8, no. 2, Aug. 1923, pp. 285-305. Bibliography.

LIVING WAGE. What About the Living Wage? Robert J. Anderson. Indus. Management (N.Y.), vol. 66, no. 3, Sept. 1923, pp. 140-143. Author seeks to prove that living wage based upon theoretical budget is unsound; that in large number of cases budgets themselves are nothing more than composite of guesses; that great desideratum is not standard wage but standard of work.

SHORT DAY IN STEEL WORKS. Steel Works Experience with the Short Day, Bradley Stoughton. Iron Age, vol. 112, no. 6, Aug. 9, 1923, pp. 325-328. Wage adjustments as worked out at various plants; question of spare-time work under new regime.

LABORATORIES

FOREIGN. French and Foreign Laboratories (Les Laboratoires Français et les Laboratoires Etrangers) L'Industrie Electrique, vol. 32, no. 745, July 10, 1923, pp. 247-252. Inefficiency of industrial and research laboratories in France; cities numerous American examples in justification, covering most important industries.

LATHES

DESIGN. Some Details of Lathe Design. Albert Clegg. Am. Mach., vol. 59, no. 11, Sept. 13, 1923, pp. 409-412, 6 figs. Push pin lock for heavy machinery; double back gears; cone clutches applied to fee-starting devices; reducing friction in powerful clutch.

DIVIDING APPLIANCE. A Worm and Plate Dividing Appliance. Model Engr. & Electrician vol. 49, no. 1164, Aug. 16, 1923, pp. 171-172, 2 figs. Attachment is suitable for private worker and can be used on practically any lathe which is not equipped with a cluster gear.

ENGINE. New Engine Lathe. Iron Age, vol. 112, no. 9, Aug. 30, 1923, pp. 546-547, 2 figs. Describes 16-in. lathe designated as model B placed on market by Pratt & Whitney Co., Hartford, Conn., primarily designed for individual motor drive, using a geared head, and may be adapted readily to single pulley drive or a cone head with countershaft drive.

PRECISION. The Le Blond 15-Inch Precision Tool Room Lathe. West. Machy. World vol. 14, no. 8, Aug. 1923, pp. 272-274, 3 figs. Special features of lathe which is said to represent highest development in lathes for toolroom work.

LIGHTING

INDUSTRIAL REGULATIONS. Industrial Lighting Regulations, G. H. Stickney. Indus. Engr., vol. 81, no. 9, Sept. 1923, pp. 447-451 and 469-470, 1 fig., 4 tables. Summary of regulations included in existing codes, together with present tendencies toward future legislation.

LOCOMOTIVES

BY-PASS VALVES. By-Pass Valves for Steam Locomotives (Druckausgleicher für Dampflokomotiven), O. Gunther. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 34, Aug. 25, 1923, pp. 836-837, 11 figs. Describes automatic plate valve for large and small cylinders in connection with a release valve for sudden equalization of pressure, which at same time serves as starting device for compound locomotives.

ELECTRIC. *See Electric Locomotives.*

FRAMES. Tests on Different Shaped Arch Bar Side Frames, Louis E. Endsley. Ry. Age, vol. 75, no. 9, Sept. 1, 1923, pp. 377-378, 3 figs. Slight changes in design reduce unit-stresses from over 40,000 lb. to about 20,000 lb.

FRANCE. Locomotive Practice and Performance in France, J. T. Burton-Alexander. Engineer, vol. 136, nos. 3527, 3528 and 3529, Aug. 3, 10 and 17, 1923, pp. 119-120, 143-145 and 178-179. Account of various trips made by author on footplates of engines and in tram itself on Midi; Paris-Orleans; Paris, Lyon and Mediterranean, and Northern of France railways.

GREAT WESTERN RY. G. W. R. Four-Cylinder Locomotive Completed. Castle. Engineer, vol. 136, no. 3530, Aug. 24, 1923, p. 197, 4 figs. [illegible] p. 202. Main particulars of first of ten new locomotives for Great Western R. 2,512 sq. ft. total heating surface, tractive effort 185 per cent boiler pressure, 31,626 lb. See also Ry. Gaz., vol. 39, no. 8, Aug. 24, 1923, pp. 252-254, 3 figs.

SUPERHEATER. Pacific Type Superheated Locomotive of the Orleans Company. "Locomotive 'Pacific'" a surchauffe de la compagnie d'Orléans. M. Lacour. Revue Générale des Chemins de Fer, vol. 42, no. 6, Jun. 1923, pp. 17-22, 14 figs. partly on supp. plates. Details of design, equipment and operation, simple expansion, table of principal data.

LUBRICATING OILS

CHEMICAL COMPOSITION AND TESTS. Some Notes on Lubrication. W. St. J. Findlay. Management (Lond.), vol. 10, no. 3, Aug. 9, 1923, pp. 65-66, 2 figs. States that lubrication, a factor of great importance in engine and machine efficiency, is not receiving attention by engineers that it demands. Describes chemical composition of the various oils used, and tests to which they are subjected.

LUBRICATION

PROBLEMS. Lubrication Problems and Their Correction. Allen F. Brauer. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 134-139, 7 figs. What lubricant to use, where, and why.

LUMBER

STANDARD ABBREVIATIONS. Standard Abbreviations of Terms Used in Lumber Industry. Eng. & Contracting (Buildings), vol. 60, no. 1, July 25, 1923, pp. 182-183. Recommended by Forest Products Laboratory of U. S. Forest Service.

M

MACHINE CONSTRUCTION

CERAMIC MATERIALS SUBSTITUTED FOR METALS. Ceramic Materials (Keramische Massen als Werkstoffe), Felix Singer. Zeit des Vereines deutscher Ingenieure, vol. 76, no 24, June 16, 1923, pp. 584-586. Replacing metals by ceramic materials in machine construction; compares properties of ceramic materials and metals; suggestions for advantageous application of ceramic materials in construction of apparatus.

MACHINE SHOPS

HEAVY WORK. Production Methods on Heavy Work. Eng. Production, vol. 6, no. 131, Aug. 1923, pp. 357-360, 12 figs. Describes procedure in Allis-Chalmers Mfg. Co.'s works, Milwaukee, Wis., in production of heavy units, such as large turbin plants, gas engines, etc.

PLANNING IN. The Profit of Planning. Engineering, vol. 116, no. 3007, Aug. 17, 1923, pp. 198-199, 1 fig. Losses in course of manufacture, some unavoidable or too costly to avoid and others avoidable by better planning and organization; emphasizes latter and shows how efficiency can be increased.

MACHINE TOOLS

MOTORS FOR HIGH-SPEED. High-speed Motors for Machine Tools, W. A. Furst. Machy. (N. Y.), vol. 30, no. 1, Sept. 1923, pp. 41-43, 3 figs. Factors that determine motor speed; voltage required at different speeds; method of obtaining high-frequency current; kilowatt output; obtaining two different frequencies; automatic control of motors.

RAILWAY WHEEL PRODUCTION. Machine Tools for Railway Wheel Production. Machy. (Lond.), vol. 22, nos. 560 and 568, June 21 and Aug 16, 1923, pp. 357-361 and 621-626, 12 figs. Consideration of machine tools of latest type that have been developed by representative machine tool makers for dealing with railway wheel production.

RUNNING-IN TESTS FOR. Running-in Tests for Machine Tool Units, Douglas T. Hamilton. Machy. (N. Y.), vol. 30, no. 1, Sept. 1923, pp. 47-48, 3 figs. Fellows Gear Shaper Co., Springfield, Vt., adheres to practice of giving machine a thorough running test before it is shipped; describes unit assembly and final assembly tests made of recently developed high-speed shaper.

SETTING DEVICES. Special Setting Devices Effect Time Savings, Fred Horner. Can. Machy., vol. 30, no. 7, Aug. 16, 1923, pp. 18-19, 8 figs. Description of several unusual methods of increasing economy and accuracy in adjustment and setting of machine tools in Canadian shops.

SPEEDS AND FEEDS. Speeds and Feeds of Machine Tools (Les vitesses de coupe économiques des outils et les temps d'usinage). Armand Bussod. Génie Civil, vol. 83, no. 3, July 21, 1923, pp. 58-63, 7 figs. Develops curves with speeds as abscissas and feed as ordinates; graphic determination of economic cutting of metals and of most economic speeds.

MACHINERY

CHARACTERISTICS AT HIGH ALTITUDES. Variations in Characteristics of Machinery at Great Altitudes (Las Variaciones de la Caracteristicas en las Maquinas a gran Altura), Antonio Pauly. Asociacion Argentina de Electrotécnicos—Boletin, vol. 9, nos. 3 and 4, Mar. and Apr. 1923, pp. 41-44. Gives experience in operating machinery three to five thousand m. above sea level, or at barometric pressure of 535-to 425 mm. hg., including steam engines, hydraulic turbines, internal-combustion engines, electric machinery, etc.

RATING OF. Rating of Machinery, E. W. Pierce. Indus. Management (Lond.), vol. 9, nos. 10, 11 and vol. 10, no. 3, May 17, 31 and Aug. 23, 1923, pp. 304-306, 334-336 and 95-97. Law in Scotland and Ireland; history of Bill; question of ratable value. From paper read before Liverpool Eng. Soc.

MALLEABLE CASTINGS

MANUFACTURE. Making Malleable Castings. Eng. Production, vol. 6, no. 132, Sept. 1923, pp. 401-406, 16 figs. Works and methods of Ley's Malleable Castings Co., Derby, England, said to be largest foundry in Europe exclusively devoted to this class of work.

MALLEABLE IRON

MELTING. Melting Small Malleable Heats, S. J. Felton. Foundry, vol. 51, no. 16, Aug. 15, 1923, pp. 671-672. Malleable iron made in arc-electric furnace gives trouble in annealing; cost of producing small quantities high and expert knowledge required to keep out of trouble. Paper presented before Am. Foundrymen's Assn.

MAPPING

AERIAL PHOTOGRAPHY. Map-Making from Air Photographs, Nature (Lond.), vol. 112, no. 2806, Aug. 11, 1923, pp. 194-197. Review of book by J. W. Gordon on generalized linear perspective, treated with special reference to photographic land surveying and military reconnaissance.

METALS

ELECTRON EMISSION. Electron Emission from Metals as a Function of Temperature, Saul Dushman. Physical Rev., vol. 21, no. 6, June 1923, pp. 623-636, 1 fig. Derivation of general equation; historical and critical remarks on general equation for electron emission; experimental results.

METAL SPRAYING

Schoop Process. Schoop Metal Spraying Process and Their Recent Progress (Quelques observations sur les procédés de métallisation Schoop et sur les progrès récents de ces procédés), J. Guilbert. Revue de Metallurgie, vol. 20, no. 6, June 1923, pp. 352-357. Explains process and its mechanism; formation of alloys and heat treatment; etc.

METALLOGRAPHY

Structure Analysis. Constant Structure Analysis (Stetige Gefügeanalyse), K. Daeves. Stahl u. Eisen, vol. 43, no. 35, Aug. 30, 1923, pp. 1137-1138, 2 figs. Construction and advantages of diagrammatic slides, in which temperature, carbon content, etc., change constantly from one end to other; experimental arrangement for production of constant slides; importance for educational purposes.

METALS

Conductivity. Effect of Pressure on Thermal and Electric Conductivity of Metals and the Wiedemann-Franz Law (Influenza della pressione sulla conducibilita calorifica ed elettrica dei metalli e la legge di Wiedemann-Franz), Silvio Lussana. Nuovo Cimento, vol. 25, nos. 3-4, Mar.-Apr. 1923, pp. 115-130. Results of Bridgman's experiments of effect of pressure on thermal conductivity of metals, differing from those of author, and justifies author's results.

Critical Points. Methods and Apparatus for Determining Critical Points of Metals and Alloys (Méthodes et appareils utilisés pour la détermination des points critiques des métaux et alliages), Pierre Dejean Chimie ; Industrie, vol. 9, nos. 4 and 5, Apr. and May, 1923, pp. 654-664 and 888-899, 48 figs. Discusses specific heats, expansion, magnetic and mechanical properties; classification and description of recording apparatus.

Extrusion, Effect on. Effect of Extrusion on the Resistance of Metals and Alloys (Influence de l'écrouissage sur la resistivité des métaux et des alliages), Léon Guillet and Marcel Ballay. Académie des Sciences—Comptes Rendus des Séances, vol. 176, no. 25, June 18, 1923, pp. 1800-1802. Results of tests of pure metals previously annealed by new method recording variation of resistance as a function of annealing temperature.

Formed and Drawn Parts. Selecting Material for Formed and Drawn Parts, L. N. Brown. Am. Inst. Min. & Met. Engrs.—Trans., no. 1257-S, Aug. 1923, 10 pp., 16 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, pp. 418-419. Method suggested of testing sheets and strips to show suitability for formed or drawn parts, consists of using a so-called ductility machine with pressure-gage attachement, and from reading, developing a "hardness factor" and depth at breaking point.

Heat Treatment. New Device for Heat Treating Metals. Elec. Ry. Jl., vol. 62, no. 7, Aug. 18, 1923, pp. 265-266, 2 figs. Greater speed in process and a more uniform product are advantages claimed for new electrical method.

Stainless. The "Stainless" Metals of Commerce, J. Kent Smith. Iron Age, vol. 112, no. 10, Sept. 6, 1923, pp. 615 and 650-651. Discussion of their properties and heat treatment; large possibilities in iron-chrome complex; place of non-ferrous alloys.

X-Ray Examination. X-Ray Examination of Irregular Metal Objects, Ancel St. John. Am. Inst. Min. & Met. Engrs.—Trans., no. 1263-S. Aug. 1923, 11 pp., 15 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, p. 417, 1 fig. Describes new method of mounting objects for X-Ray examination; typical defects observed in metals are illustrated and examples of possibilities of method are given; method is rapid, inexpensive, and can be used on a commercial scale.

METRIC SYSTEM

Conversion Chart. English-Metric Converison Chart. Power, vol. 58, no. 10, Sept. 4, 1923, p. 370. Chart by means of which quantities expressed in English units may be converted to corresponding metric units or vice versa with an error generally less than one per cent.

MINE LOCOMOTIVES

Combined Container and. Haulage on Large Scale (Grossraumförderung) H. Spackler. Braunkohle, vol. 22, no. 15, July 14, 1923, pp. 231-235, 2 figs. Discusses defects of haulage locomotives in mines; proposes combination of locomotive and container conveyor and shows that this would be especially suitable for lignite mines.

MINES

Explosions in. Mine Explosions: Causes and Remedies. D. Harrington. Coal Industry, vol. 6, nos. 7 and 8, July and Aug. 1923. pp. 308-311 and 354-357, 2 figs. Observations on mine explosions gathered by author during 15 years of coal-mining investigations in 28 states.

Ventilation. Adequate Ventilation of Metal Mines, D. Harrington. Du Pont Mag., vol. 17, no 8, Aug. 1923, pp. 14-16, 1 fig. Dangers of inadequate ventilation and ventilating methods; costs.

MOLDING METHODS

Plate Molding. Plate Moulding, W. H. Cook. Foundry Trade Jl., vol. 28, no. 364, Aug. 9, 1923, pp. 110-112, 5 figs. Determination of size of box; construction of pattern; method of working; preparation of patterns; match plates.

MONEL METAL

Properties. Monel Metal for High Temperature Work. Mar Engr. & Naval Architect, vol. 46, no 551, Aug 1923, p 303, 2 figs. Résumé of its properties.

MOTOR BUSES

Design. What Is the Ideal in Motor Bus Design-, R A. Whittingham Automotive Industries, vol 49, no. 10, Sept 6, 1923, pp. 487-489, 1 fig Author thinks trolley cars offer many ideas for adaptation, particularly as regards bodies.

MOTOR SHIPS

Twin-Screw New Type B & W Machines in M S Crux. Motorship, vol. 8, no. 9, Sept. 1923, pp 624-626, 8 figs Lighter design of machinery for twin-screw motor vessels saves weight and space Twin-screw motorship built and engined for Norwegian company.

MOTOR-TRUCK TRANSPORTATION

Development in France Development of Automobile Transport (Le développement des Transports Automobiles) H Marschal and F. Bordas Industrie des Tramways, vol 17, no 199, July 1923, pp 249-255 Automobile traffic in France between 1900 and 1921, effect on economic life, desiderata for improvement of track, net costs of transportation

MOTOR TRUCK

Carburetor Adjustment Gasoline Saved on Government Trucks by Adjusting Carburetors by Exhaust Gas Analysis. G W Jones and A C Fieldner U. S. Bur of Mines, Reports of Investigations, no 2487, June 1923, 13 pp 3 figs. Tests made at Government Fuel Yard at Washington to improve adjustment of carburetors on trucks used for transporting coal from Fuel Yard to government buildings in Washington.

Low-Loading. The Coming of the Motor Float, Motor Transport (Lond.), vol. 37, no. 962, Aug. 6, 1923, pp. 173-174, 3 figs. Details of specially designed 30-cwt. French chassis.

Manufacturing Plants. Building Motor Trucks in a Southern California Shop, Fred H. Colvin. Am. Mach,. vol. 59, no. 8, Aug. 23, 1923, pp. 293-295, 7 figs. Shops of Moreland Truck Co. at Burbank, Cal.; machinery and methods.

Municipal Multi-Purpose. A Multi-Purpose Municipal Saurer. Motor Transport (Lond.), vol. 37, no. 962, Aug. 6, 1923, pp. 169-171, 15 figs. Tank car that can be used for street cleaning and fire fighting and is convertible to three-way tipping lorry.

N

NICKEL

Uses. Outlets of Nickel in Industry, Thomas W. Gibson. Eng & Min. Jl.,—Press, vol. 116, no. 9, Sept. 1, 1923, pp. 364-366. Nickel-steel and other alloys find wide application where a quality product is desired; protective properties of nickel strengthens steel; impurities in nickel.

NICKEL STEEL

Production Direct from Ore. Nickel Steel Direct from the Ore, F. H. Mason. Iron Age, vol. 112, no. 12, Sept. 20, 1923, pp. 753-754. Use of Canadian and Cuban ores; waste involved; presence of copper; use of electric furnace.

O

OFFICE BUILDINGS

Maintenance. Industrial Office Building Maintenance, Wallace Clark. Management & Administration, vol. 6, no. 3, Sept. 1923, pp. 347-352, 9 figs. Planning, scheduling, inspection and reapirs.

OIL ENGINES

Airless-Injection. Trials of the New Hesselman Engine (Versuche mit dem neuen Hesselman-Motor) E. Hubendick. Zeit des Vereines deutscher Ingenieure, vol. 67, no. 32, Aug. 11, 1923, pp. 783-785, 11 figs. Combustion tests have shown thermal efficiency of 35.7 per cent. The highest useful average pressure was 7.24 atmos., fuel consumption at normal load is 175.2 g. per hp. (Translated from Teknisk Tidskrift, Apr. 1922.)

Construction. Suggestions for Production in Quantities of Small and Medium-Size Oil Engines (Richtlinien für den Reihenbau von kleinen und mittleren Oe 1 motoren), F. Schultz. Zeit des Vereines deutscher Ingenieure, vol. 67, 32, Aug. 11, 1923, pp. 773-777, 13 figs. Advantages of quantity production, smaller cost and greater yield; better training of workers, development of types of engines, standardization of parts, erection of engines from parts in stock.

Experiments. Some Oil Engine Experiments, A. I. Nicholson. Mar. Eng. & Naval Architect, vol. 46, no. 551, Aug. 1923, 295-300, 10 figs. Résumé of experiments carried out on a Scott-Still. a combined oil and steam engine, to clear certain details met with in oil engine design. Abstract of paper read before Inst. Engrs. & Shipbldrs. in Scotland.

Hot-Bulb. Hot-Bulb Engines of the German General Electric Co. (Die Glühkoopfmaschine der Allgemeinen Elektricitäts-Gesellschaft), Fr. Sass. Zeit des Vereines deutscher Ingenieure, vol. 67, no. 34, Aug. 25, 1923, pp. 832-835, 19 figs. Structural details and working of engine; temperature measurements on hot bulb show that no gasification of injected fuel can take place before combustion, because the temperatures are too low; fuel must ignite in liquid state.

Indicator Diagrams. Oil Engine Operation Studied by Special Cards, H. F. Birnie. Power Plant Eng., vol. 27, no. 17, Sept. 1, 1923, pp. 880-882, 20 figs. How compression, expansion, exhaust and intake strokes may be studied to advantage by use of offset and weak spring diagrams.

OIL FIELDS

Exploitation by Shafts and Galleries. Petroleum Mining by Underground Drainage, Paul de Chambrier. Oil Eng. and Finance, vol. 4, no. 80, July 21, 1923, pp. 37-40. Examination of various causes which tend to vary production; action of "essence" vapors; ventilation and planning; cost of production. (Abstract.) Paper presented at Int. Congress of Liquid Combustibless

Faulting. Faulting and Petroleum Accumulation at Mexia, Texas, Wallace E. Pratt and F. H. Lahee. Ool Eng. & Finance, vol. 4, no. 82, Aug. 4, 1923, pp. 119-122, 3 figs Describes Mexia fault and discusses its influence upon accumulation, its relation to regional geologic structure, and paramount importance of faulting in petroleum deposits of Gulf Coastal Plain.

OIL FUELS

Heating Plants Use in. Burning Liquid Fuel in Small Heating Plants, Walter J. Ottinger. Heating & Vent Mag., vol. 20, no. 8, Aug 1923, pp 44-47, 3 figs Study of various methods now in use, with chart for determining efficiency oil burner and furnace

Meters for The Metering of Oil Power Eng., vol 18, no 209, Aug 1923, pp 296-297, 2 figs. Describes new Kennedy oil meter

Production from Coal Remarkable Strides Made in Production of Liquid Fuels from Coal Automotive Industries, vol 49, no 9, Aug 30, 1923, pp 432-435 Greatest development has come through low-temperature system of distillation; other methods Relation between phenols and aromatic hydrocarbons, experimental work and results

Viscosity Fuel Oil and Viscosity, M G Langham Power, vol 58, no 11, Sept 11, 1923, pp 423-424, 1 fig Points out that viscosity of oil has much to do with size of lines, pumps, heaters and capacity of burners

OIL SHALES

Retorts The Distillation of Oil Shale Oil Eng & Finance, vol 4, no 81, July 28, 1923, pp 68-70 Describes retorts, one of which was constructed by Oil & Nitrate Products Co of Nova Scotia for U S Government during war for production of acetone

OIL WELLS

Drilling Use of Diamond Drills in Drilling Oil Wells (El Uso del [illegible] de Diamante en las Perforaciones de Pozos de Petroleo Juan H [illegible] Boletin del Petroleo, vol 15, no 2, Feb 1923, pp 111-116 Complete boring samples for geological and economic interpretation pipe diameter, [illegible] capacity of ground in determining capacity of oil well

OPEN-HEARTH FURNACES

Heat Consumption Calculation of the Heat Consumption of Open Hearth Furnaces (Die Berechnung des Warmebedarfs der Siemens-Martin-Ofen), Hugo Bansen Stahl u Eisen, vol 43, no 32, Aug 9, 1923 pp 1031-1034 [illegible] Heat circulation balance, heat losses, calculation of heat consumption [illegible] obtainable gas and air preheating, furnace efficiency, method of heat transmission

ORE HANDLING

UNDERGROUND. Loading Ore Underground with Scrapers at the Utah Apex Mine, S. F. Hoar. Am. Inst. Min. & Met. Engrs.—Trans., no. 1263-M, Aug. 1923, 7 pp., 10 figs., and abstract Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, pp. 422-423. Brief description of use of drag scrapers and small hoists for loading ore underground; types of scrapers and hoists tried and found successful, and arrangement of chutes and rigging used.

OXY-ACETYLENE CUTTING

STEEL. Economics of Oxy-Acetylene Cutting of Steel. Can. Machy., vol. 30, no. 7, Aug. 16, 1923, pp. 24-25. Abstract of report by Int. Acetylene Assn. on correct procedure for cutting forgings to finished shape by means of blow pipe. Savings of time and money effected.

OXY-ACETYLENE WELDING

BOILER SHOP. Welding and Cutting Practice in the Boiler Shop. Boiler Maker, vol. 23, no. 8, Aug. 1923, pp. 217-219, 12 figs. Deals with number of jobs, both welding and cutting, in which oxy-acetylene process has been used with high degree of success.

EQUIPMENT. Care of Oxy-Acetylene Equipment. Welding Engr., vol. 8, no. 8, Aug. 1923, pp. 28-29. Points to be observed in the handling and use of each unit of the welding outfit.

IRON. Overheating Iron in Autogenous Welding (Ueberhitzung des Eisens bei der autogenen Schweissung), Theo Kautney. Autogene Metallbearbeitung, vol. 15, nos. 21, 22 and 23, Nov. 1, 15 and Dec. 1, 1922, and vol. 16, nos. 1, 2 and 4, Jan. 1, 15 and Feb. 15, 1923, pp. 307-309, 317-321, 330-332, 6-8, 20-22 and 40-45, 27 figs. Methods for preventing overheating; microscopic examination of structure which in overheating is sufficiently loosened for oxygen to penetrate; cooling and its effect on structure of iron; annealing; etc.

OIL-STORAGE TANKS. Flange Welded Tanks. Welding Engr., vol. 8, no. 8, Aug. 1923, pp. 19-20, 3 figs. New type of construction by which all plates are flanged and welded cuts down loss of oil through leakage and adds strength to tanks.

P

PAINTS

STRUCTURAL MATERIALS. Report of Committee D-I on Preservation Coatings for Structural Materials. Paint Mfrs. Assn. of U.S., Sci. Section, Circular no. 185, July 1923, pp. 309-408, 39 figs. Report of Committee and sub-committees of Am. Soc. for Testing Mtls. Mesting of paint vehicles, methods of analysis of paint materials, varnish, shellas, preparation of iron and steel surfaces for painting, physical properties of paints and anti-fouling paints among subjects treated.

PAPER INDUSTRY

CANADA. The Pulp and Paper Industry. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 392-393, 5 figs. Statistics showing its rapid growth and importance to engineering profession.

PAPER MANUFACTURE

BY-PRODUCTS IN PULP INDUSTRY. The Development of Chemical By-Products in the Pulp Industry. Ronald G. MacDonald. (Chemical Warfare, vol. 9, no. 8, Aug. 15, 1923, pp. 2-4) Chlorin gas; caustic soda; chloroform; hydrogen gas; sulfite pulp.

DEVELOPMENT. The Development of Papermaking, W. G. MacNaughton. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 394-396. Preparation and treatment of stock; paper machine prime mover and machine drive.

MACHINES, MANUFACTURE OF. Shop Problems in Paper Machine Manufacturing, E. T. Spidy. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 404-406, 4 figs. Operations on paper machine dryers; shop work on rolls; general machine work and shop erection.

PULP MANUFACTURE. The Cooking of Sulphite Pulp Martin L. Griffin. Paper, vol. 32, no. 12, July 11, 1923, pp. 7-8 and 13, 1 fig. Proper cooking is essence of whole process of pulp making; little improvement in 40 years cooking under pressure has been practised; new system offers efficiency and economy.

PULP STRENGTH TESTING. Testing the Strengths of Pulps, Sindall and Bacon. Paper Trade Jl., vol. 77, no. 8, Aug. 23, 1923, pp. 46-49. Standardization in operation of analysis and testing said to be essential function of accurate work. Article is contribution toward standardization of methods. Influence of time, bleaching, beater roll distance, dry condition. Bibliography.

PULP WOODS. American Pulp woods, Sidney D. Wells. Paper, vol. 32, nos. 14 and 15, July 25, and Aug. 1, 1923, pp. 7-14 and 6-8, 12, 16 and 18. Suitability of various species of American woods for pulp and paper production. Revision of article by Otto Kress, Sidney D. Wells and Vance P. Edwards published in Paper, July 30, 1919 in which 30 new species have been added and many of those in original article changed to conform with later experience.

SULPHITE SPENT LIQUOR ANALYSIS. Determination of Calcium Sulphate, A. Sander. Paper, vol. 32, no. 12, July 11, 1923, pp. 5-6 and 17. Methods of analyzing sulphite spent liquor to determine calcium sulphate content; details of new method devised by German scientist; results of exhaustive tests. From Chemiker Seitung, no. 47, 1923.

WOOD DEFIBERIZATION PROCESS. McMillan Defiberization Process of Wood. Paper Trade Jl., vol. 77, no. 7, Aug. 16, 1923, pp. 43-45, 9 figs. Describes process of McMillan Process Co., of San Francisco, Cal., comprising an apparatus for defiberization of wood in such a manner that fiber is removed from solid wood in line with length of same, fibers recovered from defiberization of solid wood being for use in connection with industrial arts generally.

WOOD PULP. Pulp-Wood Consumption and Wood-Pulp Production. U. S. Bur. of Census, Forest Products 1921-1923, 15 pp. Pulp-wood consumption, wood-pulp production, and imports and exports, giving tabulated data. Compiled in co-operation with Dept. of Agriculture Forest Service.

PAPER MILLS

MACHINE TOOL REQUIREMENTS. Machine Tool Requirements of Pulp and Paper Mills, L. B. Wardle. Eng. Jl., vol. 6, no. 9, Sept. 1923, pp. 406-407. Outlines machine tool requirements of pulp and paper mills.

PIPE, CAST-IRON

CENTRIFUGAL CASTING. Cast Iron Pipe Centrifugally, E. C. Kreutzberg. Foundry, vol. 51, no. 18, Sept. 15, 1923, pp. 727-731, 9 figs. Rotating chills molds used to form bell and spigot type cast-iron pipe, core required only in bell end; use high-silicon mixture and anneal product.

PIPE STEEL

TESTING. New Methods for Mechanical Testing of Steel Pipe (Nouvelles méthodes pour l'essai mécanique des tubes d'acier). Génie Civil, vol. 83, no. 5, Aug. 4, 1923, pp. 107-108, 10 figs. Static traction and dynamic flexure tests, and ways to carry them out; notes on other tests.

PIERS

CONCRETE. Precast Units Form Substructure of Ballantyne Pier. Concrete, vol. 23, no. 2, Aug. 1923, pp. 61-65, 22 figs. Ballantyne Pier, Vancouver, consists of gravel fill with concrete deck on each side carried on two lines of timber and three lines of concrete piers with reinforced concrete sheds surmounting the decks.

PIPE, WOOD STAVE

CONSTRUCTION. Construction of Wood-Stave Pipe, R. Marks Orr. Power, vol. 58, no. 12, Sept. 18, 1923, pp. 457-458, 3 figs. Advantages; method of construction.

PISTON RODS

STEAM DROP HAMMERS. Piston Rods for Steam Drop-Hammers, A. A. Blue. Iron Age, vol. 112, no. 7, Aug. 16, 1923, pp. 415-417, 8 figs. Causes of some defective rods, specifications for material suitable for best service; heat treatment a factor.

PLANNERS

PLATE. Large Plate-Edge Planer With Electrically Operated Holding Device (Grosse Blechkantenhobelmaschine mit elektrisch betätigter Spannvorrichtung), F. Sipmann. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 26, June 30, 1923, pp. 629-630, 6 figs. Describes machine built by Schiess A. G., including now patented electric regulating device for holding plates during operation.

PORTS

MONTREAL, CANADA. The Port of Montreal, Frederick W. Cowie. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 521-524, 3 figs. Factors contributing to its development; River St. Lawrence ship channel; mechanical handling in harbor; electrification of harbor terminals, floating drydocks, standard piers, etc. (Abridged.)

POWER FACTOR

CORRECTION. Power-Factor Correction with Loaded Synchronous Motors, Clifford W. Bates. Elec. World, vol. 82, no. 7, Aug. 18, 1923, pp. 323-325, 8 figs. Analysis showing advantages of using synchronous motors to carry additional system loads; determination of variation in reactive component with variation load on synchronous machine.

METERS. Power Factor, F. E. J. Ockenden. Elec. Rev., vol. 93, no. 2384, Aug. 3, 1923, pp. 164-165, 6 figs. Study of problem of producing satisfactory power-factor meter giving a "rotary;" or 360-deg. scale and suitable for unbalanced loads of varying frequency and voltage.

PROFIT SHARING

MANAGEMENT SHARING AND. Will Profit-Sharing Bring Management-Sharing? Joseph Mayer. Management and Administration, vol. 6, no. 3, Sept. 1923, pp. 353-357. Among 15 typical profit-sharing plans adopted since 1919, two have management-sharing features.

PROSPECTING

ELECTRICAL. Results Obtained by Schlumberger Method of Electrical Prospecting, Sherwin F. Kelly. Am. Inst. Min. & Met. Engrs.—Trans., no. 1261-M, Aug. 1923, 9 pp., 2 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, p. 418. Schlumberger method is to locate those regions presenting most intense electrical activity by measurements of electrical current, at surface of ground, with a potentio-meter and non-polarizing electrodes; describes theory and technique, also field work carried out by author in Manitoba and Saskatchewan, and resulting discovery of a small vein on shore of Lake Athapapuskow.

PULVERIZED COAL

ADVANTAGES AND DISADVANTAGES. Status of Pulverized Fuel, L. W. W. Morrow. Elec. World, vol. 82, no. 11, Sept. 15, 1923, pp. 525-532, 10 figs. Decreased losses and greater flexibility in operation are admitted advantages from its utilization; typical installations and trends in development; advantages and disadvantages.

EUROPEAN DEVELOPMENT. Pulverized Fuel. Queensland Govt. Min. Jl., vol. 24, no. 278, July 14, 1923, p. 251. Union d'Electricité, at Vitry, Paris, equipped with complete installation of Lopulco system of pulverized fuel. Advantages of system. Other equipment installed.

EXPLOSION HAZARD. Explosive Tendencies of Pulverized Coal, Hatland Seymour. Chem. Age (Lond.), vol. 9, no. 215, July 28, 1923, pp. 82-84. Discusses hazards which arise in connection with utilization of pulverized fuel; draws attention to fact that little danger is involved providing that reasonable care is taken to comply with well-established precautions.

PROBLEMS. Pulverized Coal, Audrey J. Grindle. Fuels & Furnaces, vol. 1, nos. 4 and 5, Aug. and Sept. 1923, pp. 273-275 and 361-362, 364 and 366. Aug.: Fuel values; history of pulverized coal. Sept.: Ash problem; drying and pulverizing coal, cost of preparing; safety of installations.

PULVERIZERS. A self-Contained Pulverized Fuel Plant. Power Engr., vol. 18, no. 209, Aug. 1923, pp. 302-305, 4 figs. By means of machine known as Atritor, it is possible to adopt pulverized-fuel firing for boiler plants without necessity of elaborate buildings and extensive machinery.

PUMPING ENGINES

BRITISH. Some Notes on British Water Works Pumping Engines, F. Johnstone-Taylor. Fire & Water Eng., vol. 74, no. 9, Aug. 29, 1923, pp. 399-400, 2 figs. Types of units built for English and foreign water works, some large installations; China and Argentine engines.

PUMPING PLANTS

DESIGN. Modern Waterworks Pumping Stations, B. Burdick. Can. Engr., vol. 45, no. 9, Aug. 28, 1923, pp. 271-275, 4 figs. General principles outlined, examples of recent construction. Fireproof construction. Paper before Am. Water Works Assn.

EQUIPMENT. Determining the Proper Equipment for Pumping Stations, Arthur L. Mullergren. Fire & Water Eng., vol. 74, no. 9, Aug. 29, 1923, pp. 391-392, 401-402, and 408. How to decide upon most serviceable type of pumping engines and methods of drive for them; tendency toward turbine-driven centrifugal pump; economy of electric drive.

PUMPS

AIR-LIFT. The Air Lift Pump. Practical Engr., vol. 68, nos. 1901 and 1902, Aug. 2 and 9, 1923, pp. 63-65 and 74-76, 11 figs. Notes on modern apparatus which have led to more efficient working. Aug. 2: Advantages of air-lift pumping. Aug. 9: Operation; foot-piece design; booster system.

PUMPS, CENTRIFUGAL

COAL MINES. Revolutionizing Mine Pumping with Automatically Primed, Started and Controlled Centrifugal Pumps, Edgar Gealy. Coal Age, vol. 24, no. 11, Sept. 13, 1923, pp. 392-396, 8 figs. Development of automatic equipment; application of simple devices to complex operations, advantages and economies realized; details of equipment and operation.

DESIGN AND APPLICATION. The Present Status in the Design of Centrifugal Pumps (Der heutige Stand des Kreiselpumpenbaues), E. Heidebroek. Zeit. des Vereines deutscher Ingenieure, vol. 67, nos. 33 and 34, Aug. 18 and 25, 1923, pp. 797-803 and 826-831, 43 figs. Phenomena of flow in pumps; sources of loss; modern high- and low-pressure pumps; noteworthy examples of pumping plants showing varied useful possibilities of centrifugal pump.

INSTALLATION AND OPERATION. Some Notes on Centrifugal Pumps, C. C. Brown. Power Plant Eng. vol. 27, no. 17, Sept. 1, 1923, pp. 867-869, 1 fig. Working data on installation and operation.

OIL INDUSTRY. Pumps and Pumping Systems in the Oil Industry. Oil Eng. & Finance, vol. 4, no. 81, July 28, 1923, pp. 59-60, 1 fig. Details of Gwynne's centrifugal or turbine pump.

STEEL PLANTS. Motor Operated Centrifugal Pumps in Steel Plants, B. A. Cornwell. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 309-326, 6 figs. General laws governing actions of centrifugal pumps; performance and operation of typical centrifugal pumps as used in steel plants; cost of pumping water by steam-turbine-drive pump; type of motors for driving centrifugal pumps; influence of variation in frequency.

PYROMETERS

OPTICAL. Disappearance of the Filament and Diffraction Effects in Improved Forms of an Optical Pyrometer, C. O. Fairchild and W. H. Hoover. Optical Soc. of Am.—Jl., vol. 7, no. 7. July 1923, pp. 543-579, 10 figs. Laboratory form of pyrometer is described and two special improved forms of micropyrometer are described in principle. New law of diffraction, consistent with theory and experiment, i. e., of light incident on an obstacle in an image plane, only that component is diffracted which represents diffracted rays radiating from edge of aperature, Bibliography.

R

RADIATORS

TRAPS. Performance Data on Nineteen Radiator Traps. Heating & Vent. Mag., vo ' , no. 8, Aug. 1923, pp 33-39, 23 figs. Results of recent tests covering such points as venting of air, drainage of water, trapping of steam, and freedom from noise.

RADIOTELEGRAPHY

AMPLIFIERS. Some Measurements of Voltage Amplification of Audio-Frequency Amplifiers. U. S. Bur. of Standards-Circular no. 98, July 18, 1923, 3 pp., 4 figs. Results of voltage-amplification measurements made on 16 audiofrequency amplifiers which are considered as being typical of those on market during years 1921-22.

AUTOMATIC RECEIVERS. Some Methods of Automatic Wireless Reception, A. H. E. Rogers. S. African Inst. Elec. Engrs.—Trans., vol. 14, part 6, June 1923, pp. 105-112, 15 figs. Desiderata for high-speed recording apparatus; available types and their limitations. Bibliography.

LONG-DISTANCE. Long-Distance Wireless Communication, M. Childs and H. E. Penrose. S. African Inst. Elec. -Trans., vol. 14, part 5, May 1923, pp. 86-88. Information with respect to high-speed wireless services; notes on high-speed duplex wireless service between London and Paris.

RADIOTELEPHONY

BROADCASTING STATIONS. Description of the General Electric Company's Broadcasting Station at Schenectady, New York, W. R. G. Baker. Inst. Radio Engrs.—Proc., vol. 11, no. 4, Aug. 1923, pp. 339-374, 49 figs. Describes pick-up devices, amplifying equipment, transmitters, and control systems of modern broadcasting station; considers factors entering into operation and performance of such station.

INTERFERENCE. Interference, Robert H. Marriott. Inst. Radio Engrs.—Proc., vol. 11, no. 4, Aug. 1923, pp. 375-388. History of development of interference with radio receiving; discusses present change in interference problems caused by number of broadcast listeners; suggestions for eliminating or reducing interference.

RECEIVERS. Using the "Inverse Duplex" with Various Kinds of Tubes, David H. Grimes. Radio Broadcast, vol. 3, no. 3, July 1923, pp. 197-202, 5 figs. Discusses practical operation of method of employing tubes for radio and audiofrequency work simultaneously without overloading them.

RAILS

CORRUGATION. Rail Corrugation, Robert B. Holt. Tram. & Ry. Jl., vol. 54, no. 10, Aug. 23, 1923, pp. 91-93. Discussion on article by H. M. Dudgeon, Feb. and May 1923 issues of Tram. & Ry. Jl.

DEVELOPMENTS. Modern Trackwork and its Importance, Robert Hadfield. Inst. of Transport—Jl., vol. 4, no. 9, July 1923, pp. 320-339 and (discussion), 339-343, 13 figs. Rail failures; steel for rails; metallurgical improvements in rail steel. Review of development of rails.

STREET-RAILWAY, LAYING OF. Laying of Street Railway Rails in Different Types of Road Construction (Pose des rails de Tramways dans les divers revêtements de chaussées), A. Mariage. Industrie des Tramways, vol. 17, no. 199, July 1923, pp. 239-249, 7 figs. Report of inquiry addressed to French street-car lines. Methods of laying; advantages and disadvantages of different types of roadbeds; rail jointing; noise and oscillation and how to lessen them.

RAILWAY CONSTRUCTION

ARGENTINE-CHILEAN RAILWAY. Building New Argentine-Chilean Transandine Railway, Richard F. Maury. Eng. News-Rec., vol. 91, no. 9, Aug. 30, 1923, pp. 332-336, 7 figs. Details regarding Salta-Chile extension of Argentine State Rys. now under construction, to connect existing railway system with Pacific port of Antofagasta; has American viaducts and equipment, maximum grade 2.5 per cent, uses switchbacks and spirals, summit 14,681 ft.

RAILWAY CONSTRUCTION

LOCATION. Recent Railway Location in Southern Columbia, F. R. Molther. Eng. News-Rec., vol. 91, no. 7, Aug. 16, 1923, pp. 258-271, 3 figs. Difficult problem of linking up cities in Andes Mountains, providing outlet to sea, lack of transportation facilities, no local subsistence.

RAILWAY ELECTRIFICATION

ARGENTINA. Railway Electrification in South America. Electrician, vol. 90, nos. 2348, 2349 and 2351, May 18, 25 and June 8, 1923, pp. 542-543, 567-568 and 618-620, 11 figs. Details regarding inauguration of electric traction on Buenos Aires Western Ry., including power stations, transmission lines, rolling stock, etc.

ENGLAND. The Electrification of the S. E. and C. Railway. Elec. Rev., vol. 93, no. 2386, Aug. 17, 1923, p. 236, 1 fig. New system on South Eastern and Chatham section of Southern Railway will improve conditions at London terminals and co-ordinate service.

RAILWAY MANAGEMENT

FREIGHT ACCOUNTING. Freight Accounting on the North Shore, R. B. MacRae. Elec. Ry. Jl., vol. 62, no. 9, Sept, 1, 1923, pp. 329-332. System of daily freight accounts on Chicago, North Shore & Milwaukee Railroad; by sectionalizing of agents, accounts and proving to a known total a complete daily check is obtained; methods of accumulating totals.

RAILWAY MOTOR CARS

GASOLINE. Powerful Gasoline Motor Driven Train. Ry. Age, vol. 75, no. 7, Aug. 18, 1923, pp. 291-292, 6 figs. Sykes Company demonstrates two-car train driven by 245-hp. engine and seating 74 passengers.

RAILWAY OPERATION

LINE CAPACITY, INCREASING. How the Capacity of a Line Can Be Increased. Ry. Age, vol. 75, no. 11, Sept. 15, 1923, pp. 463-469. Prize-winning and other papers received in contest, as follows: Enlarge the Congested Places in the Line, L. R. Smith: Uniform Movement Will Increase Capacity, P. H. Pearson; Systematic Study of Limiting Factors Essential, G. D. Brooke; Increase the Car Loading, M. A. Simmer.

STATISTICS. I. C. C. Statistics and Operating Efficiency, J. E. Slater. Ry. Age, vol. 75, no. 10, Sept. 8, 1923, pp. 427-430. Operating statistics reports instituted by Interstate Commerce Commission; suggestions as to proper use of data.

GRAIN CONTROL. Automatic Train Control, L. F. Hiward. Southern & Southwestern Ry. Club, vol. 17, no. 3, May 1923, pp. 17-18, 21-22, 25-26, 29-30, 33-34, 37-38, 41-42 and 45-46, 4 figs. Review of development of automatic train control on different railways. Types of automatic valves and application.

Report on Sprague Automatic Train Control. Ry. Age, vol. 75, no. 9, Sept. 1, 1923, pp. 399-40. Detailed review of sixty-day test; result not conclusive but further experiments encouraged.

TRAIN DESPATCHING. Single-Track Despatching on the Orleans (Le dispatching en voie unique sur le réseau d'Orléans), M. Piarrat. Revue Générale des Chemins de Fer, vol. 42, no. 6, June 1923, pp. 482-489, 4 figs. Describes installation of American system as a test on Montlucon-St. Sulpice line, to give increased circulation of rolling stock and expedite traffic.

RAILWAY SHOPS

ELECTRIC PRACTICES OF. N. &. W. Electric Shop Practices. Elec. Ry. Jl., vol. 62, no. 7, Aug. 18, 1923, pp. 257-260, 4 figs. Repair work at maintenance shops of electric division at Bluestone Junction on Norflok & Western; equipment and methods well adapted to minimizing upkeep costs.

RAILWAY TIES

STEEL. A New Metal Railway Tie Without Holes (Note sur une nouvelle traverse métallique "sans trou"), Armand Desoer. Revue Universelle des Mines, vol. 17, no. 6, June 15, 1923, pp. 449-558, 4 figs. Design and construction of new type of steel tie which has no holes, the weak point of all metal ties, its advantages; comparative maintenance cost of ties.

RAILWAY TRACK

ELEVATION. Train Operation Improved by Grade Separation. Ry. Age, vol. 75, no. 10, Sept. 8, 1923, pp. 420-425, 10 figs. Completion of East Orange work gives Delaware, Lackawanna & Western three tracks through suburban territory, improving service, and eliminate grade crossings.

STRESSES IN. Device for Determining Stresses in Track. Elec. Ry. Jl., vol. 62, no. 8, Aug. 25, 1923, pp. 294-295, 3 figs. Otheograph, device for recording actual pressures due to locomotives; graphic record is made directly by impact of wheels.

TURNTABLES. Friction Drive for Turntable Tractors. Ry. Age, vol. 75, no. 10, Sept. 8, 1923, pp. 443-445, 3 figs. Outfits installed by Great Northern cannot be damaged by careless operation.

RAILWAY YARDS

FLOOD LIGHTING. Norfolk & Western Installs Lights in 15 Yards. Ry. Age, vol. 75, no. 7, Aug. 18, 1923, pp. 283-287, 8 figs. System of flood lighting peculiarly suited to requirements of classification yards.

RAILWAYS

AUSTRALIA. The North-South Transcontinental Railway of Australia. Ry. Gazette, vol. 39, no. 8, Aug. 24, 1923, pp. 245-249, 1 fig. Review of report issued by Parliamentary Standing Committee on Public Works of Australia. Proposed routes; costs.

IMPORTANCE TO INDUSTRIAL CENTRES. Railway Requirements of an Important Industrial Area, J. A. Jenkinson. Inst. of Transport—Jl., vol. 4, no. 9, July 1923, pp. 344-353 and (discussion) 353-356. Transport requirements of an important industrial centre from point of view of public and of railway. Permanent way and layout; provision of train services; goods and coal services; operating department.

ROLLING STOCK, AIR RESISTANCE ON. Measuring the Air Resistance on Railway Material (Mesure de la résistance de l'air sur le matériel des chemin de fer), Ch. Maurain, A. Toussaint and R. Pris. Academie des Sciences. Comptes Rendus des Séances, vol. 177, no. 5, July 30, 1923, pp. 308-310. Results of tests with models in a wind tunnel, including table of coefficients for k RV for locomotives, tenders, cars, etc., isolated and in combination.

REFRACTORIES

DISINTEGRATION BY CO. The Disintegration of Refractory Brick by Carbon Monoxide, B. M. O'Harra and W. J. Darby. Am. Ceramic Soc. Jl., vol. 6, no. 8, Aug. 1923, pp. 904-914, 7 figs. Experiments illustrate forcibly disintegration by increase in volume brought about by deposition of carbon resulting from decomposition of CO according to reaction $2CO = CO_2 + C$, at temperatures of 550 deg. cent.

REFRIGERATING PLANTS

FLUID METERS. Reliability of Fluid Meters in Refrigerating Tests, J. S. Mayo. Refrig. Eng., vol. 10, no. 1, July 1923, pp. 1-8 and (discussion) 8-13, 5 figs. Author's experience with brine and liquid ammonia meters shows that no reliance can be placed in them.

REFRIGERATION

METHODS. Refrigeration: What It Is and How to Use It, P. Seymour. A. Wardale. Chem. & Met. Eng., vol. 29, no. 11, Sept. 10, 1923, pp. 506-511, 7 figs. The [illegible] upon which available systems of natural and mechanical refrigeration operate with charts and tables which will aid in solution of refrigerating problems.

REGULATORS

AREA. A Universal Regulator. Power Engr., vol. 11, no. 8, Aug. 1923, pp. 294-295, 5 figs. In Area automatic regulator same controlling mechanism is adapted for very wide variety of purposes, and to give reliable results in different conditions.

RESEARCH

NUMERICAL DATA AS AID IN. Study of Numerical Data as a Means of Utilizing Experience in Industrial Research. Grosszahl Forschung, ein neues Mittel zur Verwertung der Erfahrung in Industrie und Industrieforschung. K. Daeves. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 26, June 30, 1923, pp. 643-644. 3 figs. Describes new method of studying masses of numbers, such as statistics, which gives accurate and valuable results without costly experiments, including use of curves of averages, frequencies, etc.

ROAD CONSTRUCTION

COST'S ESTIMATION. Overlooked Items in Estimating Road Work. C. S. Hill. Eng. News-Rec., vol. 91, no. 10, Sept. 6, 1923, pp. 391-393. Factors affecting costs whose neglect or improper evaluation in estimating turn theoretical profits into practical losses.

STEEL, USE OF. Steel Plays New Role in Highway Construction. Frank G. Steinebach. Iron Trade Rev., vol. 73, no. 8, Aug. 23, 1923, pp. 525-530 and 541, 10 figs. Discusses ways in which impetus in highway construction affect manufactures of machinery, tools, fabricated steel, etc.; uses for iron and steel in road building.

ROCK CRUSHING

KICK VS. RITTINGER THEORIES. A Contribution to the Kick versus Rittinger Dispute. H. E. T. Haultain. Am. Inst. Min. & Met. Engrs. Trans., no. 1262-M, Aug. 1923, 6 pp., 3 figs. and (abstract) Min. & Metallurgy, vol. 41, no. 200, Aug. 1923, pp. 423-424, 2 figs. Working with miniature rolls and an accurate integrating dynamometer, author arrived at conclusion that neither Kick nor Rittinger accurately connect up size of product with energy required to crush rock; ratio of size of product to energy will vary with rock and with degree of crushing.

ROADS

TESTING APPARATUS. Development of Apparatus for Field Testing of Roads. H. F. Clemmer. Eng. & Contracting (Roads & Streets), vol. 60, no. 2, Aug. 1, 1923, pp. 248-251, 5 figs. Machines for testing subgrade and determining repeated load; slab tests with Caly core drill; method and cost of taking cores; tests of surface irregularities.

TRACTIVE RESISTANCE. The Tractive Resistance of Pavement Surfaces. A. B. Cutter. Am. City, vol. 29, no. 2, Aug. 1923, pp. 124-125. Results of tests made by author.

ROADS, MACADAM

RESURFACING BY ASPHALT-PENETRATION. Asphalt-Penetration Resurfaces Old Macadam Streets. Eng. News-Rec., vol. 91, no. 9, Aug. 30, 1923, pp. 349-350, 3 figs. Old waterbound macadam streets in Bridgeport, Conn. being converted into excellently surfaced thoroughfares, at less than a dollar a yard.

ROLLING MILLS

BAR MILL. Enlarges Rolling Mill Capacity. J. D. Knox. Iron Trade Rev., vol. 73, no. 12, Sept. 20, 1923, pp. 807-811, 7 figs. Completion of new 20-in. unit prefaces other improvements at Dunkirk, N.Y., plant; flexible charging machine; describes installation and contemplated extension.

COLD STRIP ROLLING. Cold Strip Rolling. W. H. Cleaver. Iron Age, vol. 112, no. 12, Sept. 20, 1923, p. 744. Points regarding process.

ROD MILL. Continental Rod-Mill Practice. Iron & Coal Trades Rev., vol. 107, no. 2894, Aug. 17, 1923, pp. 224-226, 15 figs. Methods and equipment in Continental rod mills. From Revue de Metallurgie.

TRAINS. Rolling Mill Trains (Les trains machines), E. Poncelet. Revue de Métallurgie, vol. 20, no. 6, June 1923, pp. 369-380, 21 figs. Process and apparatus for rolling blooms and billets; wire drawing; etc.

S

SAFETY VALVES

BOILER. The How and Why of Safety Valves. Power, vol. 58, no. 10, Sept. 4, 1923, pp. 357-361, 8 figs. General principles underlying operation of different types of pop safety boiler valves; practical features; describes some typical safety valves.

SAND, MOLDING

COMPOSITION. Composition of Molding Sand, Henry B. Hanley. Foundry, vol. 51, no. 18, Sept. 15, 1923, pp. 745-747. Typical analysis of molding sands from many sources are presented and conclusions drawn to show effect of bonding elements on life and refractoriness. (Abstract.) Paper presented before Am. Foundrymen's Assn.

TREATMENT AND PROPERTIES. Rational and Economic Treatment of Foundry Sands (Traitement Rationnel et Economique des Sables servant au moulage de la Fonte), G. Ecureux. Fonderie Moderne, vol. 17, July 1923, pp. 219-222. Imperfections in castings due to poor quality of sand used; analysis and composition of sands; porosity, refractivity and other properties; fineness; screening; etc.

SCALES

TRACK. Analysis of Track Scale Tolerances, Harry M. Roeser. Scale Jl., vol. 9, no. 11, Aug. 10, 1923, pp. 5-7. Bureau of Standards and American Railway Assn. tolerances; comparison of results of distributed load and single load tests; etc.

SCREW MACHINES

MILLING AND DRILLING ATTACHEMENT. Extending the Scope of the Automatic. Eng. Production, vol. 6, no. 131, Aug. 1923, pp. 346-348, 10 figs. Details of new milling and drilling attachement designed for use on automatic screw machine, which will enable series of holes to be drilled through end of work parallel with spindle, recesses to be end-milled and slots to be cut.

SPINDLES FOR. High-Speed Spindles for Screw Machines, Luther D. Burlingame. Machy. (N. Y.), vol. 30, no. 1, Sept. 1923, pp. 29-31, 6 figs. Special high-speed equipment for automatic screw machines, operating on brass, with examples showing production of parts in three seconds or less.

SEMI-DIESEL ENGINES

COLD-STARTING DEVICE. Novel Starting Device for Oil Engines. Power Eng., vol. 18, no. 209, Aug. 1923, pp. 301-302, 2 figs. Describes new series of two-stroke semi-Diesel engines, incorporating novel means of cold starting.

SEMI-STEEL

THERMAL TREATMENT. Thermal Treatment of Molded Pieces, Albert Portevin. Iron Age, vol. 112, no. 12, Sept. 20, 1923, pp. 743 and 794. Imperfections in tempering semi-steel; density of metal affected by heat treatment, which may produce porousness. Memorandum presented to Acad. of Sci.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Design Features of the Indianapolis Activated-Sludge Plant, Charles H. Hurd. Eng. News-Rec., vol. 91, no. 7, Aug. 16, 1923, pp. 258-262, 6 figs. Circulating aeration effected by deflecting baffles giving 6-hr. travel at rate of 2 ft. per sec.; rapid removal of sludge in deep tanks with settling cones and slots.

HAMILTON, CANADA. PUMPING AND DRAINAGE SYSTEMS. Pumping and Drainage Systems, Hamilton. Can. Engr., vol. 45, no. 8, Aug. 21, 1923, pp. 241-249, 3 figs. City engineer's report on alternative systems of intercepting sewers, pumping stations and drainage required for Hamilton, for co-ordination with system of sewage disposal.

SHIPS

LEVIATHAN. American Mail Boat "Leviathan." Le paquebot Américain "Leviathan" (ex-"Vaterland"). Génie Civil, vol. 83, no. 6, Aug. 11, 1923, pp. 121-125, 9 figs. Describes design and equipment before, during and after war; table of principal data of some of largest trans-atlantic liners.

SIZE AND SPEED ECONOMIC. Economic Size and Speed of Vessels. Shipbldg. & Shipg. Rec., vol. 22, no. 5, Aug. 2, 1923, pp. 134-136. Imperial Shipping Committee's report, subsidies necessary to maintain fast mail services, calling in air post; alternative suggestions; passenger accommodation.

SOUND RANGING

SUB-AQUEOUS. The Present Status of Sub-Aqueous Sound Ranging. Harvey C. Allen. Coast Artillery Jl., vol. 59, no. 1, July 1923, pp. 35-55, 18 figs. Present status of binaural phase of sub-aqueous sound ranging; brief description of existing equipment; summary of past and recent experiments; outline of possible future work and statement of essential requirements.

SPRINGS

HELICAL. Coupled Oscillations of a Helical Spring, A. Sommerfeld. Optical Soc. of Am.—Jl., vol. 7, no. 7, July 1923, pp. 529-535, 3 figs. Instrument for determination of elastic constants of wire: torsional and bending moments of spiral spring; effects of resonance; effects of coupling.

LEAF. Leaf Springs (Les ressorts à lames). Ouvrier Moderne, vol. 6, no. 5, Aug. 1923, pp. 177-183, 11 figs. Modulus of elasticity, maximum elastic expansion, etc.; describes new method of calculation of suspension springs for automobiles which has given entire satisfaction; formulas and graphs used.

WIRE. Designing and Making of Wire Springs, J. H. Sullivan. Iron Age, vol. 112, no. 7, Aug. 16, 1923, pp. 413-414. Operations of coiling and grinding; proper relative dimensions of coils; character of wire best suited for springs.

STANDARDIZATION

INDUSTRIAL. Standardization in the Engineering Industry. A. J. Stubbs. Post Office Elec. Engrs.' Jl., vol. 16, part 2, July 1923, pp. 132-141. Discusses standardization of measures, materials and machines.

STEAM

POWER AND PROCESS WORK, USE FOR. The Combined Use of Steam for Power and Other Purposes, Telford Petrie. Engineer, vol. 136, no. 3531, Aug. 31, 1923, pp. 220-222, 5 figs. Points out that, whatever process pressure may be, it must be wasteful and expensive to draw steam from high-pressure boiler through reducing valves, whereas if steam engine is used in place of reducing valve, definite amount of power is produced from heat which would otherwise only go to superheat low-pressure steam; describes different types of such engines.

TABLES, APPLICATIONS OF. Practical Applications of the Steam Tables, W. E. Biggs and W. R. Woolrich. Nat. Engr., vol. 27, no. 9 Sept. 1923, pp. 427-428, 1 fig. Relations of temperature and quantity of heat; definitions of units and applications of steam tables to practical problems.

TABLES AND DIAGRAMS. Tables and Diagrams for Water Vapor Computed on the Basis of Its Specific Heat, Oscar Knoblauch, E. Raisch, and H. Hausen. Mech. Eng., vol. 45, no. 9, Sept. 1923, pp. 538-540, 3 figs. Investigators claim to have derived an equation for specific heat up of simple character, with pressure and temperature entering as magnitudes of first power only; from this equation they have derived equation of state and for entropy and heat content. Translated from Tabelen und Diagramme für Wasserdampf berechnet aus der spezifischen Wärme, R. Oldenbourg, Publishers, Berlin, 1923, 32 pp.

STEAM-ELECTRIC PLANTS

KANSAS CITY, MO. Electrical Features, Northeast Station, Kansas City. Power, vol. 58, no. 9, Aug. 28, 1923, pp. 318-321, 6 figs. Generating unit of 30,000-kw. capacity served by vertical condenser with special facilities for cleaning and efficient combination of circulating pumps; house turbine used for emergency auxiliary drive; new layout of electrical system serving auxiliaries and improved monolithic bus cell structure.

TESTING INSTRUMENTS. Some Instruments Practices of the United Electric Light & Power Company. W. E. Caldwell. Power vol. 58, no. 8, Aug. 21, 1923, pp. 280-283, 3 figs. Explains how company which operates huge Sherman Creek and Hell Gate Stations in New York City, safeguards accuracy of its fundamental test data; instructions for construction of precision.

STEAM ENGINES

AUTOMATIC STOPS. General Specifications for Construction and Installation of Automatic Engine Stops. Assn. Iron & Steel Elec. Engrs., vol. 5 no. 9, Sept, 1923, pp. 355-359. As recommended by Safety Committee.

Standardization of Engine Stops, Walter Greenwood. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 361-368. Arguments in favor of standardization.

STEAM PIPE

UNDERGROUND MAINS. Underground Steam Main Construction, John K. Raymond. Domestic Eng. (Chicago), vol. 104, no. 8, Aug. 25, 1923, pp. 384-386, 5 figs. Installing steam mains in concrete conduits in state institutions in Wisconsin; experiments also with hot-water heating through direct injection of high-pressure steam.

STEAM POWER PLANTS

EXHAUST-STEAM UTILIZATION. Exhaust Steam Turned to Profit. Power Plant Eng., vol. 27, no. 18, Sept. 15, 1923, pp. 911-917, 7 figs. Economies which may be expected from isolated power plant where there is demand for exhaust steam have been fully realized in newly constructed plant for shoe manufacturing plant in Columbus, Ohio; preliminary results show that cost of additional generating equipment will pay for itself within 2½ years.

INSTITUTION BUILDINGS. An Example of Institution Efficiency. Power Engr., vol. 14, no. 8, Aug. 1923, pp. 288-293, 12 figs. Describes power, heating and auxiliary system of North London Poor Law Instn., showing usual sources of thermal inefficiency have been largely obviated and how considerable savings have been made; institution consists of 17 large blocks of buildings, covering area of over 9 acres.

REMODELLING. Parke, Davis & Co. Remodel Detroit Power Plant. Power, vol. 58, no. 10, Sept. 4, 1923, pp. 406-412, 8 figs. Remodel plant while maintaining service; installation of bleeder turbines to co-ordinate more closely power and heating systems; no exhaust escapes to atmosphere, it is either utilized or condensed so that high economy is secured.

STEAM ROLLERS

MAINTENANCE AND REPAIR. Running, Maintenance and Repair of Steam Rollers. G. W. G. Allen. Surveyor, vol. 64, no. 1644, July 20, 1923, pp. 45-46. Suggests directions in which economies may be effected.

STEAM TRAPS

TESTING FOR LEAKAGE. Testing Steam Traps for Leakage, L. D. Goff. Steam Power, vol. 2, no. 4, May 1923, pp. 7 and 14, 1 fig. Method for testing traps for steam loss, which is quick and approximately correct.

STEAM TURBINES

ALIGNING METHODS. Accurate Methods of Aligning Steam Turbines; Taking the Sag Out of a Tight Line, Edgar G. Barker. Power, vol. 58, no. 10, Sept. 4, 1923, pp. 378-380, 5 figs. Describes method which is quickly and positively applicable at any point in a tight line for producing correct distance for vertical measurements of alignment.

CRITICAL SPEED. First Critical Speed of Combined Steam-turbine Set, W. R. Needham. Mech. World, vol. 74, nos. 1909 and 1910, Aug. 3 and 10, 1923, pp. 65-66 and 81-82, 19 figs. Deals with multiple-support systems.

STEEL

CHROME-NICKEL *See Chrome-Nickel Steel.*

COLD-DRAWN. Effect of Low-Temperature Annealing on Some Mechanical Properties of Cold-Drawn Steels, S. H. Rees. Iron & Steel Inst.—Advance Paper, no. 12, for Meeting Sept. 1923, 11 pp., 8 figs. Shows effect of cold drawing without subsequent annealing in case of milk and of high-carbon steel.

CORROSION. The Effect of Velocity on the Corrosion of Steel in Sulfuric Acid, W. G. Whitman, R. P. Russell, C. M. Welling, and J. D. Cochrane, Jr. Mass, Inst. Technology—Bul., vol. 59, no. 34, July 1923, 12 pp. 4 figs. Describes apparatus and methods employed in recent investigation; results.

The Influence of Nickel and Chromiun upon the Solubility of Steel (in Relation to Corrosion), W. H. Hatfield. Iron & Steel Inst.—Advance Paper, no. 8, for Meeting Sept. 1923, 14 pp., 5 figs. partly on supp. plate. Discusses series of experiments designed to give information upon effect of alloying separately, and together, elements chromium and nickel with iron, carbon content being varied, and solubility of such alloys in nitric acid, sulphuric acid, and hydrochloric acid.

CORROSION-CRACKING. The Corrosion Cracking of Steel under the Influence of Internal Stresses, Albert M. Portevin. Iron & Steel Inst.—Advance Paper, no. 11, for Meeting Sept. 1923, 19 pp. 10 figs. Observations referring to cracking of certain shells, and reasons which have led to its being regarded as result of presence of internal stresses.

GRAIN GROWTH. Abnormal Grain Growth in Cold Rolled Low Carbon Steel, Victor E. Hillman and Frederick L. Coonan. Am. Soc. Steel Treating—Trans., vol. 4, no. 2, Aug. 1923, pp. 162-170, 9 figs. Reviews research work conducted in determining factors and conditions causing abnormal grain growth in steel, resulting from annealing critically cold-rolled low-carbon steel.

Grain Growth in Iron and Steel, Hsi C.Wang. Iron & Steel Inst.—Advance Paper, no. 15, for Meeting Sept. 1923, 11 pp., 8 figs. on supp. plate. Literature of grain growth; author's experiments; theories in strained metal.

HYDROGEN DECARBURIZATION. The Relative Efficiency of Dry and Moist Hydrogen on the Decarburization of Steel at 950° C., and the Effect of Hydrogen on the Phosphorus Content. E. D. Campbell, John F. Ross and W. L. Fink. Iron & Steel Inst.—Advance Paper, no. 3, for Meeting, Sept. 1923, 7 pp. It is concluded from results of experiments that (1) double carbides of iron and chromium are more stable than those of pure iron alone; (2) moist hydrogen is not only more efficient than dry hydrogen in decarburization at 950 deg. cent., but is essential to complete decarburization; (3) neither moist nor dry hydrogen at 950 deg. has any effect on phosphorus content of steel.

MICROSCOPIC EXAMINATION. Microscope Aids Steel Selection, E. C. Smith. Iron Trade Rev., vol. 73, no. 10, Sept. 6, 1923, pp. 673-677 and 669-680, 31 figs. Application of microscope to production of satisfactory gears in a satisfactory commercial way; reviews gear development. From paper read before Am. Gear Mfrs.' Assn.

NICKEL. *See Nickel Steel.*

PRESSED, FAILURE IN. Strains in Pressed Low Carbon Steel, Wm. J. Merten. Forging—Stamping—Heat Treating, vol. 9, no. 8, Aug. 1923, pp. 354-356, 7 figs. Metals subjected to drawing, stamping or pressing operations are severely strained; failures are frequent unless material is annealed at various stages.

REFINING. Theory and Practice of Steel Refining, Haakton Styri. Iron & Steel Inst.—Advance Paper, no. 13, for Meeting Sept. 1923, 39 pp., 3 figs. Author seeks to show that all reactions between oxygen and usual elements take simultaneously; it is consequently quite impossible for silicon only to react with oxygen in dioxidizing.

SHEET, SWAGING OF. Swaging of Sheet Steel, Brass or Aluminum (Considérations sur la fabrication par emboutissage des objets à parois minces, d'épaisseur uniforme; objets en tôle d'acier, en laiton, en aluminium), J. Thomas. Revue de Métallurgie, vol. 20, nos. 4 and 5, Apr. and May 1923, pp. 225-247 and 307-319, 34 figs. Explains swaging of forms of objects from thin sheets of uniform thickness; describes production of metal goods such as cylinder covers, etc.; raw materials used in manufacture of swaging tools; tempering and heat treating of steel, including new method of tempering which does not cause cracks.

STAINLESS. Stainless Steel. Foundry Trade Jl. vol. 28, no. 365, Aug. 16, 1923, pp. 131-135, 23 figs. Practical application of stainless steel in hydraulic and steam-plant problems.

Stainless Steel. Its Properties and Some of Its Engineering Applications, J. H. G. Monypenny. Mech. World, vol. 74, nos. 1907 and 1910, July 27 and Aug. 10, 1923, pp. 57 and 88-89. Corrosion differences; effects of heat treatment; air-hardening properties; resistance to corrosion; mechanical properties and composition. (Abstract.) Paper read before Cleveland Instn. Engrs.

VANADIUM. *See Vanadium Steel.*

ZIRCONIUM IN, EFFECTS OF. Some Effects of Zirconium in Steel Alexander L. Feild Am. Inst. Min. & Met. Engrs. Trans., no. 1266-S, Aug. 1923, 36 pp., 11 figs. and (abstract) Min. & Metallurgy, vol. 4, no. 200, Aug. 1923, pp. 420-421. Deals with plain carbon steel only. Description of methods of experimental steel manufacture and laboratory testing, discusses in the light of typical analyses preferential chemical reaction of zirconium with oxygen, nitrogen, and sulphur in steel, explains by means of tentative working theory, the various effects on mechanical properties of steel.

STEEL CASTINGS

HEAT TREATMENT. Heat Treat To Improve Castings, A. W. Lorenz. Foundry, vol. 51, no. 18, Sept. 15, 1923, pp. 740-741, 2 figs. Tests show that chrome-nickel steel and other castings have been improved by heat treatment which shows up defects in design. (Abstract.) Paper read before Am. Foundrymen's Assn.

STEEL INDUSTRY

SHEET SALES AND PRODUCTION. Sheet Sales and Production Analyzed, W. Herman Greul. Iron Age, vol. 112, no. 11, Sept. 13, 1923, pp. 682-683, 5 figs. Comparable trend charts as aid in determining relation of inventories, production and shipments.

STEEL MANUFACTURE

DEOXIDIZING AGENTS, ACTION OF. The Complex Action of Manganese and Other So-Called Deoxidizing Agents Used in the Manufacture of Steel, Federico Giolitti. Iron & Steel Inst.—Advance Paper, no. 6, for Meeting Sept. 1923, 14 pp. Discusses phenomenon known as tranverse weakness and its causes.

STEEL WORKS

BETHLEHEM, PA. Electrical Applications in Bethlehem Plant of Bethlehem Steel Company, D. M. Petty and A. J. Standing. Blast Furnace & Steel Plant, vol. 11, nos. 6 and 7, June and July 1923, pp. 304-310 and 368-377, 12 figs. Description of what Philadelphia section of Assn. Iron & Steel Elec. Engrs. saw on visit to these mills. June: Description of power generation and distribution features. July: Description of manufacturing departments.

YARD ELECTRIFICATION. Electric Transportation, F. O. Schnure. Assn. Iron & Steel Elec. Engrs., vol. 5, no. 9, Sept. 1923, pp. 327-334, 1 fig. Notes on yard transportation within steel plant, and yard electrification.

STOKERS

WATER-TUBE BOILERS. Mechanical Stokers for Marine Water Tube Boilers, W. J. Muller. Engineering, vol. 116, no. 3010, Sept. 7, 1923, pp. 297-299, 4 figs. Results from practical experience with mechanical stokers applied to marine water-tube boilers. Paper before Instn. Nav. Architects. See also Shipbldg. & Shipg. Rev., vol. 22, no. 10, Sept. 6, 1923, pp. 292-294, 2 figs.

STONE

VALUATION OF DEPOSITS. Valuation of Various Kinds of Stone Deposits, Joel H. Watkins. Cement, Mill & Quarry, vol. 23, no. 4, Aug. 20, 1923, pp. 25-28. Need for valuation of stone deposits; considerations on which valuation should be based; characteristics of rock deposits; increase in mining of high-grade limestone.

STREET RAILWAYS

CARS, DELMEZ PATENT. Street Cars With Large Wheel Base, Ball Bearings and Special Suspension of Electric Motors (Voiture de Tramways à grand écartement d'essieux, roulements à billes et suspension spéciale des moteurs électriques), G. Magnan. Industrie des Tramways, vol. 17, no. 119, July 1923, pp. 255-260, 8 figs. Describes Delmez patent, giving details of design and operation, its advantages, and tests made.

CARS, LIGHT-WEIGHT. Development of Light Weight Cars, W. J. Clardy. Elec. Traction, vol. 19, no. 8, Aug. 1923, pp. 393-394, 1 fig. City service in St. Louis, which is said to be typical of modern developments in this class of equipment.

CARS, SAFETY. Operating Results of Automatic Door Safety Cars, Charles Gordon. Elec. Ry. Jl., vol. 62, no. 8, Aug. 25, 1923, pp. 283-287, 4 figs. Regular operation of automatic exit door, double-truck, one-man safety cars on Chicago Surface Lines proves practicability. Method of studying and analyzing passenger movements in development of car design.

FLEXIBLE TRANSPORTATION EQUIPMENT. Trolley Buses and Flexible Vehicles for Street Railway Service, William P. Kennedy. Soc. Automotive Engrs.—Jl., vol. 13, no. 3, Sept. 1923, pp. 179-195, 20 figs. Surveys some general conditions prevailing in street-railway field and prospective development of a new type of service, in discussing necessity for closer co-operation between engineers of automotive industry and operating organization of railways, idea being to develop flexible transportation equipment that will co-ordinate with operation of present railway-transportation facilities and to promote utilization, wherever feasible, of railway power supply in employment of flexible bus-type equipment in supplementing and extending railway-organization service.

TRAFFIC PROBLEMS. Tramways from a Traffic Point of View under Existing Conditions, E. S. Rayner. Inst. of Transport—Jl., vol. 4, no. 9, July 1923, pp. 394-399 and (discussion) 399-405, 3 figs. Modern traffic problems; capacity and length of tracks; load problems.

STROBOSCOPES

MIRROR TYPE. High Speed Stroboscope. Engineering, vol. 116, no. 3009, Aug. 31, 1923, pp. 255-256, 5 figs. Describes apparatus developed by British Research Assn. for Woollen and Worsted Industries, Leeds, Eng., for observation of cap spinning; illuminates objects in a horizontal plane for a considerable radius from instrument, distance depending only on intensity of light source and darkness of room.

STRUCTURAL STEEL

REINFORCED WITH CONCRETE. Structural Steelwork Reinforced with Concrete, Ewart S. Andrews. Concrete, vol. 18, no. 8, Aug. 1923, pp. 505-508, 1 fig. Experiments upon strength of steel columns encased in concrete; strength of beams.

SUBSTATIONS

AUTOMATIC. Automatic Substations (Les Sous-Stations Automatiques), M. Sekutowicz. Industrie des Tramways, vol. 17, nos. 196, and 197, Apr. and May 1923, pp. 113-134 and 153-166, 48 figs. Historical review; different types, including those consisting of rotary converters, of generator groups, and of mercury-vapor rectifiers; automatic equipment of Gen. Elec., Westinghouse, and Brown-Boveri types; recent progress in automatic substation construction; results of practical operation.

SUPERHEATERS

TESTING DEVICE. Device for Testing Superheater Units and Air Reservoirs. Boiler Maker, vol. 23, no. 8, Aug. 1923, pp. 226-227, 1 fig. Speed in operating and accuracy of testing are features of new device designed for use in Readville shops of N. Y. N. H. & H.

SURVEYING

INSTRUMENTS. A New Surveying Instrument, C. Erb Wuensch. Eng. & Min. Jl., Press, vol. 116, no. 7, Aug. 18, 1923, pp. 271-273, 7 figs. Construction and uses of device invented by author.

T

TANTALUM

PRODUCTION AND USES. Tantalum. All About It, O. Ivan Lee. Sci. & Invention, vol. 11, no. 5, Sept. 1923, pp. 446-447, and 499-500, 6 figs. Occurrence, mining and latest methods of refining, uses.

TELEPHONY

AUTOMATIC. Automatic Development, F. J. Dommerque. Telegraph Engr., vol. 27, no. 8, Aug. 1923, pp. 22-24. Survey of present development of automatic equipment; author contends that proper engineering can make automatic feasible even in smallest exchanges.

TERMINALS, RAILWAY

FREIGHT. Burlington Develops Large New Freight Station. Ry. Age, vol. 75, no. 11, Sept. 15, 1923, pp. 475-479, 6 figs. Large terminal being constructed at Chicago Union Depot area.

JERSEY CITY, N. J. New Deep Water Terminal Put in Operation. Ry. Elec. Engr., vol. 14, no. 8, Aug. 1923, pp. 233-248, 8 figs. Lehigh Valley completes first unit of Claremont project for handling ore and miscellaneous freight.

TESTING MACHINES

METAL STRIP. A New Testing Machine. Reginald G. Johnston. Metal Industry (Lond.), vol. 23, no. 6, Aug. 10, 1923, pp. 109-110, 1 fig. Pile tester testing machine is said to possess advantages of ease of working, absence of calculations and portability of apparatus.

TEXTILE MILLS

LIGHTING. Reproduced Daylight and Quality Production. Hibbard S. Busby. Textile World, vol. 64, no. 8, Aug. 25, 1923, pp. 33-35, 7 figs. Functions and types of daylight lamps; importance of effective conditions for controlling manufacturing operations; utility of daylight apparatus and practical suggestions on use; special unit for dye house.

THERMOMETERS

KATATHERMOMETER. The Usefulness of the Katathermometer in Determining Healthful Air Conditions. Heating & Vent. Mag., vol. 20, no. 8, Aug. 1923, pp. 52-53. Results of new studies with this instrument, bearing on body heat and efficiency, showing numerous fields in which Katathermometer will prove of value.

TIDAL POWER

UTILIZATION. Using Tidal Energy (L'utilisation de l'énergie des marées), Charles Evrard. Outillage, vol. 7, nos. 8 and 10, Feb. 24 and Mar. 10, 1923, pp. 204-205 and 244. Describes projected Aber-Vrach' tidal-power station recently sanctioned by French Parliament; conditions of concession.

TIMBER

DOUGLAS FIR. Douglas Fir for Mine Timbers, C. J. Hogue. Eng. & Min. Jl., Press, vol. 116, no. 8, Aug. 25, 1923, pp. 316-319, 3 figs. Pacific Douglas fir forests; has great strength and light weight, and is durable; preservative treatment.

TIME STUDY

MALLEABLE FOUNDRY. Time Study in a Malleable Foundry, Martin A. Harder. Iron Age, vol. 112, no. 12, Sept. 20, 1923, p. 748. Summary of factors taken into consideration; how it is applied in actual practice.

TRAFFIC

CONTROL, LONDON STREET RAILWAY. Traffic Control on London County Council Tramways. Tram. & Ry. Jl., vol. 54, no. 10, Aug. 23, 1923, pp. 75-80, 11 figs. Telephone system adopted for use on northern section of London County Council Tramways.

TRANSFORMERS

HIGH-VOLTAGE. Modern Construction of High-Power Transformers (De la construction moderne des transformateurs de grande puissance), Robert Marchand. Revue Générale de l'Electricité, vol. 13, nos. 25 and 26, June 23 and 30, 1923, pp. 1043-1050 and 1079-1088, 30 figs. How mechanical forces occur in transformers during switching-in current rush, during a ground or under short circuit; how and why circular coil-winding stands up best under radical forces; recommends avoiding taps and use of small auxiliary transformer with necessary taps in series, with main unit, for main transformers feeding important trunk lines; recommends use of two-step oil switches with properly dimensioned resistance between two steps; protection of transmission lines; insulation, etc.

INSTRUMENT, CHECKING. How to Check Instrument Transformer and Meter Connections, Victor, H. Todd. Power, vol. 59, no. 11, 1923, pp. 413-415, 11 figs. Polarity of instrument transformers; connecting up wattmeters; polarity of polyphase circuits; installing meter wiring in conduit; use of multi-colored cable for wattmeter connection.

TRANSPORTATION

URBAN. Fields of Urban Transportation Agencies, Victor Topping. Can. Engr., vol. 45, no. 9, Aug. 28, 1923, pp. 265-267. Economic analysis of various methods of surface transportation, including electric traction, trolley bus and auto bus; cost of service per route-mile under various traffic conditions and headways. See also Elec. Ry. Jl., vol. 62, no. 8, Aug. 23, 1923, pp. 280-291.

V

VANADIUM STEEL

USE OF. Vanadium Steel for Engineering Purposes, Mar. Engr. & Naval Architect, vol. 46, no. 551, Aug. 1923, pp. 308-310, 1 fig. Influence of vanadium as a steel ingredient; sources of supply of vanadium; range of application of vanadium steel; some remarkable results of tensile tests.

VISCOSIMETERS

OIL. Apparatus for Measuring Viscosity of Liquids (Les appareils pour la mesure de la viscosité des liquides), Jean Philippe. Ouvrier Moderne, vol. 6, no. 4, July 1923, pp. 141-146, 12 figs. Design and operation of various viscosimeters for lubricating oil and heavy fuel oils.

W

WAGES

COMPENSATION PLAN. A Compensation Plan That Works. William J. Franklin. Indus. Management (N. Y.), vol. 66, no. 3, Sept. 1923, pp. 149-150, 2 figs. How large plant reduced turnover and stimulated both teamwork and production.

WATER FILTRATION

SAND. Some Practical Pointers on Rapid Sand Filter Operation. William D. Hatfield. Fire & Water Eng., vol. 74, no. 9, Aug. 29, 1923, pp. 395-396, and 412. Description of operation of rapid sand filtration system; general layout of plant; liquid chlorine as effective safety valve; description of the method of chlorination; etc. Abstract of paper before Canadian Section, Am. Water Works Assn.

WATER MAINS

WELDED. Welded Pipe Line Construction. Gas Industry, vol. 25, no. 8, Aug. 1923, pp. 260-262, 7 figs. Service qualities as observed in welded water-main construction.

WATER POWER

GREEN RIVER, COLORADO BASIN. Green River as a Source of Power. Ralf R. Woolley. Jl. Electricity, vol. 51, no. 4, Aug. 15, 1923, pp. 126-128, 5 figs. Surveys made on Green River; proposed methods of developing power.

WATER SUPPLY

SURFACE, CANADA. Surface Water Supply of Canada-Arctic and Western Hudson Bay Drainage and Mississippi Drainage in Canada-in Alberta, Saskatchewan, Manitoba and Western Ontario. Canadian Dep't. Interior, Dominion Water Power Branch, Water Resources Paper No. 30, 1923. 297 pp., 3 maps. Results of hydrometric investigations for climatic year ending Sept. 30, 1921; meteorological data.

SURFACE, UNITED STATES. Surface Water Supply of the United States, 1919-1920, Nathan C. Grover. U. S. Geol. Survey, Water-Supply Paper, no. 510, 1923, 348 pp. 5 figs. The Great Basins.

WATER TREATMENT

IRON REMOVAL PLANT. Iron Removal and Softening Plant, Benton Harbor, Mich. Eng. News-Rec., vol. 91, no. 10, Sept. 6, 1923, pp. 378-379, 3 figs. Novel features comprise mixing chambers equipped with stirring devices and so arranged that portion of water delivered to plant may be over-treated with lime before mixed with remaining portion.

WELDING

BRONZE. A Masterpiece of Bronze Welding, Pendleton Powell. Brass World, vol. 19, no. 8, Aug. 1923, pp. 243-246, 4 figs. Welding cathedral bell in Berlin; some of the mechanical difficulties; method employed. Translated from Zeitschrift fur geammte Giessereipraxis.

MODERN PRACTICE. Modern Welding Practice. R. Gillespie Williams. Eng. Rev. & Trader, vol. 36, nos. 10 and 11, Apr. and May 1920, pp. 301-305 and 331-337, 18 figs. Description of equipment used in oxy-acetylene and arc welding; resistance-welding equipment and its applications.

See also Electric Welding; Electric Welding, Arc; Oxy-Acetylene Welding.

WIND TUNNELS

DIMENSIONS. The Modification of Wind-Tunnel Results by the Wind-Tunnel Dimensions, Max M. Munk. Franklin Inst.—Jl., vol. 196, no. 2, Aug. 1923, pp. 203-213, 1 fig. Determines necessary corrections for influence of dimensions of wind-tunnel on results of tests on wings and propellers.

WOOD

PLYWOOD. Manufacture and Uses of Plywood, H. J. Townsend. Timber Trade & Eng. Supp. (Timber Trades Section), July 28, 1923, pp. 24-25, 5 figs. English production; measurement; pricing; etc.

WOOD PRESERVATION

MINE TIMBERS. Creosoting Experience at Two Small Mining Plants, Thomas R. Clark. Coal Age, vol. 24, no. 10, Sept. 6, 1923, pp. 357-358, 1 fig. Pressure-treated timber said to be as good as new after 13 years; untreated sets replaced three to five times; brush-coated timber still sound after four years; now using dipped timber.

X

X-RAYS

METAL EXAMINATION. Finding Defects in Metals by X-Rays (Recherche des défauts des métaux par les rayons X), P. Pusard. Arts & Metiers, vol. 76, no. 33, June 1923, pp. 616-623, 18 figs. Production of x-rays; Coolidge x-ray bulb of high penetrability; methods of testing; examples of application to lead, welded joints, aluminum pistons, etc.

Z

ZINC METALLURGY

ELECTROLYTIC PRODUCTION. Electrolytic Zinc Plant at Great Falls, Montana. W. E. Mitchell and J. P. Cooper. Chem. Eng. & Min. Rev., vol. 15, no. 177, June 5, 1923, pp. 320-322. Process developed to treat ore high in iron and lead content.

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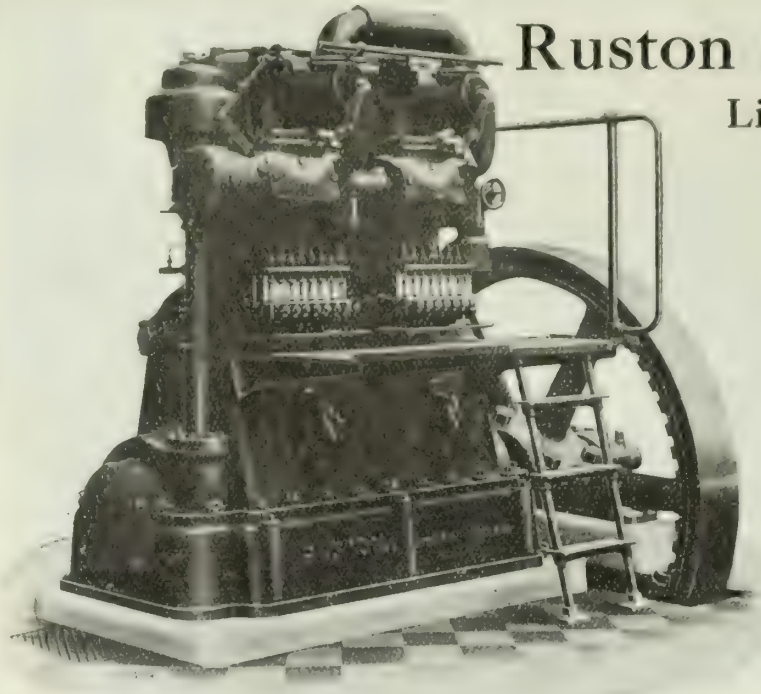

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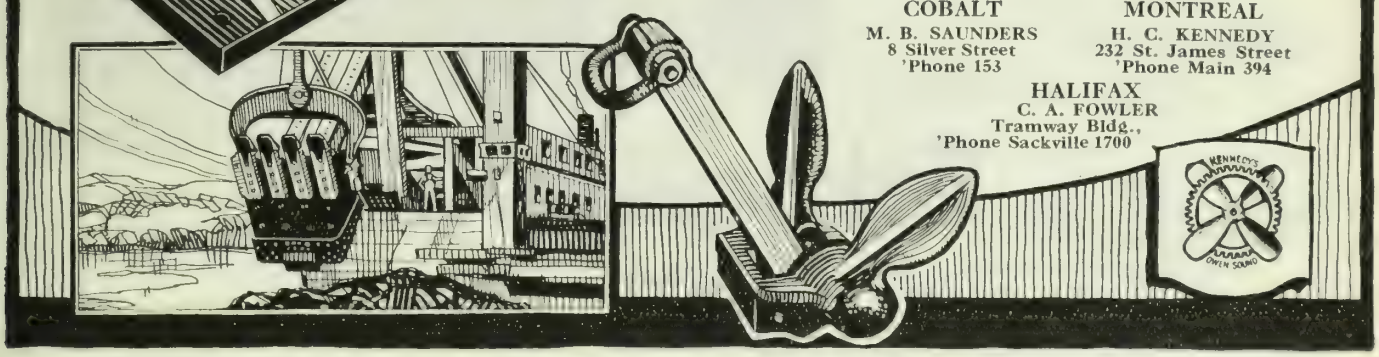

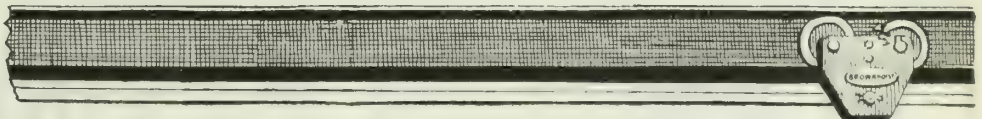

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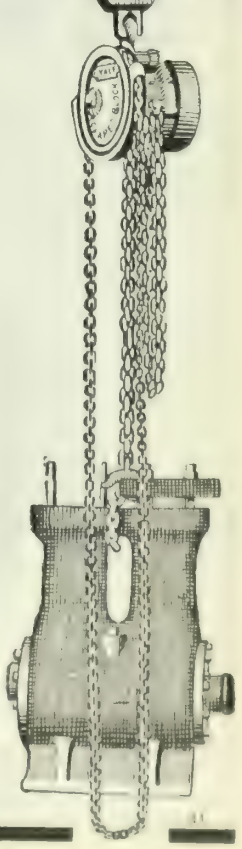

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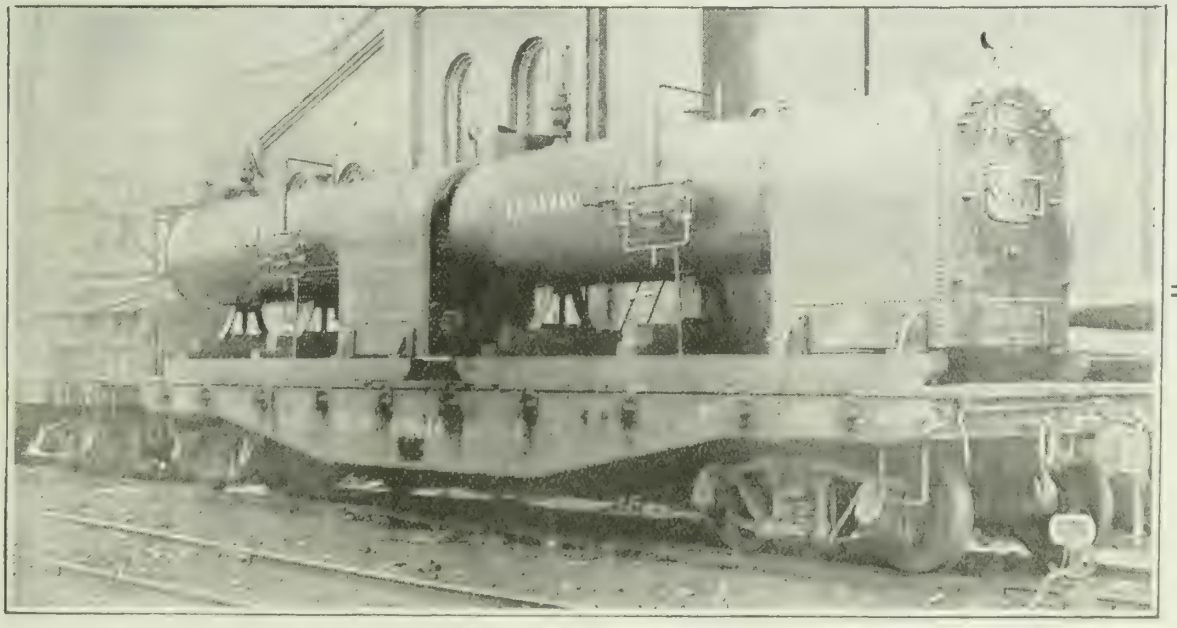

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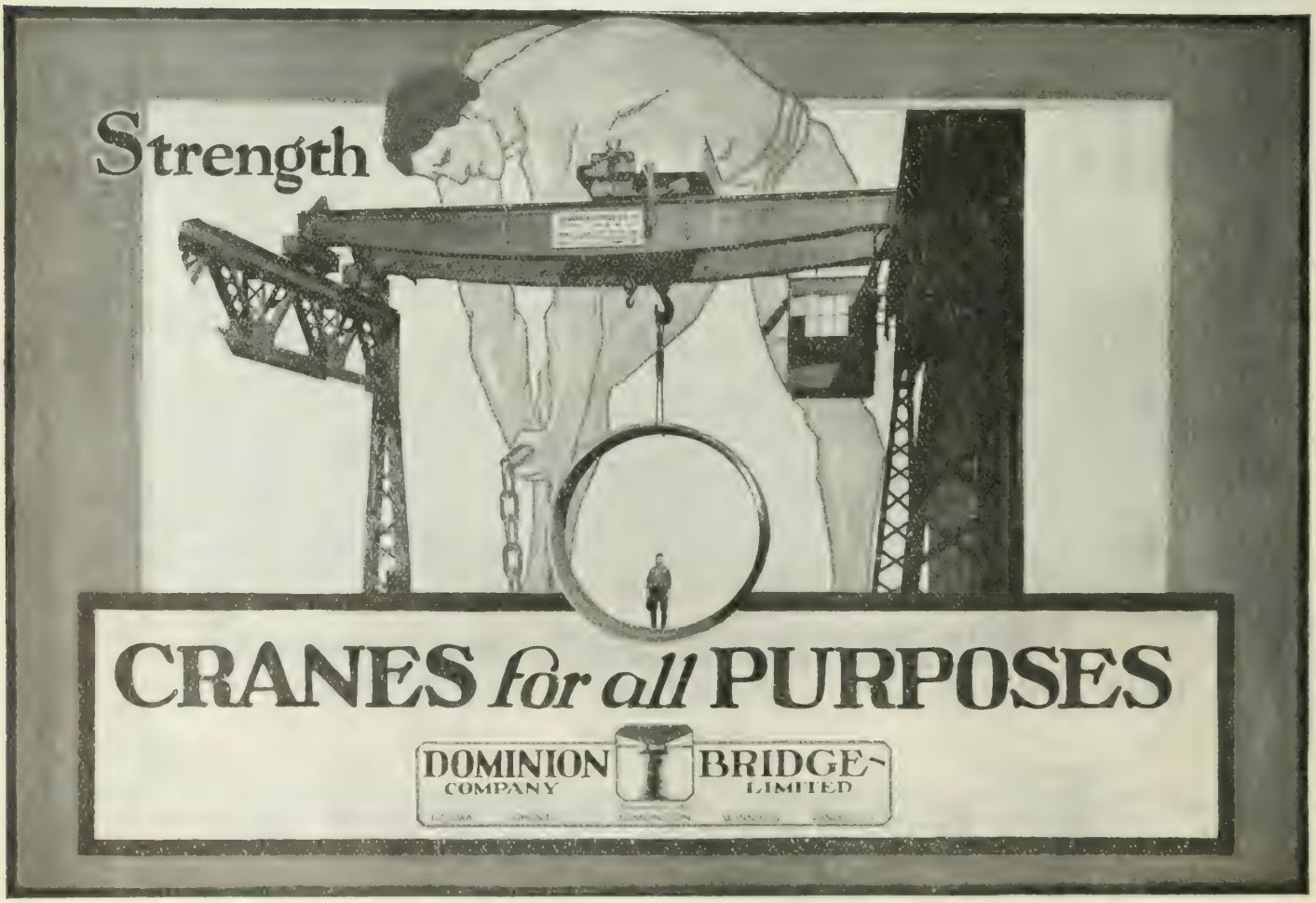

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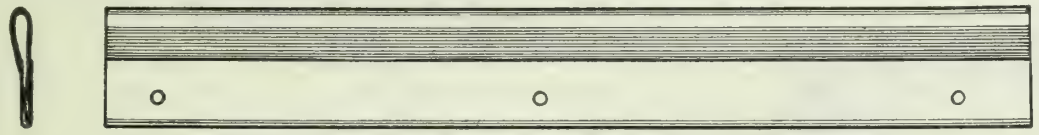

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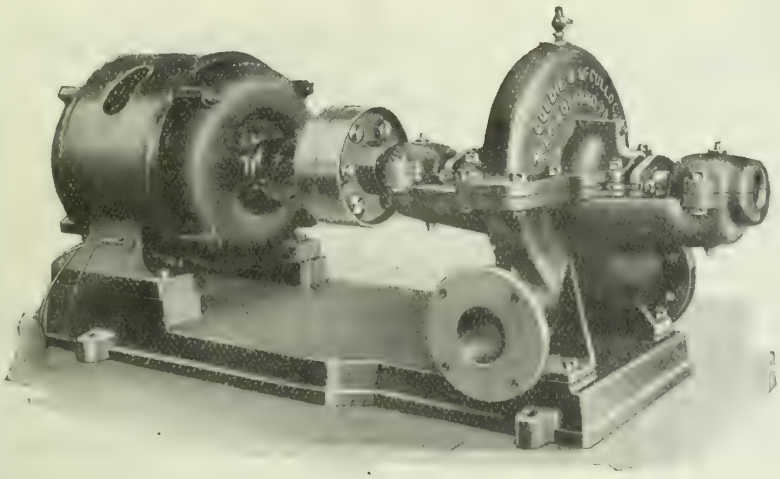

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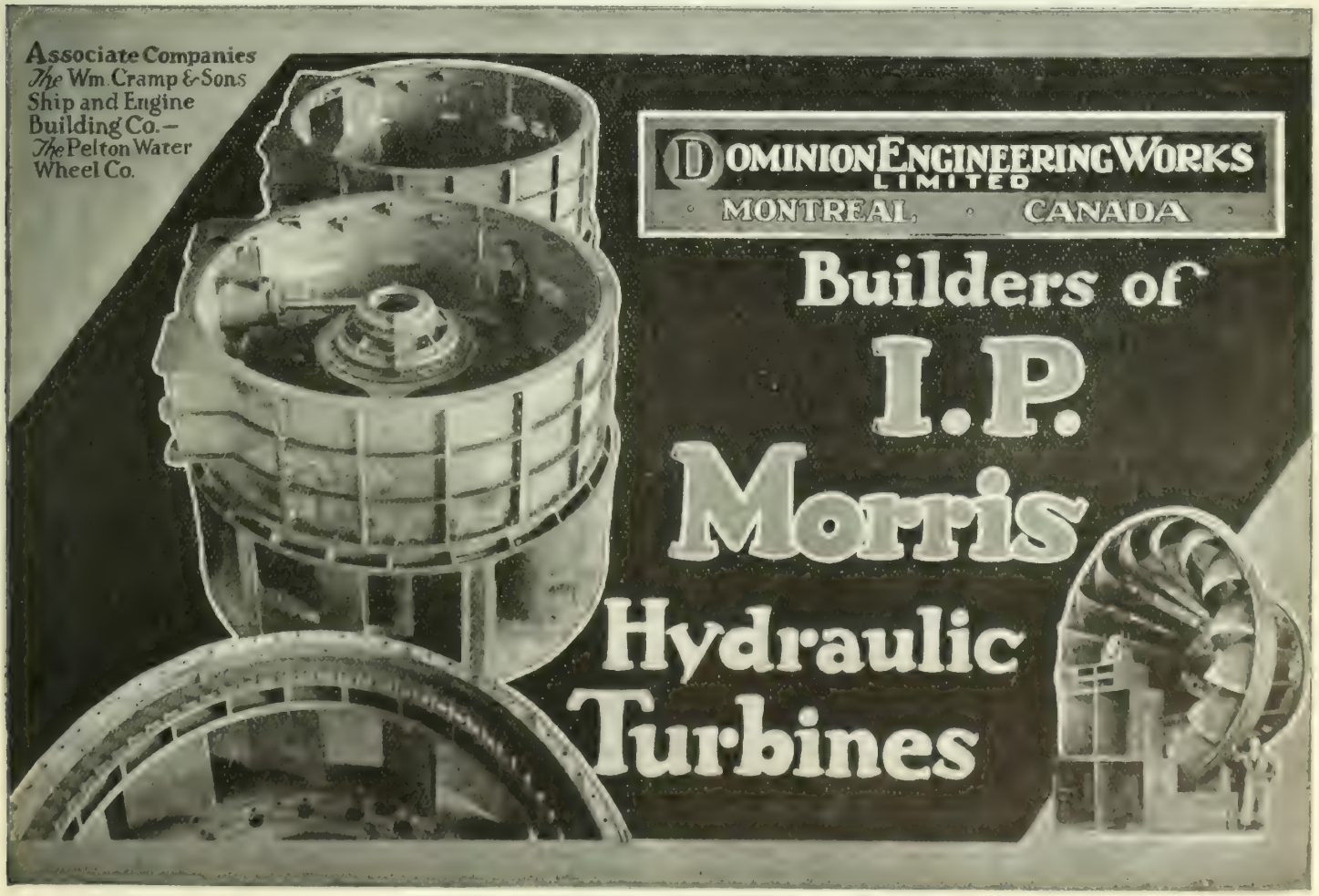

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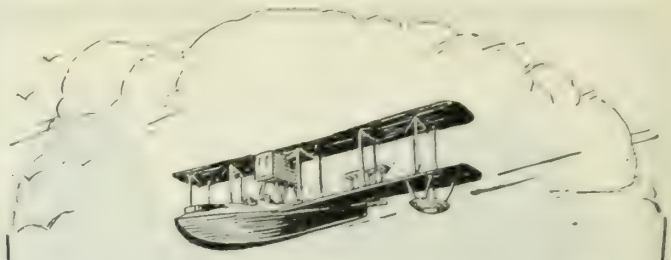

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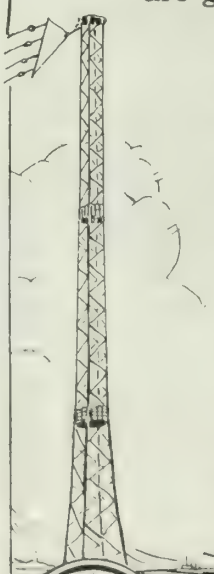

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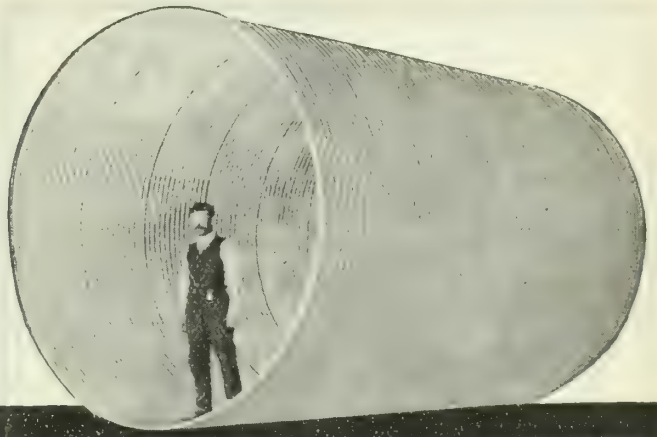

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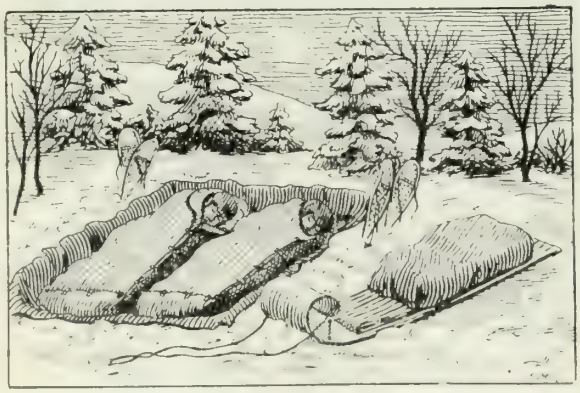

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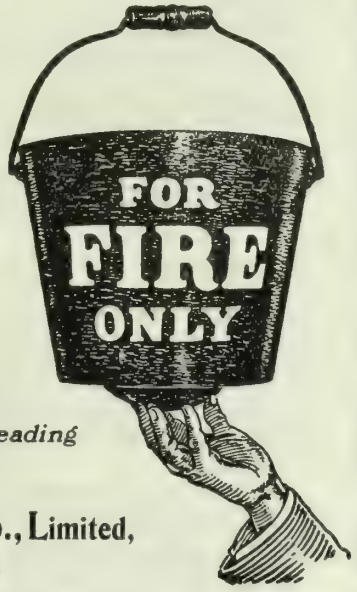

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Fig. 490
Steam Radiator Valve (Screwed)

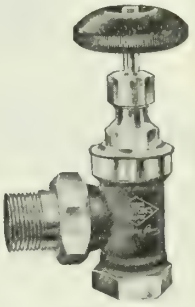

Fig. 494
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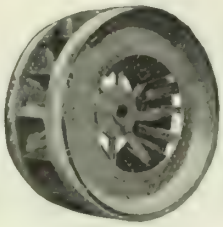

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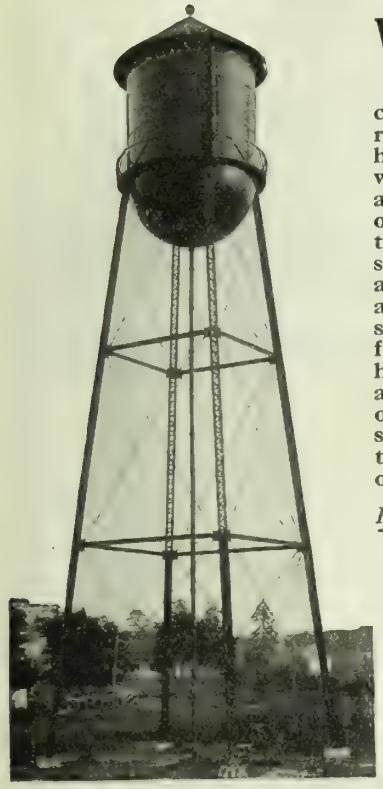

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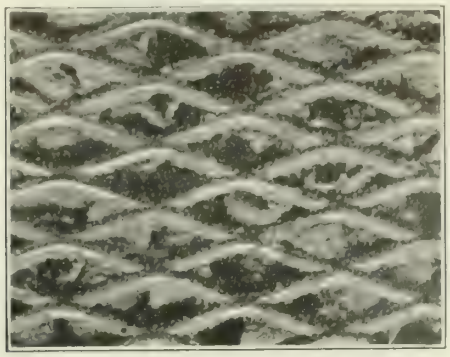

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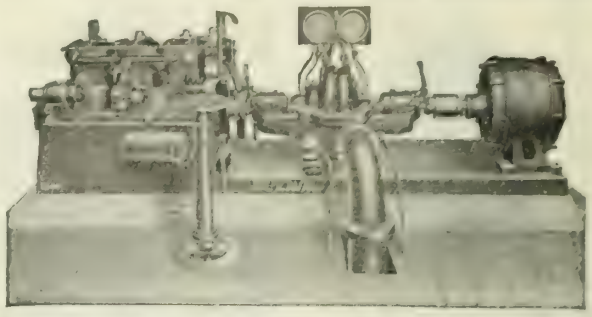

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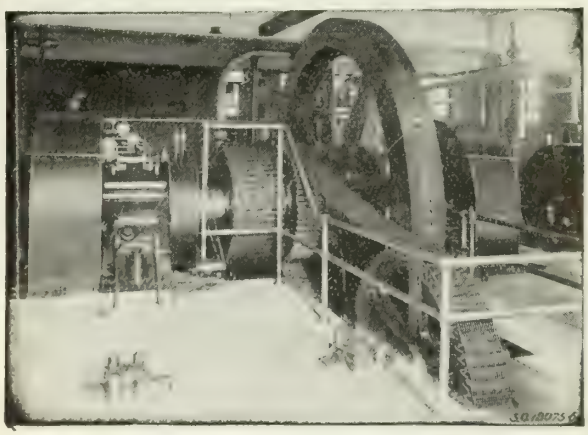

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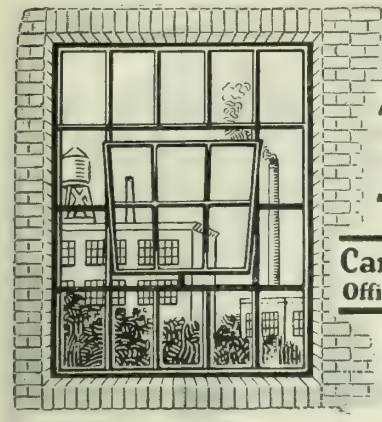

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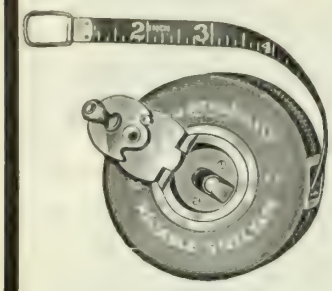

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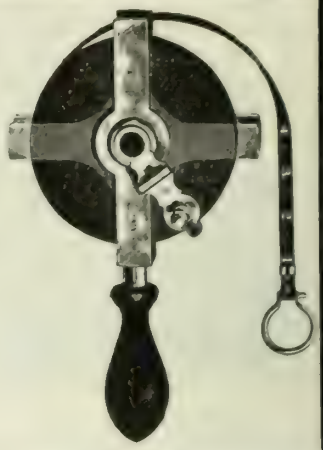

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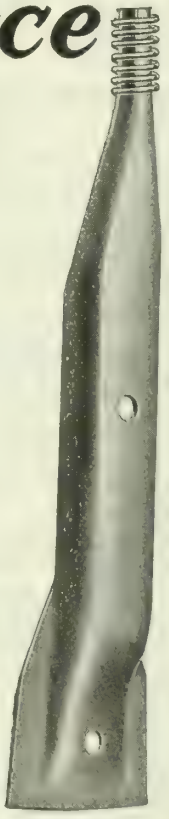
OPEN hearth steel stamped perfectly to produce the greatest strain resistance.

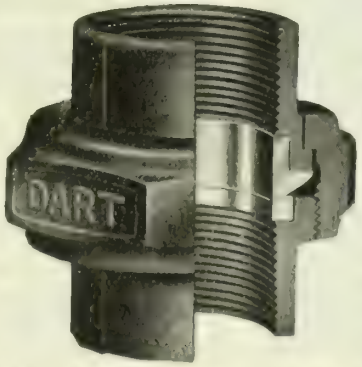
Hot-dip galvanized with a full even coat of finest Western Canada spelter.

ASK YOUR JOBBER



N. SLATER Co.,
LIMITED
Hamilton, Canada.

DART UNIONS
NEVER LEAK



SOLD BY
YOUR JOBBER
MANFRD BY
DART UNION CO. LTD.,
TORONTO

John Erskine, B. Sc., A.M.E.I.C.
General Manager.

William Farrar,
President.

The Mohawk Sand & Gravel
Company, Limited

Capacity—25 cars per day

Sand, 1″ and 2″ Crushed Gravel, Pea Gravel, Crushed Pit Run Gravel

Can ship by T.H.B., C.P.R., G.T.R., M.C.R.

Material Test Sand contains less than 1% of loam.

Box 336 **Brantford, Ontario**

Purchasers' Classified Directory

A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 52

A

Acids:
Nichols Chemical Co., Ltd.
Air Brakes:
Canadian General Electric Co., Ltd.
Air Coolers:
Laurie and Lamb.
Alumina Sulphate;
Nichols Chemical Co., Ltd.
Ammonia Controlled Water Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Ammonia Valves and Fittings:
Crane Ltd.
Anchorage Equipment:
Midwest Canada, Ltd.
Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Arches, Flat:
Combustion Engineering Corp., Ltd.
Asphalt:
Imperial Oil Ltd.
Ash Handling Equipment:
Combustion Engineering Corp. Ltd.
Automatic Air Valves:
Jenkins Bros., Ltd.
Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Taylor Stoker Co., Ltd.
Automobiles:
Ford Motor Co., of Canada, Ltd.

B

Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.
Balls, Steel:
Canadian S.K.F. Co., Ltd.
Bar Benders:
Koehring Co., of Canada, Ltd.
Bar Cutters:
Koehring Co., of Canada, Ltd.
Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.
Beams:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Bearings, Ball:
Canadian S.K.F., Co., Ltd.
Openshaw & Bennett, Ltd.
Bearings, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Bearings, Roller:
Canadian S.K.F. Co., Ltd.
Belting:
Dunlop Tire and Rubber Goods Co., Ltd.
General Supply Co., of Canada, Ltd.
Jones and Glassco, Regd.
Blowers:
B. F. Sturtevant Co. of Canada, Ltd.
Blowers, Centrifugal:
De Laval Steam Turbine Co.
Blue Print Machinery:
Instruments Ltd.
J. Frank Raw Co., Ltd.
Boilers:
E. Leonard & Sons, Ltd.
Waterous Engine Works Co., Ltd.
Boilers, Heating:
Engineering & Machine Works of Canada, Ltd.
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.
Boilers, Marine:
Engineering & Machine Works of Canada, Ltd.
Boilers, Power:
Engineering & Machine Works of Canada, Ltd.
Boilers, Portable:
E. Leonard & Sons, Ltd.
Boilers, Return Tubular:
Goldie & McCulloch Co., Ltd.
Bolts:
British Empire Steel Corp., Ltd.
Steel Co., of Canada, Ltd.
Books:
John Wiley & Sons, Inc.
Renouf Publishing Co.
Bridges, Highway:
Hamilton Bridge Works Co., Ltd.
Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Broadcasting Equipment:
Marconi Wireless Telegraph Co., of Canada, Ltd.
Northern Electric Co., Ltd.
Bucket Loaders:
Mussens Ltd.
Builders Supplies:
Jno. E. Russell Co., Ltd.
Building Papers:
Barrett Co., Ltd.
Buildings, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
MacKinnon Steel Co., Ltd.

C

Cars, Dump:
Hydro Salvage Syndicate.
Mussens Ltd.
Car Dumpers:
Canadian Mead-Morrison Co., Ltd.
Car Equipment Specialties:
Dominion Insulator & Mfg. Co. Ltd.
Car Pullers:
Canadian Mead-Morrison Co., Ltd.
Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.
Casements, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Castings:
William Kennedy & Sons, Ltd.
Castings, Brass:
Engineering & Machine Works of Canada, Ltd.
Superheater Co., Ltd.
Castings, Bronze:
Engineering & Machine Works of Canada, Ltd.
Castings, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Castings; Ferro-Alloy.
Canadian Steel Foundries, Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Engineering & Machine Works of Canada, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
Castings, Steel:
Canadian Steel Foundries, Ltd.
Catenary Materials:
Dominion Insulator & Mfg., Co. Ltd.
Cement, Dealers:
Jno. E. Russell Co., Ltd.
Cement Gun:
General Supply Co., of Canada, Ltd.
Cement, Manufacturers:
Canada Cement Co., Ltd.
Cement, Waterproofing:
Dominion Tar & Chemical Co., Ltd.
Chains:
Canadian Link-Belt Co., Ltd.
Chains, Silent:
Jones and Glassco, Regd.
Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Chemist, Industrial:
Milton Hersey Co., Ltd.
Chimneys:
Combustion Engineering Corp., Ltd.
Circuit Breakers:
Dominion Engineering Agency, Ltd.
Coal:
British Empire Steel Corp., Ltd.
Coal Handling Equipment:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Coke:
British Empire Steel Corp., Ltd.
Cooling Air Filters:
Midwest Canada, Ltd.
Compressor Filters:
Midwest Canada, Ltd.
Compressors:
General Supply Co., of Canada, Ltd.
Compressors, Air:
Canadian Westinghouse, Co., Ltd.
Hydro Salvage Syndicate.
Compressors, Ammonia:
Taylor Stoker Co., Ltd.
Compressors, Centrifugal: Co.
De Laval Steam Turbine
Concrete Inserts, Continuous:
Midwest Canada, Ltd.
Concrete Mixers:
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Hydro Salvage Syndicate.
Koehring Co., of Canada, Ltd.
Mussens Ltd.
Condensers, Synchronous & Static
Canadian General Electric Co., Ltd,
Condensite Celoron Silent Gears.
Diamond State Fibre Co., of Canada Ltd.
Construction Material:
Northern Electric Co., Ltd.
Contractors:
E. G. M. Cape & Co.
Chick Contracting Co., Ltd.
E. O. Leahey & Co., Ltd.
Randolph MacDonald Co., Ltd.
Contractors' Plant and Supplies.
F. H. Hopkins & Co., Ltd.
Controllers, Electric:
Canadian Westinghouse Co. Ltd.
Conveyors:
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd.
Conveyors, Belt and Screw:
Canadian Link-Belt Co., Ltd.
Conveyors, Portable Belt:
Mussens Ltd.
Couplers, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Cranes, Caterpillar type:
Koehring Co., of Canada, Ltd.
Cranes, Locomotive:
Canadian Link-Belt Co., Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Cranes, Travelling:
Dominion Bridge Co., Ltd.
Creosote Oils:
Barrett Co., Ltd.
Dominion Tar & Chemical Co., Ltd.
Cross Arm Braces, Steel:
Burlington Steel Co., Ltd.
Crushed Stones:
Jno. E. Russell Co., Ltd.
Culvert Pipe:
Canada Lock Joint Pipe, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Pedlar People, Ltd.
Culverts, Metal:
Pedlar People, Ltd.
Culverts, Road:
Canada Lock Joint Pipe, Ltd.

D

Damp Proof Coating:
Dominion Tar and Chemical Co., Ltd.
Damper Regulation:
Under-Feed Stoker Co., of Canada, Ltd.
Derricks:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Dies:
Pratt & Whitney Co., of Canada, Ltd.
Doors, Fireproof:
Canadian Metal Window and Steel Products, Ltd.
Draughting Supplies:
Instruments, Ltd.
J. Frank Raw Co., Ltd.
Dredges:
Canadian Mead-Morrison Co., Ltd.
Drill Chucks:
Canadian S.K.F., Co. Ltd.
Drying Systems:
B. F. Sturtevant Co., of Canada, Ltd.
Dumb Waiters, Electric:
Turnbull Elevator Co., Ltd.

E

Economizers:
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada Ltd.
Educational:
Industrial Extension Institute.
Electrical Appliances:
Northern Electric Co., Ltd.
Electrical Instruments:
Instruments, Ltd.
Electrical Supplies:
Northern Electric Co., Ltd.
Elevator Safety Gates:
Turnbull Elevator Co., Ltd.
Elevators, Freight:
Turnbull Elevator Co., Ltd.
Elevators, Passenger:
Turnbull Elevator Co., Ltd.
Elevators, Push Botton:
Turnbull Elevator Co., Ltd.
Enamels, Acid & Fume Resisting:
Dominion Paint Works, Ltd.
Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.
Engines, Gas and Oil:
Canadian Fairbanks-Morse Co., Ltd.
Engines, Steam:
Goldie & McCulloch Co., Ltd.
Laurie and Lamb.
E. Leonard & Sons. Ltd.
Excavators:
Engineering & Machine Works of Canada, Ltd.
Excavators, Dragline:
Koehring Co., of Canada, Ltd.
Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.
Expanded Metal:
Pedlar People Ltd.

F

Fans:
B. F. Sturtevant Co., of Canada. Ltd.
Fan Engine Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.
Fence Posts, Steel:
Burlington Steel Co., Ltd.
Fibre, Hard Vulcanized:
Diamond State Fibre Co., of Canada, Ltd.
Fillers, Wood and Metal:
Dominion Paint Works, Ltd.
Filters, Air:
Midwest Canada, Ltd.
Fire Alarm Apparatus:
Northern Electric Co., Ltd.
Fireproofing, Hollow Tile:
Interlocking Tile Co., Ltd.
Fish Paper:
Diamond State Fibre Co., of Canada, Ltd.
Floortyle:
Pedlar People, Ltd.
Forgings:
British Empire Steel Corp., Ltd.
Dominion Bridge Co., Ltd.
Friction Clutches:
Dodge Manufacturing Co., Ltd.
Fuel, Oil:
Imperial Oil, Ltd.
Furnaces, Automatic:
Under-Feed Stoker Co., of Canada, Ltd.

G

Gasoline:
Imperial Oil, Ltd.
Gauges:
Pratt & Whitney Co., of Canada, Ltd.
Gear Reductions:
Hamilton Gear & Machine Co.
Gears:
Canadian Link-Belt Co., Ltd.
Dominion Engineering Works, Ltd.
Hamilton Gear & Machine Co.
Gears, Machine Cut:
Jones and Glassco, Regd.

BURLINGTON STEEL
COMPANY, LIMITED
HAMILTON CANADA

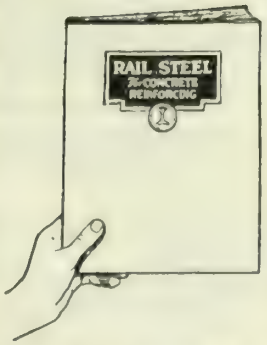
Specifications

A steel specification is a document for guidance to the manufacturer in producing an article, and a protection to the purchaser in accepting it. A specification should be written only after careful study of the production of the article, and an equally careful study of the use to which it is to be put.

Specification A-16-14, covering Rail Steel Bars, was issued by the American Society for Testing Materials only after the most careful investigation that has ever been made of any reinforcing material. In 1913, Professor W. K. Hatt, then of Purdue University (now on Mr. Hoover's staff), made over 3,000 tests on as many samples obtained under normal working conditions from four separate mills. Professor Hatt found that Rail Steel Bars had unusual strength, and furthermore, "excess ductility for its strength above usual grades of steels."

Specification A-16-14 is, therefore, everything that a specification should be. It is a protection to the purchaser. It assures him of getting Rail Steel Bars, proven by over 3,000 tests to have a quality factor (strength and ductility) in excess of usual grades of steel. This specification at the same time prevents any substitution of undesirable re-rolled material.

Specify your reinforcing steel to meet A.S.T.M. specifications A-16-14, or equal



You will be interested in the facts contained in this valuable book. A copy is yours for the asking.

Burlington Reinforcing Bars used in construction of new Farmers Dairy Building, erected 1922. Toronto, Ont.

Jackson Lewis Company
Gen. Contractors

Harkness, Louden & Hertzberg
Engineers

Purchasers' Classified Directory

For Alphabetical List of Advertisers see page 52

Gears, Silent, Waterproof:
Diamond State Fibre Co., of Canada, Ltd.
Gears, Double Helical:
De Laval Steam Turbine Co.
Generators:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Grab Buckets:
Canadian Mead-Morrison Co., Ltd.
Ground Joints Unions:
Dart Union Co., Ltd.

H

Hangers:
Dodge Manufacturing Co., Ltd.
Heaters, Boiler Feed-Water:
Goldie & McCulloch Co., Ltd.
Heating Material:
Crane Ltd.
Hoisting Engines:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Hoists:
Koehring Co., of Canada, Ltd.
Hoists, Electric:
Hydro Salvage Syndicate.
Taylor Stoker Co., Ltd.
Hoists, Hydraulic:
Turnbull Elevator Co., Ltd.
Hoists, Mono-Rail:
Taylor Stoker Co., Ltd.
Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.

I

Industrial Electric Control:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.
Insulated Rail Joints, Continuous
Rail Joint Co., of Canada, Ltd.
Insulating Compounds:
Dominion Tar & Chemical Co., Ltd.
Insulation, Fibre and Celoron:
Diamond State Fibre Co., of Canada, Ltd.
Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
Barrett Co., Ltd.

K

Kerosene:
Imperial Oil Ltd.

L

Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency Ltd.
Lighting Equipment, Industrial and Street:
Canadian General Electric Co., Ltd.
Locomotives:
Mussens Ltd.
Locomotives, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd.
Hydro Salvage Syndicate.
Lubricating Oils & Greases:
Imperial Oil Ltd.

M

Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Hydro Salvage Syndicate.
Charles Walmsley & Co., (Canada), Ltd.
Machinery, Special:
Dominion Engineering Works, Ltd.
Marine-Machinery:
William Kennedy & Sons, Ltd.
Material Handling Plants:
Canadian Mead-Morrison Co., Ltd.
Measuring Tapes:
Lufkin Rule Co., of Canada, Ltd
Merchant Bars:
British Empire Steel Corp., Ltd.
Metal Lath:
Pedlar People, Ltd.
Trussed Concrete Steel Co. of Canada, Ltd.
Milling Cutters:
Pratt & Whitney Co., of Canada, Ltd.
Mining Machinery:
William Kennedy & Sons. Ltd.
Motors:
Canadian Fairbanks-Morse Co. Ltd.
Dominion Engineering Agency Ltd.
Motor Cars:
Ford Motor Co., of Canada, Ltd.
Motors, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Motor Oils:
Imperial Oil Ltd.
Motor Trucks:
Ford Motor Co., of Canada, Ltd.
Mixers, Paving:
Koehring Co., of Canada, Ltd.

N

Nails:
British Empire Steel Corp., Ltd.

O

Oil Burning Equipment:
Combustion Engineering Corp., Ltd.
Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

Packing:
Dunlop Tire & Rubber Goods, Co., Ltd.
Paints, Acid Resisting:
Dominion Paint Works, Ltd.
Paints, Anti-Corrosive:
Dominion Paint Works, Ltd.
Paints, Concrete:
Dominion Paint Works, Ltd.
Paints, Damp-proof:
Dominion Paint Works, Ltd.
Paints, Graphite:
Dominion Paint Works, Ltd.
Paints, Machinery:
Dominion Paint Works, Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd.
Dominion Paint Works, Ltd.
Paper Mill Machinery:
Dominion Engineering Works. Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Paving and Paving Materials:
Dominion Tar & Chemical Co., Ltd.
Penstocks:
Engineering & Machine Works of Canada, Ltd.
Pinions:
Hamilton Gear & Machine Co.
Pipe Coils:
Superheater Co., Ltd.
Pipe, Concrete:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Pipe Couplings, Union
Dart Union Co., Ltd.
Pipe Fittings:
Crane Ltd.
Pipe, Lead:
Steel Co. of Canada, Ltd.
Pipe Lines:
Canada Lock Joint Pipe, Ltd.
Pipe, Lock Joint:
Canada Lock Joint Pipe, Ltd.
Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
General Supply Co., of Canada, Ltd.
National Iron Corp., Ltd.
Pipe Lock Bar:
General Supply Co., of Canada, Ltd.
Pipes, Reinforced Concrete:
Canada Lock Joint Pipe, Ltd
Pipes, Wrought Iron:
Crane Ltd.
Pitch:
Dominion Tar & Chemical Co., Ltd.
Plates, Brass and Copper:
Openshaw & Bennett, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co., Ltd.
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
Power Apparatus:
Northern Electric Co., Ltd.
Power Plant Equipment:
Instruments, Ltd.
Propellor Wheels:
Wm. Kennedy & Sons, Ltd
Publishers:
John Wiley & Sons, Inc.
Renouf Publishing Co.
Pulleys:
Canadian S.K.F. Co., Ltd.
Dodge Manufacturing Co., Ltd.
Pulleys, Fibre:
Diamond State Fibre Co. of Canada, Ltd.
Pulp Grinders:
Engineering & Machine Works of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulp Mill Deckers:
Engineering & Machine Works of Canada, Ltd.
Pulp Mill Machinery:
Waterous Engine Works Co. Ltd.
William Hamilton Co., Ltd.
Pulpwood Machinery:
Canadian Mead-Morrison Co., Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulverized Fuel Systems:
Combustion Engineering Corp., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Pump Governors:
Under-Feed Stoker Co., of Canada, Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Koehring Co of Canada, Ltd.
Canadian Fairbanks Morse Co. Ltd.
Dominion Engineering Works, Ltd
General Supply Co., of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pumps and Condensers.
Goldie & McCulloch Co., Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil,
Taylor Stoker Co., Ltd.

R

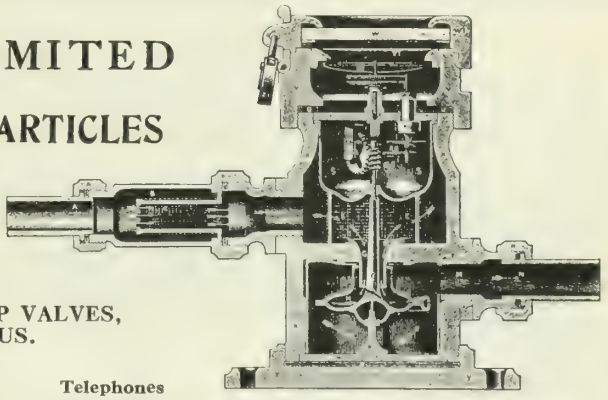
Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Marconi Wireless Telegraph Co. of Canada, Ltd.
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Ties:
Canadian Tie & Lumber Co., Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Receptacles, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Recording Instruments:
Combustion Engineering Corp., Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Reservoir Fittings:
Guest & Chrimes, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Materials:
Dominion Tar & Chemical Co., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
Road Tar:
Dominion Tar & Chemical Co., Ltd.
Roofing Cement:
Dominion Tar & Chemical Co., Ltd.
Roofing Material:
Dominion Tar & Chemical Co., Ltd
Roofings, Metal:
Pedlar People Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Rolling Mill Rolls:
Canadian Steel Foundries, Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Rope Wheel:
Dodge Manufacturing Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Rubber Goods, Mechanical:
Dunlop Tire & Rubber Goods, Co., Ltd.
Jenkins Bros., Ltd.
Rules Steel and Wood:
Lufkin Rule Co., of Canada, Ltd.

S

Safes:
Goldie & McCulloch Co., Ltd.
Sash, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Machinery:
Waterous Engine Works Co., Ltd.
William Hamilton Co., Ltd.
Scales:
Canadian Fairbanks-Morse Co., Ltd.
Screening Equipment:
Canadian Link-Belt Co., Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Sewer Pipe:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Shaftings:
Dodge Manufacturing Co., Ltd.
Shafting, Anchorage:
Midwest Canada, Ltd.
Sheets:
Steel Co., of Canada Ltd.
Shovels, Gasoline:
Koehring Co., of Canada, Ltd.
Sheating:
Barrett Co., Ltd.
Shingles, Prepared Asphalt:
Barrett Co., Ltd.
Skip Hoists:
Canadian Mead-Morrison Co., Ltd.
Smoke Stacks:
Engineering & Machine Works of Canada, Ltd.

Consult the advertiser, his information is valuable.

THE PRODUCTS OF
GUEST & CHRIMES LIMITED
ROTHERHAM (ENG).
WATERWORKS CONSTRUCTIONAL ARTICLES
Siemen's and Adamson's "Turbine"—WATER METERS
Sizes ⅜"—18"
VALVES for Water, Gas and Sewage.
Bateman and Moore's AIR VALVES.
RESERVOIR FITTINGS
Standpipes, Draw-Off Valves, Filter Valves, etc.
PENSTOCKS, WATER LEVEL RECORDERS, FLAP VALVES,
PRESSURE GAUGES, TESTING APPARATUS.
— Canadian and U. S. Representatives —
703 Federal Bldg., TORONTO
BRITISH-AMERICAN FUEL & METALS LIMITED
Telephones Adelaide 6958-9


Turbine Water Meter—⅜ to 1½ inches

TENDERS

EQUIPMENT FOR SALE BY

The Corporation of the City of Victoria, B.C.

The Corporation of the City of Victoria, B.C., has for sale certain equipment used in the construction of the Johnson Street Bridge. The material for sale is as follows:

1—Land Derrick, complete, (less engine).

2—1-yard Concrete Buckets.

1—1-yard Smith Concrete Mixer, and 9 x 9 Wache Vertical Steam Engine, direct-connected, also Hopper, Galvanized-Iron Cylinder, Pipe and Fittings from Boiler.

1—Vertical Boiler, 25 H.P., 42 x 96, 148-lb. working pressure, with all Fittings and Stack.

2—Cement Blowers.

1—Scow, 27 x 90, with Sheds and Timber Work.

1—7 x 10 Double-Drum Hoisting Engine. Timber Work for underwater Concrete Guides. Also Skid for 7 x 10 Engine.

1—12" Vertical Centrifugal Pump, with 40-ft. Shaft, Bearings, Guides, etc.; also Timber Work.

1—12 x 8 Atlas Steam Engine.

1—Pce. 16" Double Leather Belt; 48 ft. Rubber; 22 ft. Leather; 40 ft. Balatta-type, etc.

1—72 x 108 Vertical Boiler.

1—No. 1 Union Iron Works Steam Hammer.

1—Diving Outfit, complete; Pump, Scow, etc.

3—Diving Suits.

1—Derrick Scow, complete, equipped with 9 x 10 American Hoist and Derrick Engine, also Swinging Engine and all Fittings, including Ejector, Westinghouse Air Compressor, etc.

1—1-yard Orange-Peel Bucket.

1—Small scow.

For further particulars and prices apply to the City Purchasing Agent, City Hall, Victoria, B.C.

E. S. MICHELL,
Purchasing Agent.

PROVINCE OF QUEBEC

DEPARTMENT OF ROADS

Tender for Bridges

Tenders made on forms supplied by the Department of Roads and placed under envelopes bearing the words: "Tender for Bridges", shall be received at the office of the Minister of Roads, in the city of Quebec, Government Building, up to one o'clock of the afternoon, on.

Thursday, November 8th, 1923,

for the construction of a concrete bridge over the Red Creek, on Montreal-Sherbrooke Highway, in the municipality of Petit Lac Magog, and for construction of concrete bridges over Petit Pré, Casault and Lemoine Rivers, on Quebec-Saint-Siméon Highway, in the parish of Chateau-Richer.

The Government of the Province of Quebec does not bind itself to accept any of the tenders.

J. L. BOULANGER,
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Quebec, October 16th, 1923.

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The above plant now in use and will be sold subject to delivery F.O.B. tracks Merritton, about Nov. 20th, 1923.

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Imperial War Graves Commission Memorials to the Missing in France. Preliminary Notice.

The Imperial War Graves Commission invite architects who served during the war as members of the military, naval, or air forces raised in any part of the British Empire to send in their names for admission to a competition for the designing of the undermentioned of the memorials to the Missing to be erected in France by the Imperial War Graves Commission.

The memorials to the missing proposed are to commemorate those who fell in the War in France and Belgium but have no known grave and will be in the neighbourhood of the following places, and will have inscribed on them the following number of names:—

At BETHUNE, 20,000 names; at ARMENTIERES, 15,000 names;
at CAMBRAI, 6,000 names; at SOISSONS, 5,000 names.

Applications for particulars of premiums and other regulations from those desiring to compete are to be addressed to the Secretary, (Works Branch) Imperial War Graves Commission, 82 Baker St., London, W.1., and must be received there not later than January 1st, 1924, and must be accompanied by a statement giving particulars of the war service and professional career of the applicant, and clearly stating which of the memorials it is desired to compete for.

A deposit of two guineas for each set of plans, regulations and other particulars applied for must accompany the application, and such deposit will be returned either on receipt of a bona-fide design or on the return of the plans, regulations and particulars in good condition.

The Assessor appointed by the Imperial War Graves Commission to examine and report on the designs submitted is Sir Aston Webb, K.C.V.O., P.R.A.

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For Alphabetical List of Advertisers see page 52

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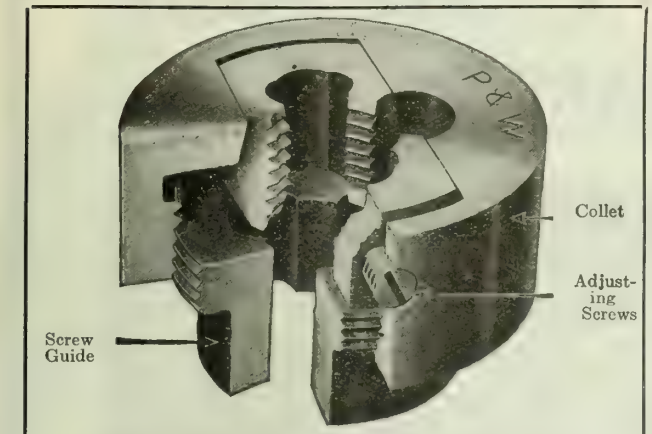

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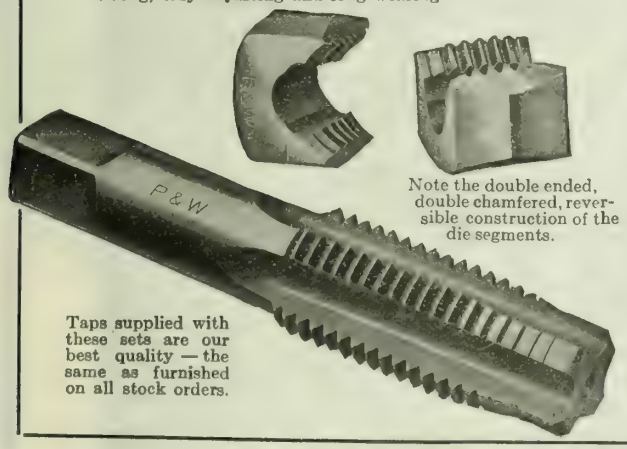

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ONE or two of these sets will come in handy almost anywhere. At comparatively low cost they provide a ready means for doing accurately those threading and tapping jobs that come up every day.

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Notice the dies furnished with these sets. The die segments being double-ended and reversible, they can be turned over in the collet to present a new set of cutting edges to the work. This practically doubles the life of the die. The double-end feature also permits the upper surface of the die to be used to thread very short pieces and to thread close to a shoulder when necessary. These dies are also interchangeable with similar dies of other makes.

Ask for Circular No. 293 for full description and prices

PRATT & WHITNEY COMPANY

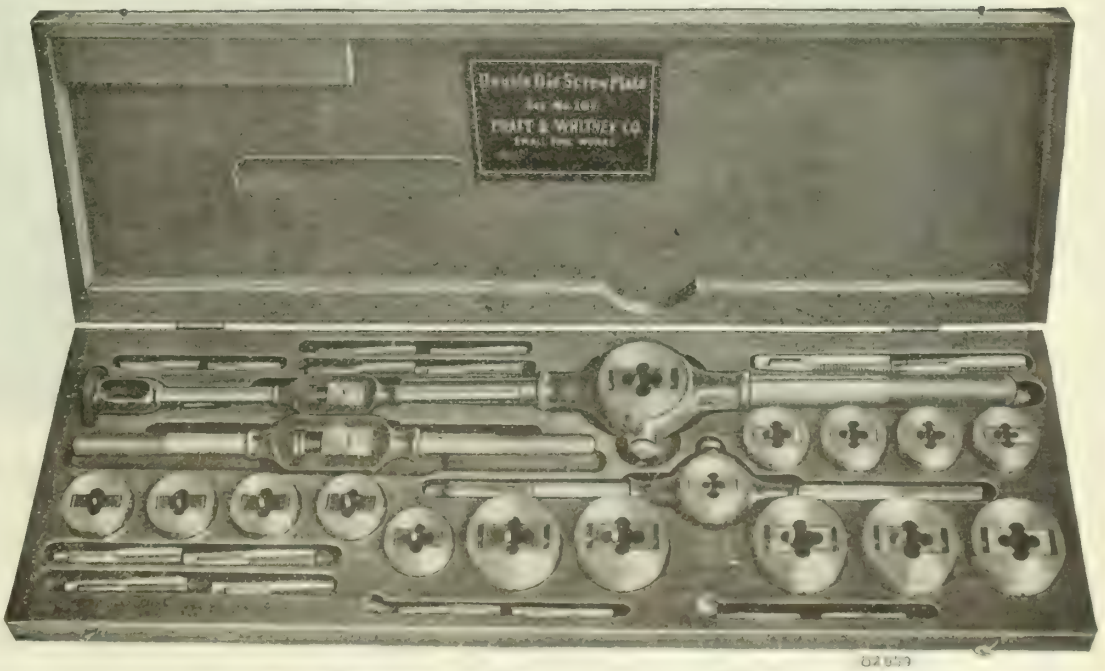
General Offices and Works

DUNDAS - ONT.

TORONTO
32 Front St. West
VANCOUVER
B. C. Equipment Co.

HALIFAX
Roy Building
WINNIPEG
1205 McArthur Bldg.

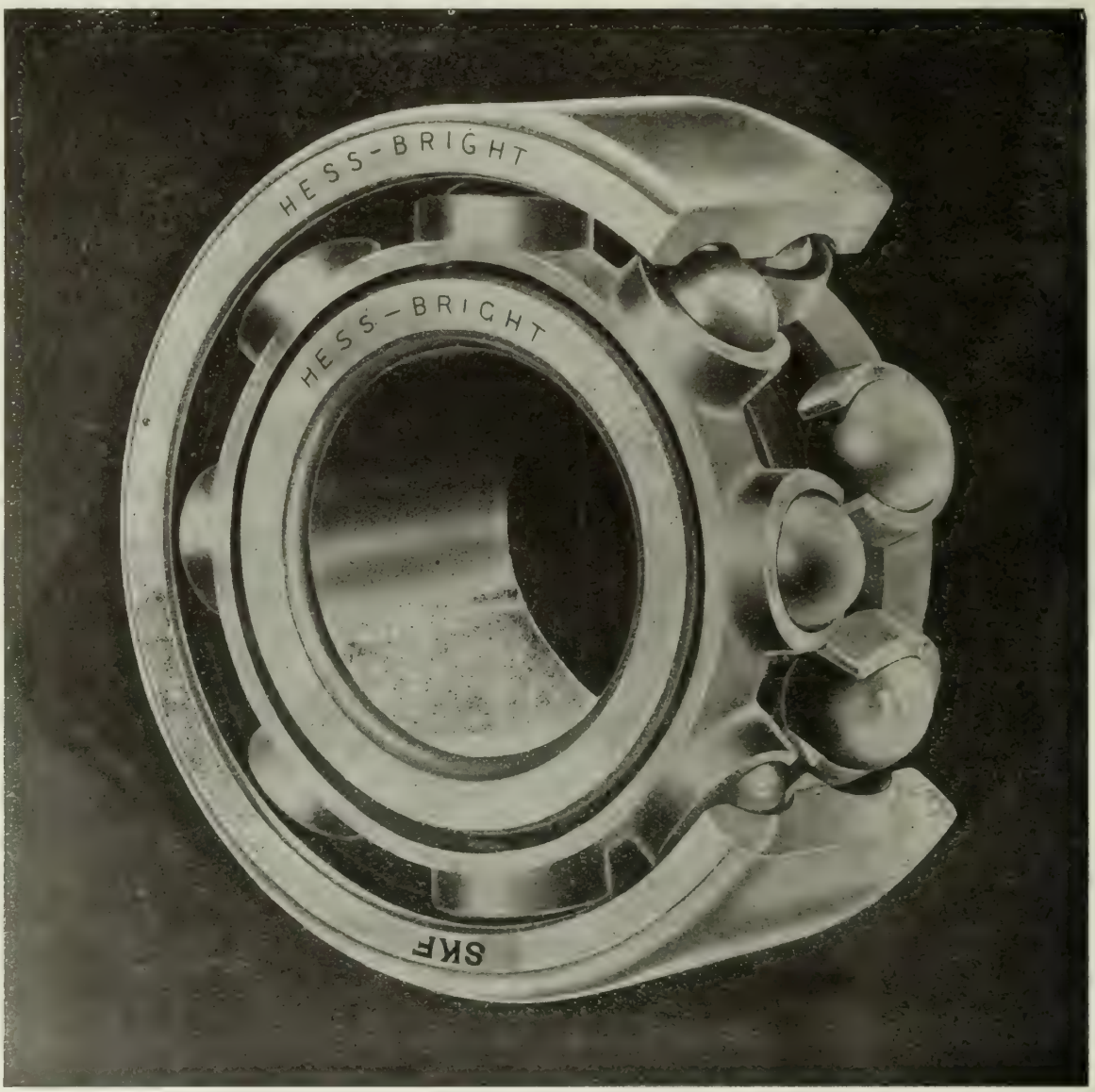
MONTREAL
723 Drummond Bldg.
WALKERVILLE
103½ Sandwich St.



PRATT & WHITNEY COMPANY
OF CANADA, LIMITED

Men of influence consult Journal advertising.

HESS-BRIGHT DOUBLE ROW DEEP GROOVE BALL BEARING



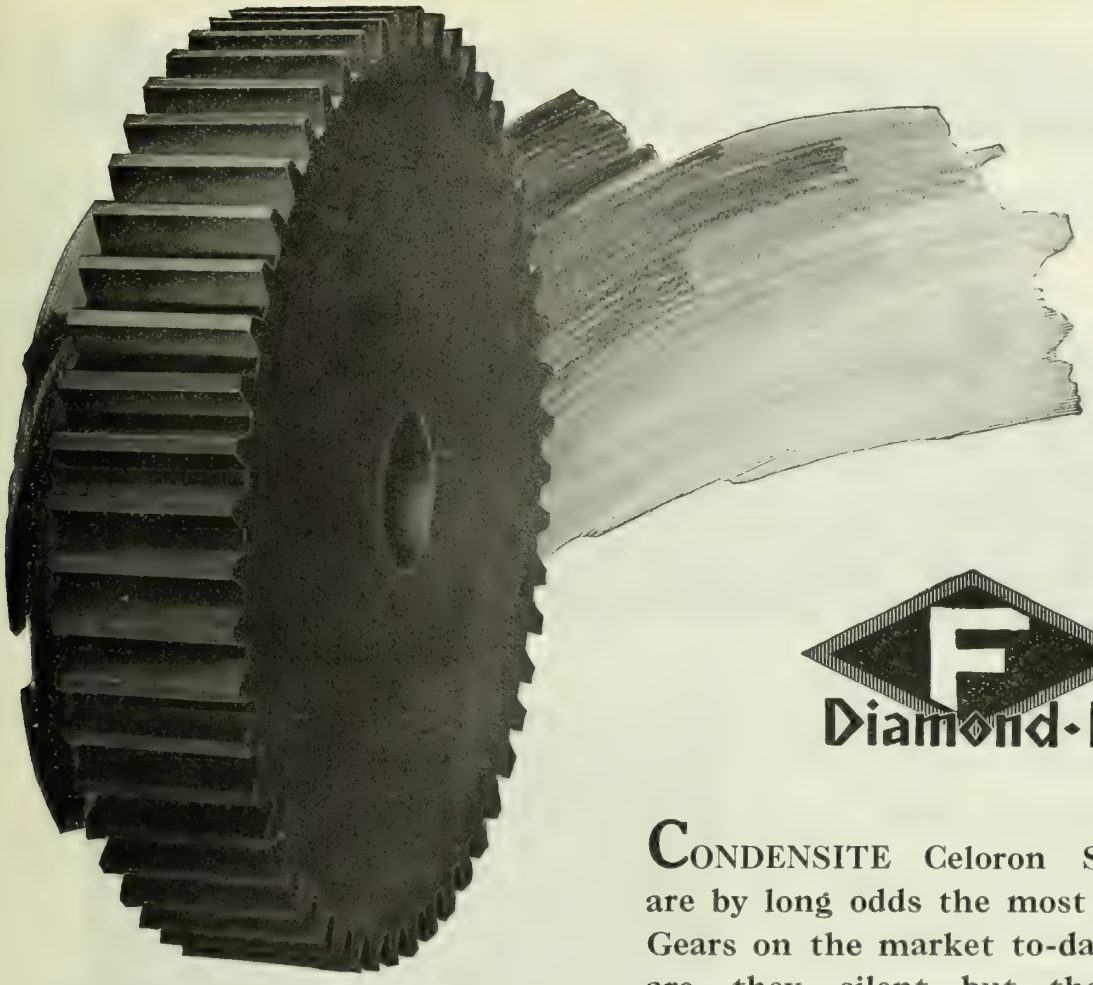
A BEARING OF ABSOLUTE MAXIMUM CAPACITY WITHOUT SACRIFICING THE POWER SAVING OVER OTHER TYPES OF ANTIFRICTION BEARINGS.

NOTE THE DEEP GROOVES FOR THRUST LOAD AND ITS ACCURATE DESIGN.

CANADIAN SKF COMPANY, LIMITED

TORONTO - MONTREAL

Write for the advertisers' literature mentioning The Journal.



Diamond·F

DIAMOND FIBRE

has proved its superiority to other materials in the manufacture of Track Insulation and Railway Equipment such as Bushings, End posts, Engine-box liners, Fish plates, Gaskets, Gauge Cock Handles, Standard Fish Plates, Washers, etc.

Supplied in sheets, rods, tubes, fish paper or machined parts to specifications.

CONDENSITE Celoron Silent Gears are by long odds the most satisfactory Gears on the market to-day. Not only are they silent but they are also absolutely water-proof and unaffected by oil, grease or other organic solvents.

A TRIAL WILL QUICKLY CONVINCE YOU.

DIAMOND STATE FIBRE COMPANY OF CANADA LIMITED

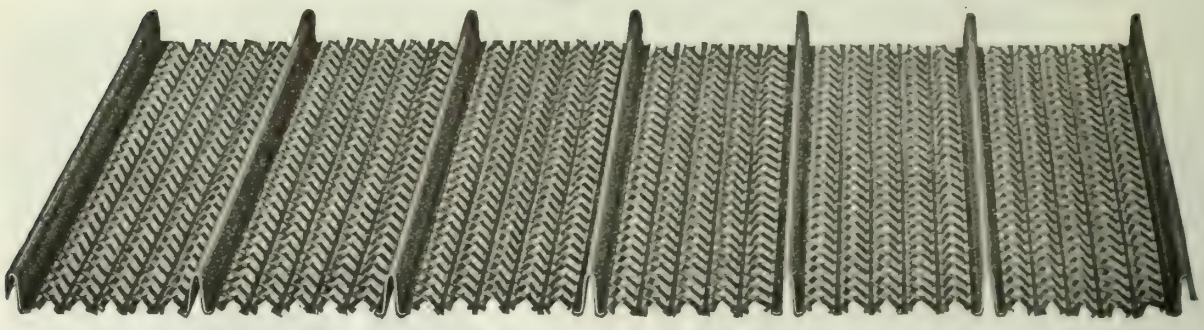
TORONTO

CELORON SILENT GEARS

WATER-PROOF
OIL-PROOF

When purchasing equipment consider The Journal advertiser.

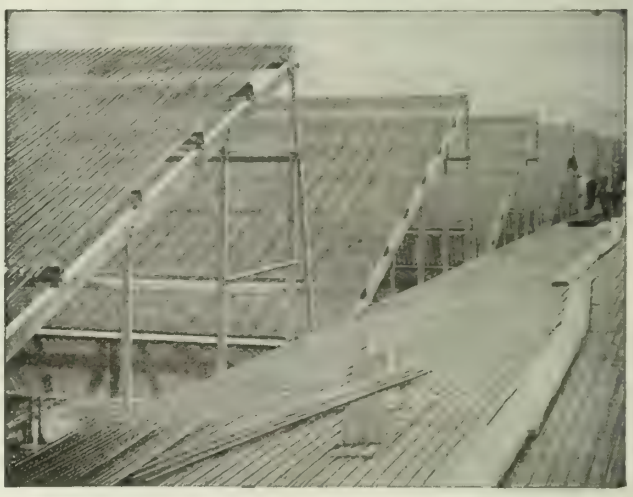
ROOFS, WALLS and PARTITIONS
can be constructed more economically with
Hyrib



Why Use Hyrib?

BECAUSE HYRIB

Eliminates all forms for concrete.
Saves channels and wiring.
Reinforces the concrete and plaster.
Insures fireproofness and permanence.
Permits wide spacing of supports.
Reduces weight of construction.
Increases available floor space.
Saves time, labor and material.



Hyrib Walls and Sidings

are much less expensive than other types of permanent construction, and more economical than old-style constructions which require constant maintenance on account of rust and decay.

A solid two-inch Hyrib concrete wall is as solid as a 12-inch brick wall. It conducts no more heat. It is as fireproof. It costs much less. It is more quickly erected and more easily adapted to special framing.

Our Hyrib Book is free to all who write for it.

Trussed Concrete Steel Co. of Canada Limited

WALKERVILLE, ONTARIO

Branches: TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER
Warehouses: TORONTO MONTREAL WINNIPEG CALGARY

McCRACKEN SEWER PIPE
Is Winning Canada's Favor

H·W·Patterson
Engineer
Walkerville & Ford
Says—

"Walkerville, Ontario, March 5th, 1923.
Mr. W. I. Newmarch,
John E. Russell Co., Ltd.,
Harbor Administration Bldg., Toronto, Ont.
Dear Sir,
We laid three miles of McCracken Pipe twenty-four inches to six inches in 1920. Combined sewers are in excellent condition. We are using one line as outlet for centrifugal line pump, three-inch discharge. We consider McCracken Pipe satisfactory for combined sewers, and will be calling upon you shortly for four miles additional pipe.
H. W. PATTERSON,
Engineer, Walkerville and Ford."

McCRACKEN Concrete Sewer Pipe has proved its case in Canada. Experienced engineers in all parts of the Dominion are giving it their hearty endorsement.

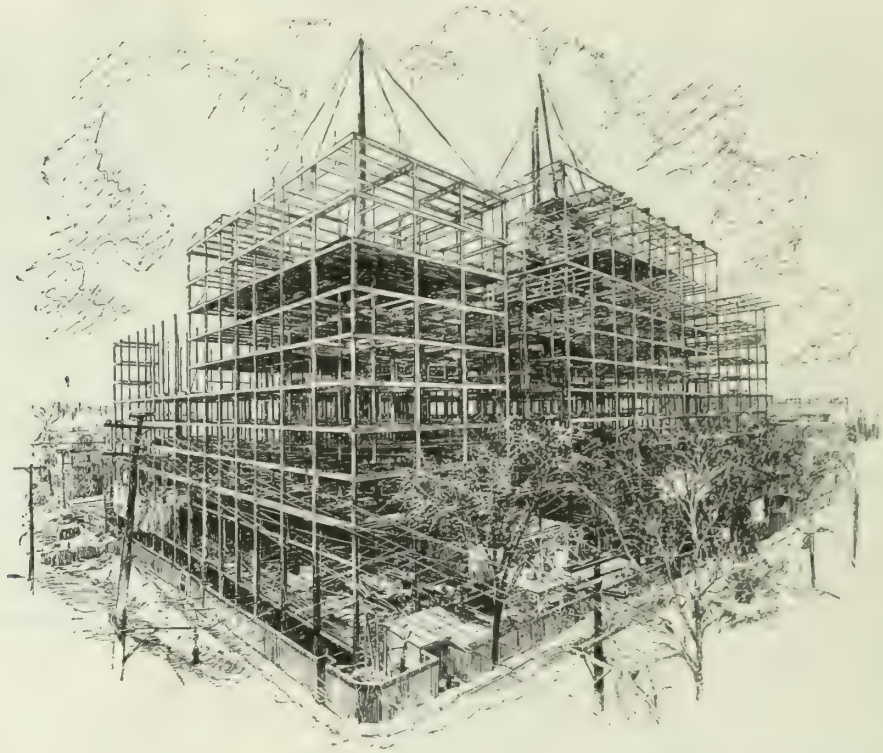
This widespread popularity is partly because McCracken Concrete Sewer Pipe is manufactured in accordance with standard specification issued by the American Society for Testing Materials, and inspected by Canadian Inspection and Testing Company Limited. And of equal importance—engineers recognize the great advantage of the uniform high quality of this pipe. They know that they can depend on every foot they buy.

McCRACKEN
SEWER PIPE
"The Pipe That Endures"

JNO. E. RUSSELL., LIMITED
GENERAL SALES AGENTS
Harbor Administration Building, Toronto

If Winter Comes

as Winter always does



STRUCTURAL STEEL

is particularly well adapted for construction work, in avoiding the usual interrupted progress of erection when the time schedule runs into the Winter Months.

Winter construction with STRUCTURAL STEEL is profitable, from the economy due to the increased supply and efficiency of labor during the cold weather months.

It will pay you to prepare your building plans for construction next winter with STRUCTURAL STEEL.

BUILD WITH
STRUCTURAL STEEL

Issued by the
Structural Steel Association

CANADIAN MM CO MEAD-MORRISON CANADIAN MM CO

SKIP HOISTS

Built for Consumers Glass Co., (2), Montreal and similar to others built for Brown Corp. (1), Brompton Pulp & Paper Co., (2), International Harvester Co., (1), C. N. R. (8), City of Edmonton, (1),

For handling coal, ashes, sand, soda ash, etc.

STEAM HOISTS
GRAB BUCKETS
DERRICKS

COALING PLANTS
CAR PULLERS
CONVEYORS

ENGINEERS, MANUFACTURERS, CONTRACTORS

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B. C. EQUIPMENT CO. - - - - Vancouver

CANADIAN MEAD-MORRISON CO.
LIMITED
CANADA CEMENT BUILDING
WORKS: MONTREAL WELLAND ONT.

LT. COL. R. G. STEWART, PRESIDENT
E. A. LARMONTH, VICE PRESIDENT
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J. D. CUNNINGHAM, SECY. TRES.

E. O. LEAHEY & COMPANY
LIMITED

GENERAL CONTRACTORS

Electric Dredge on Queenston-Chippawa Power Development

Head Office:
OTTAWA,
Ont.

Advertisers appreciate the engineer's purchasing power.

TURNBULL ELEVATORS GOOD ELEVATORS

YOU do not buy an elevator every day—when you do, you want to make sure of getting one that will last many years with the least amount of trouble and expense for upkeep.

For over twenty years we have been building Freight and Passenger Elevators — always taking pride in making them sturdy and dependable—as the many machines in operation to-day after years of heavy service testify.

But many improvements — in design and construction have been added during these years until to-day Turnbull Elevators are the choice of Architects and Engineers for their finest buildings.

The
TURNBULL ELEVATOR COMPANY
LIMITED
TORONTO

MONTREAL BRANCH: 10 Victoria Street

Representatives in—VANCOUVER, CALGARY, WINNIPEG, WINDSOR, HALIFAX, ST. JOHN.

View of Woodstock-Ingersoll Provincial Highway during Construction, and above, completed stretch between Beachville and Woodstock

Concrete Highways Stand the Wear

The requirements of modern traffic are best met by highways of modern construction— built for permanence with concrete. The known ability of this modern material to resist climatic conditions and heavy traffic together with the reduction in motive power costs it ensures, explains the rapidly increasing mileage of permanently paved Canadian highways.

Highways of concrete require very little upkeep. They lighten the taxpayer's burden and reduce haulage costs. Farmer and consumer alike, feel the benefit of this, and the whole community is helped by the tourist trade such highways invite.

Literature on Concrete roads will be gladly sent on request. It shows the true economy of concrete for building enduring pavements. Write our Service Department for this, or any other information on Concrete.

Specify
CANADA CEMENT
Uniformly Reliable

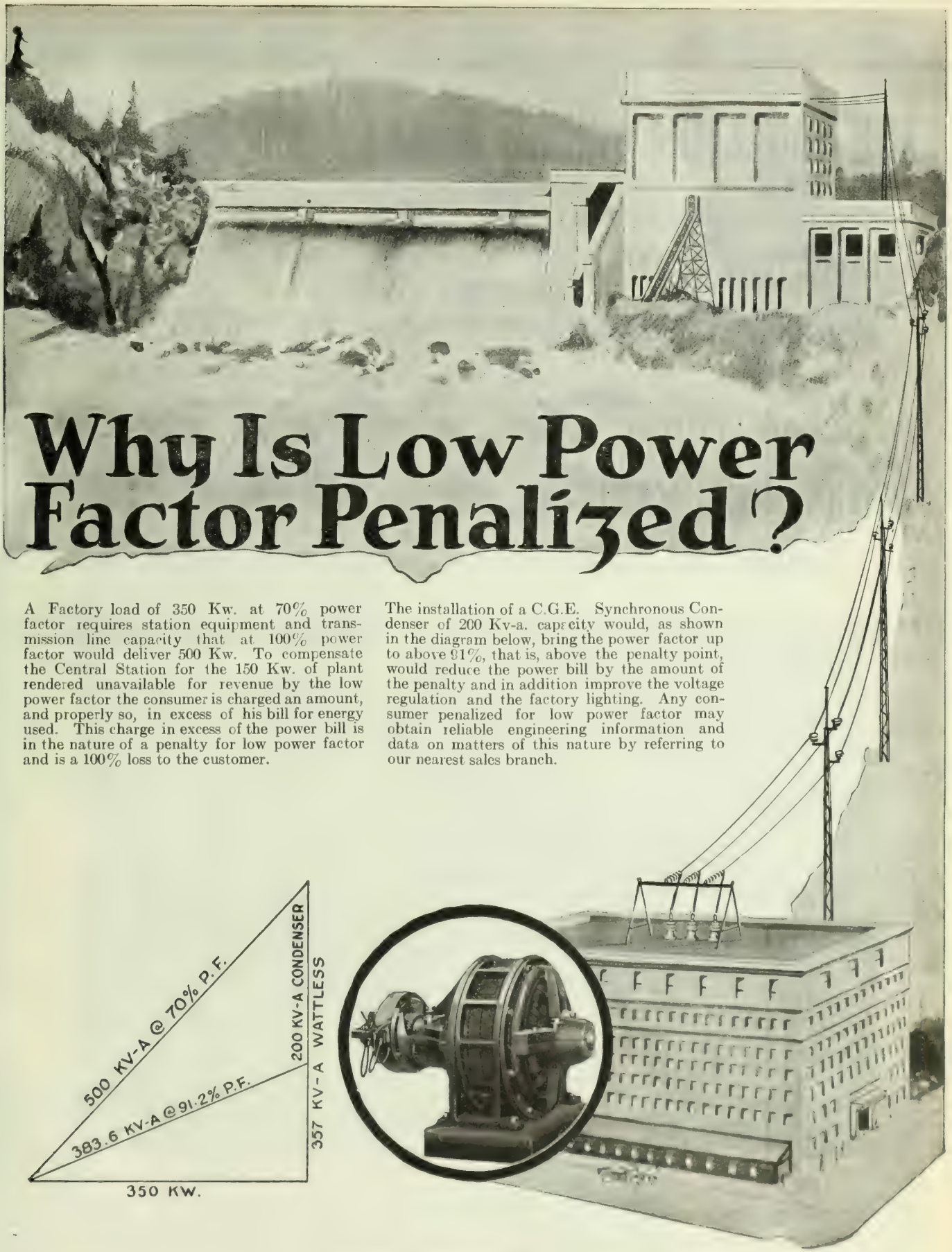
CANADA CEMENT
CONCRETE
FOR PERMANENCE

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

Canada Cement Company Limited

Canada Cement Company Building Phillips Square Montreal

Sales Offices at: Montreal Toronto Winnipeg Calgary



Why Is Low Power Factor Penalized?

A Factory load of 350 Kw. at 70% power factor requires station equipment and transmission line capacity that at 100% power factor would deliver 500 Kw. To compensate the Central Station for the 150 Kw. of plant rendered unavailable for revenue by the low power factor the consumer is charged an amount, and properly so, in excess of his bill for energy used. This charge in excess of the power bill is in the nature of a penalty for low power factor and is a 100% loss to the customer.

The installation of a C.G.E. Synchronous Condenser of 200 Kv-a. capacity would, as shown in the diagram below, bring the power factor up to above 91%, that is, above the penalty point, would reduce the power bill by the amount of the penalty and in addition improve the voltage regulation and the factory lighting. Any consumer penalized for low power factor may obtain reliable engineering information and data on matters of this nature by referring to our nearest sales branch.

"Made in Canada" by

Canadian General Electric Co., Limited

HEAD OFFICE TORONTO

Branch Offices: Halifax, Sydney, St. John, Montreal, Quebec, Cobalt, Ottawa, Hamilton, London, Windsor, South Porcupine, Winnipeg, Calgary, Edmonton, Vancouver, Nelson and Victoria.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
410 GENERAL ASSURANCE BLDG
BAY AND TEMPERANCE STS.
TORONTO.

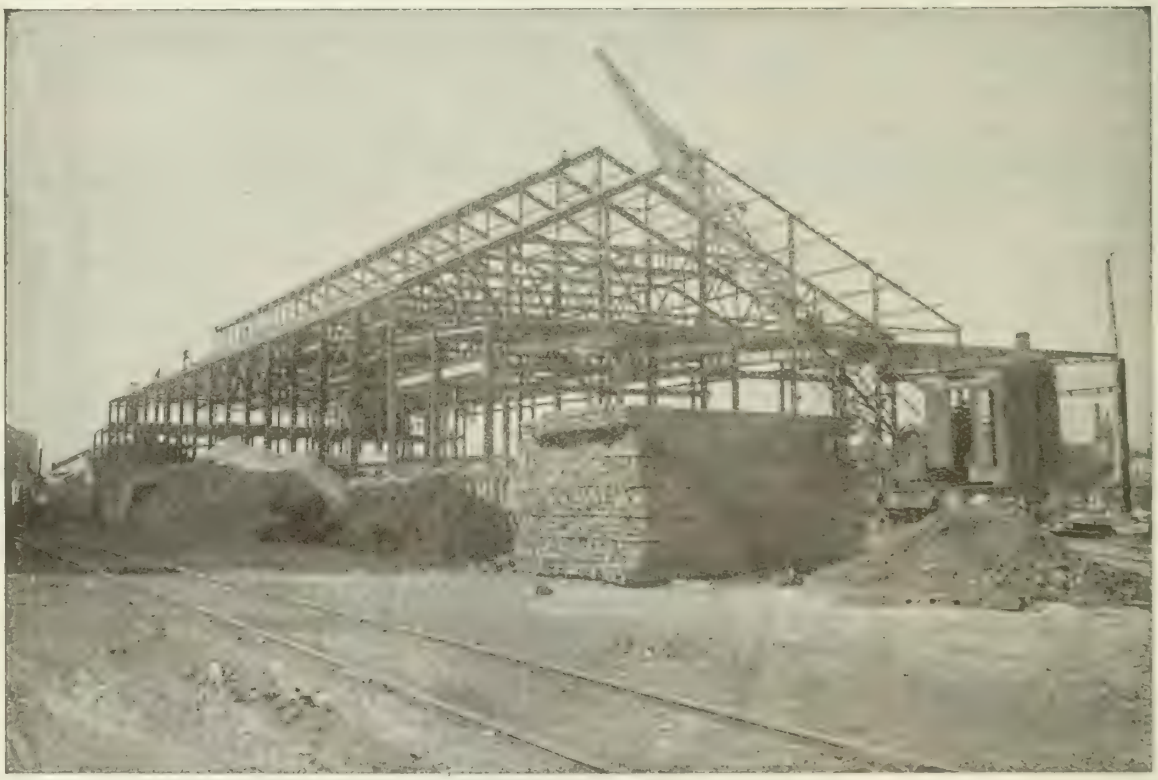
ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.



We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

Mentioning The Journal gives you additional consideration.

P · A · X

Private Automatic Exchange

ECONOMICAL

The Automatic Telephone

The P.A.X. is a time saver—a trouble saver and is built to last. Pays for itself in any plant.

The P.A.X. is the only rapid, easy and economical means of intercommunication between widely separated departmental heads of a business.

Business needs action. The turn of the dial gives action any time—all the time.

"A Pair of Wires and a Dial", telling of P. A. X. in operation is yours for the asking. Write our nearest House.

Northern Electric Company
LIMITED

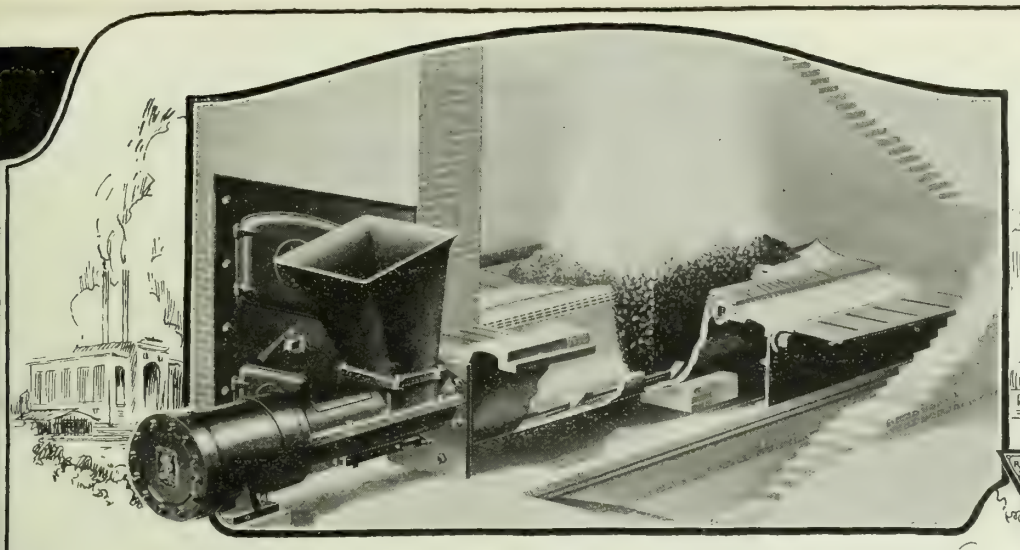
MONTREAL TORONTO WINDSOR CALGARY
HALIFAX HAMILTON WINNIPEG EDMONTON
QUEBEC LONDON REGINA VANCOUVER

"Makers of the Nation's Telephones"

MANUFACTURING
Manual Telephones
Automatic Telephones
Wires & Cables
Fire Alarm Systems
Radio Sending and receiving Equipment

DISTRIBUTING
Construction Material
Illuminating Material
Power Apparatus
Household Appliances
Electrical Supplies
Power & Light Plants
Marine Fittings

Remember The Journal when buying apparatus.

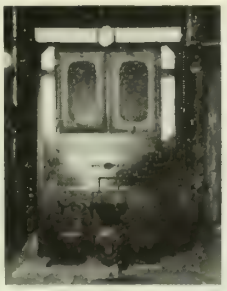


End smoke worries.... End efficiency troubles....

—with this cheaply installed stoker

SMOKE and inefficiency go hand in hand. The stoker that does not eliminate smoke, is always one that does not extract full value from the coal.

The "Jones Standard Side Dump" Stoker—shown above—is highly efficient. It operates on the unexcelled "Jones" principle of combustion. The coal is first coked and then the volatile gases pass up through the incandescent zone of the fuel bed, where they are burned. Smoke is practically eliminated.



The stoker shown below and another not shown here are installed under 172 hp. B&W Boilers in a bank in the middle of a city where smoke ordinances are very strict. The engineer says that smoke trouble has been entirely eliminated. Efficiency runs high. Installation cost was low, because only shallow ashpits are required for the removal of the ash.

Would you like the whole story? Just drop a post card for the Bulletin:

The "Jones Standard Side-Dump"

"Jones" and "Riley" Stokers

The Under-Feed Stoker Co., of Canada, Ltd.

146 King Street, West, Toronto

Alta. & West. Sask.: Mr. J. Twomey, Camrose, Alta.

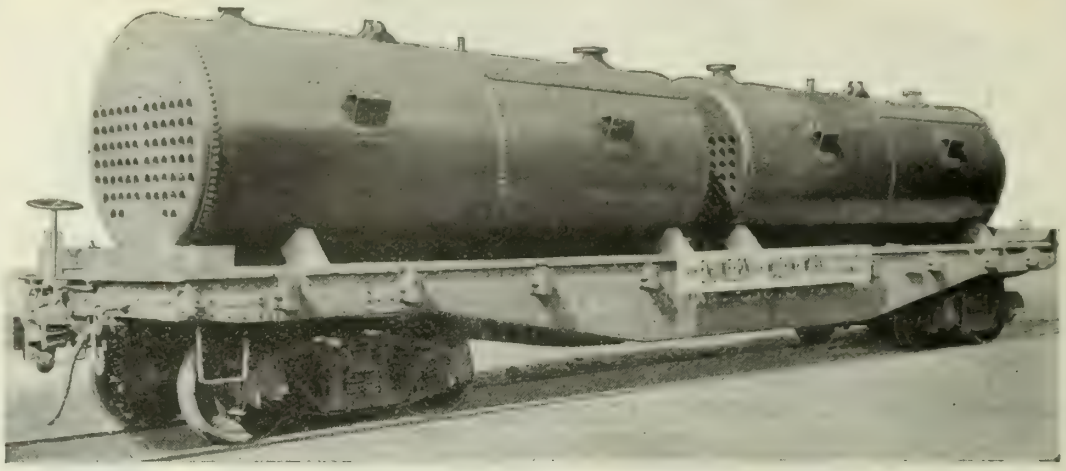
British Columbia: E. A. Earle, Limited, Vancouver, B.C.

Man. and East. Sask.: W. W. Hicks & Co., Winnipeg

Quebec: The Cleaton Co., (Canada), Ltd., Montreal, Que.

"Murphy" Automatic Furnaces

The advertiser is ready to give full information.



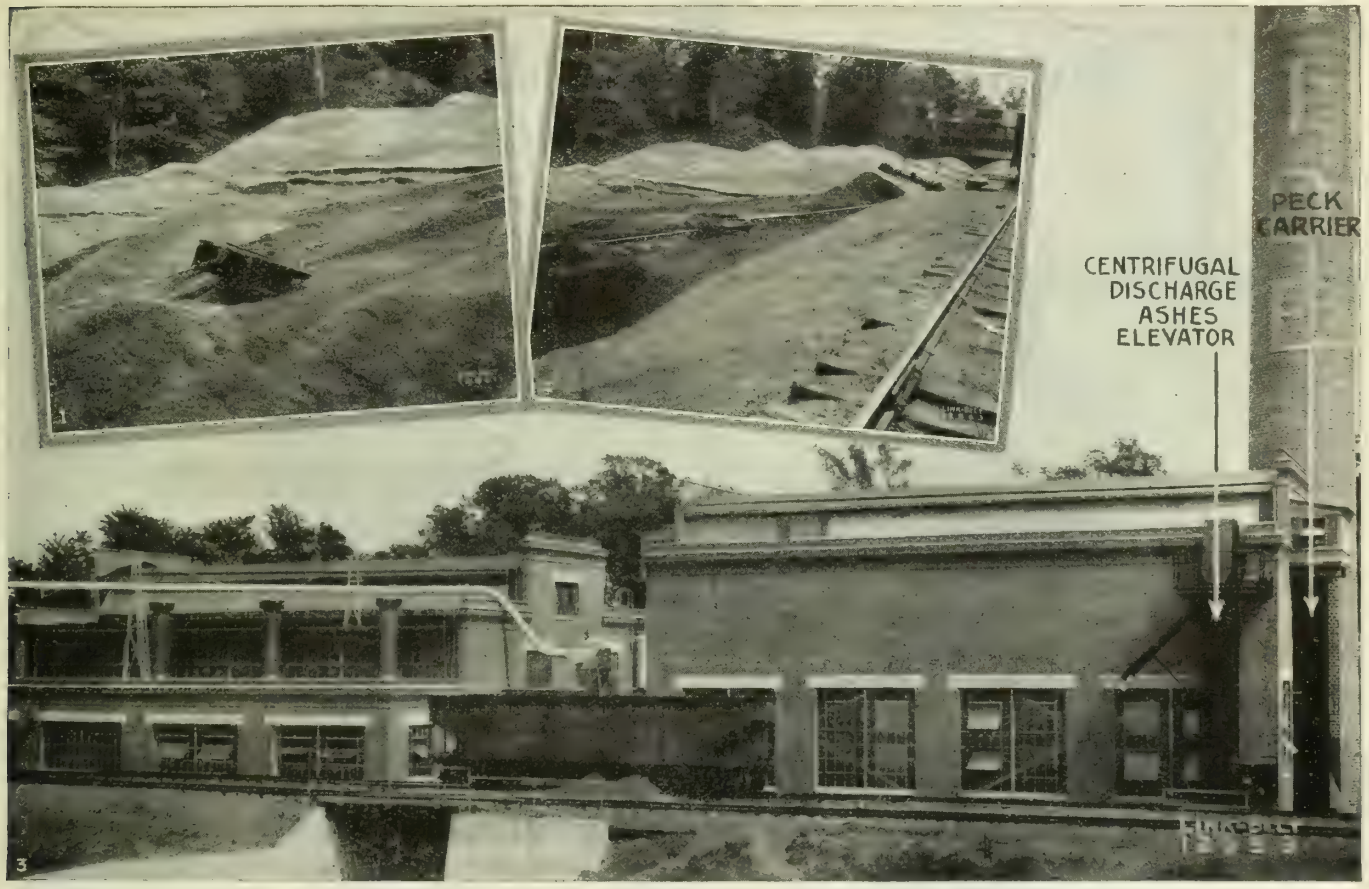
Experience and Equipment that mean Service

WHEN you buy a tank, container or boiler from us you are buying more than a mere assemblage of metal. You are drawing upon a reservoir of engineering and constructional experience in fine plate work that has been accumulating for 35 years. The fact that we are known to make as high grade steam boilers as any produced in America attests to that. We have one of the largest flanging presses in North America, we have hydraulic presses, multiple electric drilling machines to drill rivet holes out of the solid and many other machines of the most modern type to help us help you. We quote promptly, economically and understandingly.

Engineering & Machine Works of Canada, Ltd.

ST. CATHARINES, ONT.

Eastern Sales Offices: Hall Machinery Co., Sherbrooke, Que., and Birks Bldg., Montreal.
Winnipeg Agents: Powell Equipment Company, Limited. Vancouver Agents: M. Grindley Co.



1—Power Hoe on its return trip. 2—10,000 ton storage pile with belt conveyor delivering to initial pile from which Power Hoe gets its load
3—General view of Exide's power plant.

Exide Battery's Coal Storage

STORING and reclaiming coal can be made a simple practical operation—requiring little labor, and extremely economical of operation.

Link-Belt experienced engineers have designed and built plants for large and small tonnage—each one to fit the individual requirements of the local conditions.

Let us look over your plant and suggest a Link-Belt method of handling your coal. Usually large economies are made by a well-planned coal storage system.

We manufacture in their entirety, in our plants, all of the various approved types of equipment used in the handling of coal. Our designs, therefore, are made without prejudice, and are uninfluenced by a desire to force the use of some particular type of equipment, to which we might be restricted by patterns or facilities, or to which we are committed by costly exploitation.

1408

LINK-BELT LIMITED
(FORMERLY CANADIAN LINK-BELT COMPANY, LIMITED)
TORONTO—WELLINGTON AND PETERS STS. MONTREAL—10 GAUVIN LANE

LINK-BELT LIMITED
WELLINGTON & PETERS STS., TORONTO
Please send postpaid—Link-Belt General Catalog No. 400

Name _____
Firm _____
Street _____
Town _____
State _____ E. J. 12-23

MAIL THIS COUPON

LINK-BELT

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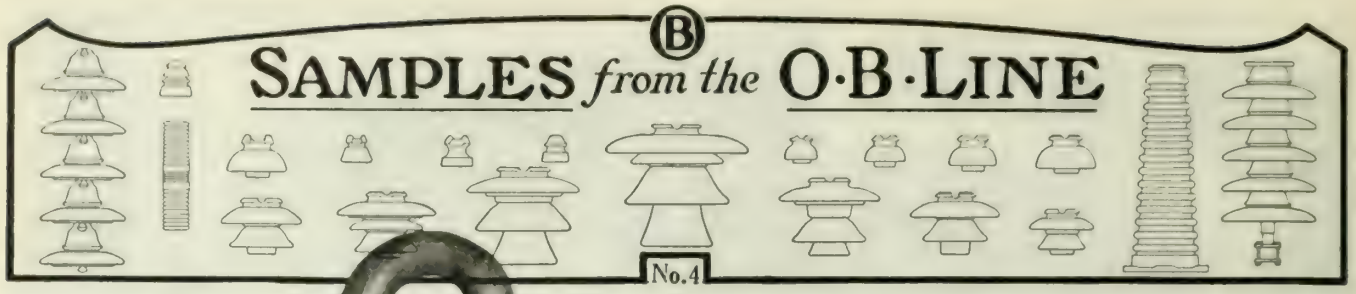


Dependable Suspension Insulators

Proved by years of service

YEARS ago, a large installation of O-B Suspension Insulators very similar in design to those illustrated here, was put into service. The design was radically different from any of the others suggested for the installation mentioned, but quickly proved its merit, and has since been extensively imitated.

Various refinements and valuable improvements have been added, but the original design has persisted, almost without change, and has made a truly remarkable record for reliability and long life.

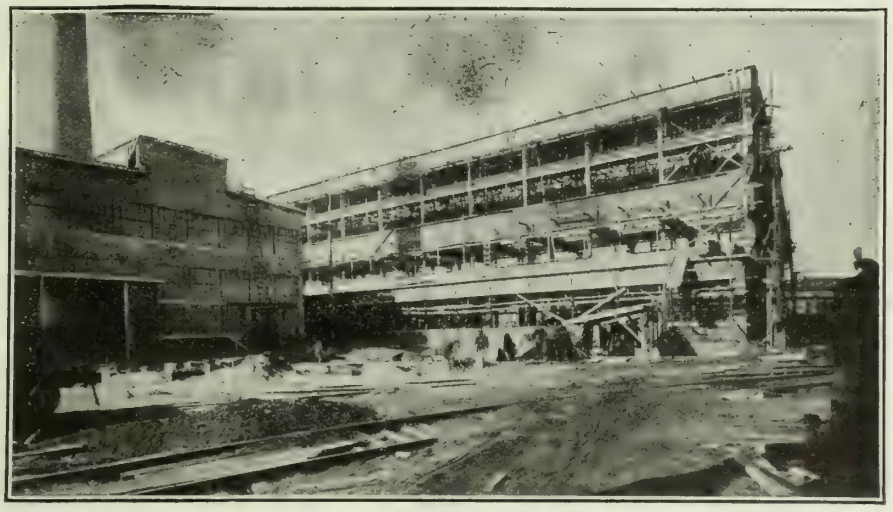
Field service records of some of the largest operating companies indicate that O-B Insulators of this design have only their own field performance records to break.

Dominion Insulator & Mfg. Co. Ltd

(*Manufacturing Ohio Brass Company Products in Canada*)

Niagara Falls - - - - - - Ontario

CEMENT-GUN
TRADE MARK



Work done and photograph furnished by Traylor-Dewey Contracting Co., Allentown, Pa.

GUNITE was chosen by the New York Shipbuilding Company, Camden, New Jersey, for the walls of their new buildings, which were erected during the war period, on account of the rapid construction and fireproofing quality.

Their judgement has now been confirmed by the National Board of Fire Underwriters in a report issued May 12, 1922, which gives 2 in. single GUNITE walls a rating of ONE HOUR and hollow GUNITE walls a rating of THREE HOURS and they are an absolute FIRE STOP.

: : : : : : : *LET US GIVE YOU FULL DETAILS* : : : : : : :

CANADIAN REPRESENTATIVES:

The General Supply Co. of Canada, Limited

OTTAWA

MONTREAL, TORONTO, WINNIPEG, MONCTON, NORTH BAY, VANCOUVER.

The Taylor Stoker

Why do so many Central Stations use the TAYLOR?

When the exacting nature of the demands of the Central Station on a stoker are considered the answer to this question becomes of considerable interest to every stoker user or prospective user.

Uninterrupted Service is the major consideration, and the Central Station therefore selects a stoker, above all, for *reliability*.

Fluctuations in Central Station loads are many and rapid and frequently extreme changes occur in an unusually short space of time. *Extreme flexibility* is therefore another factor of importance in the choice.

Since most Central Stations are located in centers of population *Smokeless Operation* is still another attribute which the Central Station Stoker must possess.

Maximum boiler output, substitution of brain for brawn in boiler room operation, fuel economy are other considerations which carry much weight just as they do in every power plant.

Among Central Station engineers and operators generally, it is a well established fact that the Taylor Stoker can be depended upon absolutely to meet these requirements. That is why the Public Service Companies of New York, Philadelphia, Baltimore, Washington, Providence, Springfield, Dayton, Toledo and Detroit as well as those of dozens of smaller industrial centers have chosen the Taylor Stoker.

Send for the Taylor Stoker "Picture Book". It is an impressive story, with very few words of the extent of Taylor Stoker selection in the Central Station field.

THE TAYLOR STOKER COMPANY, LTD.
TORONTO, ONTARIO

Principal Sales Office: 416 Phillips Place, Montreal, Que.

Consider the advertiser, his course is that of wisdom.

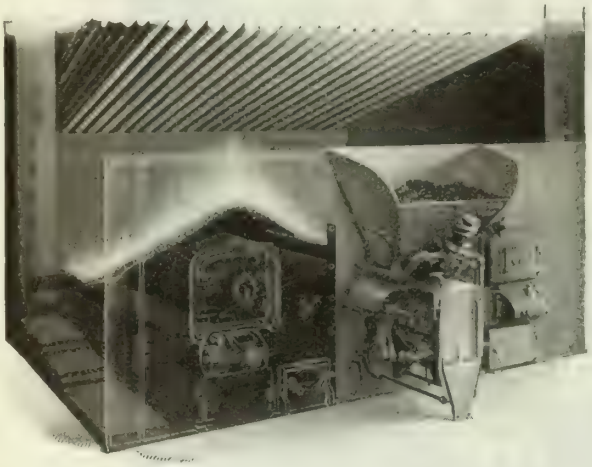
General Offices:

HAMILTON & MONTREAL

COMBUSTION ENGINEERING CORPORATION

LIMITED

Type E Stoker



THIS stoker is of the underfeed, single retort type, with ample front observation doors and side dumps always under observation and control. The ash dumps are operated from the front of the boiler, and the fact that deep ash pits are not required permits the installation of this stoker where excavation is impossible, as the refuse can be removed on the floor line at the front of the stoker. Grate bars are air cooled and are alternately moving and fixed. The moving bars have a short upward and outward motion which may be regulated according to the requirements of the fuel. The active part of the fire is continuously self-cleaning.

A few special features of the Type E Stoker are:

The entire length of the retort bottom consists of a sliding member carrying the pusher block and the auxiliary pushers, insuring positive and proper feeding of the coal.

No separate drive required; the steam ram is an integral part of the stoker.

The action of the stoker is controlled by the operating valve mounted on the front of the hopper.

Air from the high pressure compartment passes through and cools the fire bars, and is thereafter discharged between the bars, entering the furnace at a temperature that will facilitate proper combustion.

This stoker is simple in design, may be quickly installed and insures high economy, large over-load capacity, and continuous operation. It will burn a wide range of bituminous coals and is applicable to boilers from 150 H.P. up. It is the most widely installed stoker of its type in this country, which is possibly the best evidence of its efficiency and reliability.

* * *

REPRESENTATIVE USERS

Pacific Mills, Ocean Falls, B.C.
Canada Paper Company, Windsor Mills, P.Q.
Canadian National Railways, Moncton, N.B.
J. R. Booth, Ottawa, Ont.
Spanish River Pulp and Paper Mills, Espanola, Ont.
Granby Coal Mines, Cassidy's, B.C.
Laurentide Paper Co., Grand Mere, P.Q.

Combustion Engineering Corporation

LIMITED

HEAD OFFICE: TORONTO

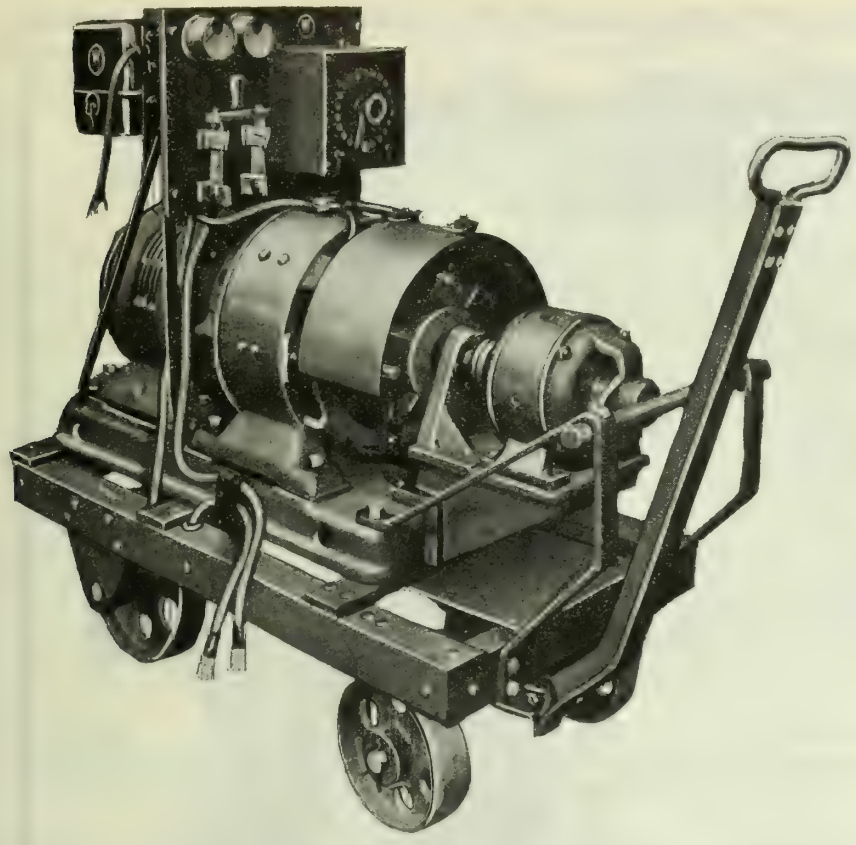
Type E Stokers
Type K Stokers
Coxe Stokers
Self Contained Stokers
New Frederick Stokers

Green Chain Grate Stokers
Green Cast Iron Hoppers
Quinn Oil Burning Equipment
Lopulco Pulverized Fuel Systems
Detrick Flat Suspended Arches

Combusco Water Seal Ash Conveyor
Elliot De-Aerators and Condensors
Custodis Chimneys
Uehling Co2 Recorders
Beaumont Coal and Ash Handling Equipment

Howden Steam Turbines, High Speed Engines
and
Howden Ljungstrom Patent Air Preheaters

MONTREAL WINNIPEG VANCOUVER



Portable Arc-Welding Outfits

CANADIAN WESTINGHOUSE

OF all the factors which enter into the making of a perfect weld, arc steadiness and arc control are of prime importance.

The idea back of the Westinghouse Equipment was to build a machine which would assist the operator in obtaining good welds consistently, and yet have a sturdy simple design and construction.

The first thing done was to simplify the design as much as possible in order to assure an easy running, staunch machine to give continuous operation for steady welding work.

Second, a control system was worked out by Westinghouse Engineers, a simple, strong controller, giving the operator any current he may desire at the arc, or a single, steady current for a full day's work from a single rheostat. This flexibility is one of the distinct advantages of Westinghouse Welding Equipments where the welding work is variable.

And lastly, the Westinghouse Equipments were perfected in all sizes from the popular 175 ampere portable equipment to the heavy multiple operator equipments which have made arc welding such an important factor in modern production.

Canadian Westinghonse Co., Limited, Hamilton, Ont.

TORONTO, Bank of Hamilton Bldg.
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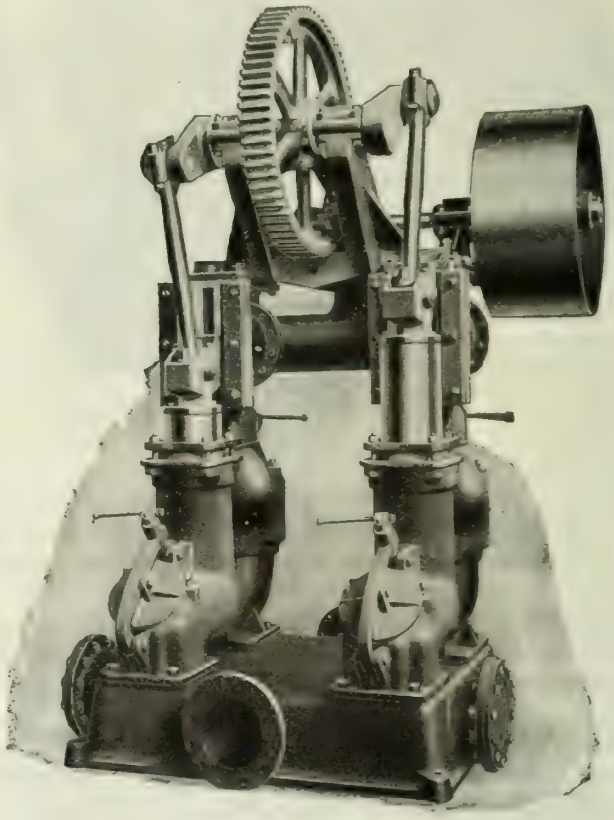

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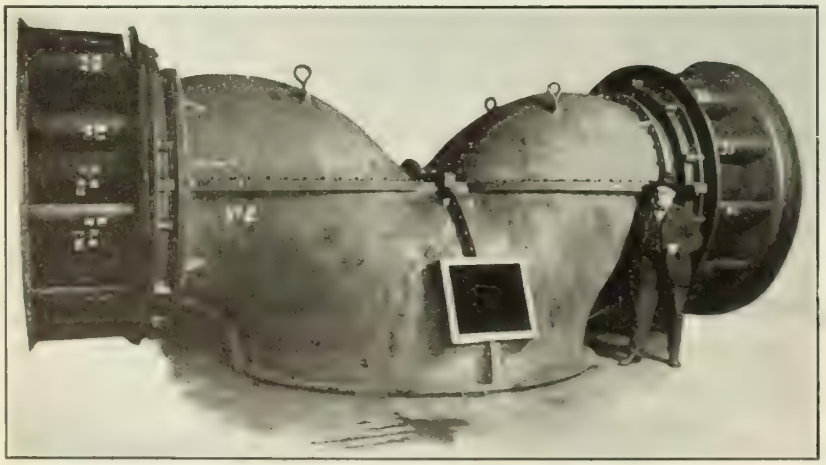

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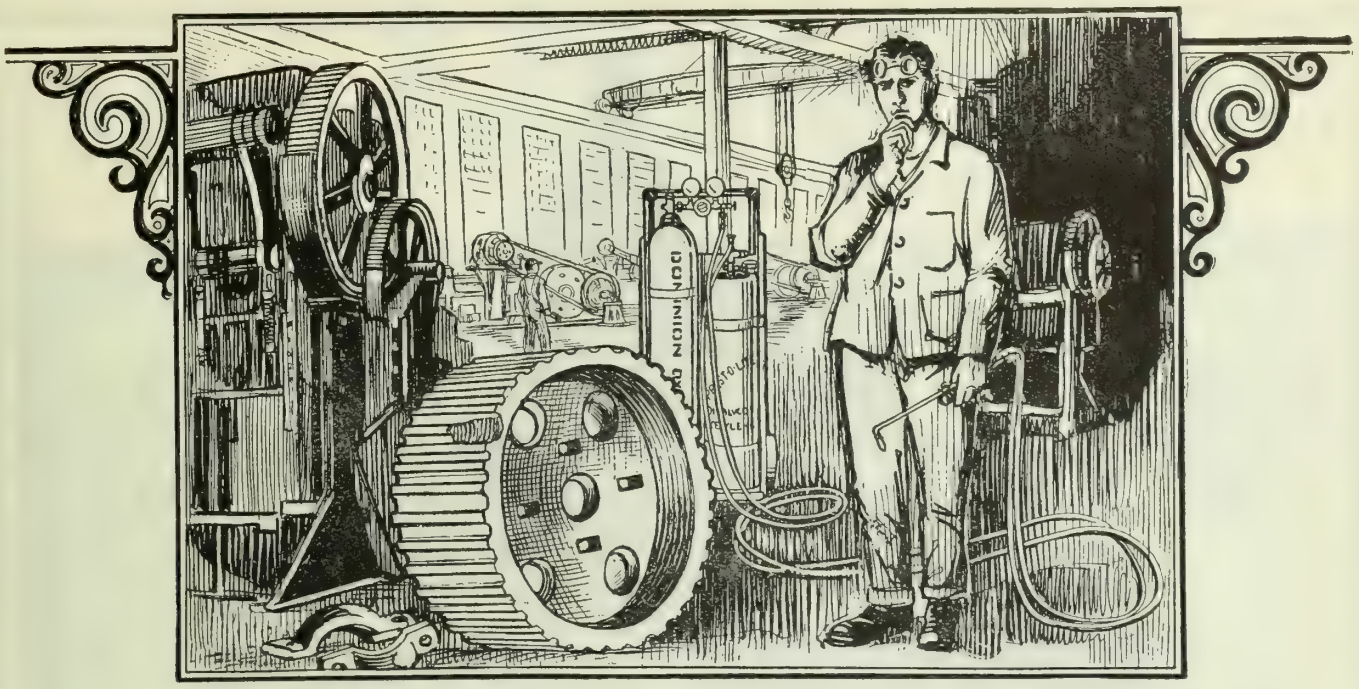

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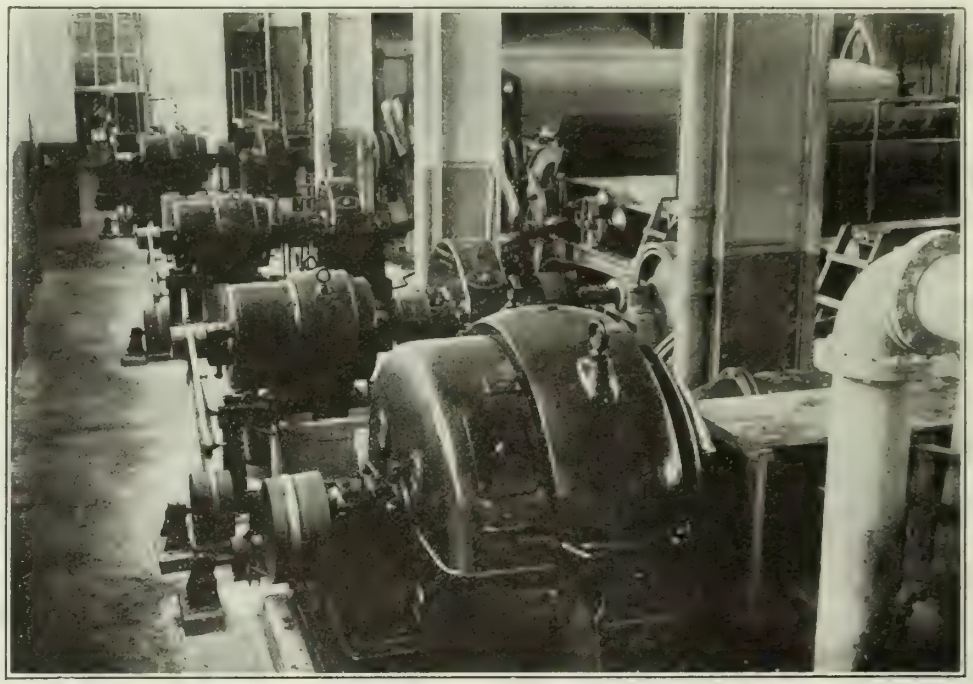

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DECEMBER 1923 Volume VI, No. 12

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Metals in Engineering Service

A Few Notes on Design, Choice of Materials and Inspection of Failures

Gordon Sproule, M.Sc., A.M.E.I.C.,
Lecturer in Metallurgy, McGill University.

Paper read before the Montreal Branch, The Engineering Institute of Canada, April 26th, 1923.

In the January 1923 number of *The Engineering Journal* there appeared a very valuable article entitled "The Inspection of Ferrous Materials" by E. A. Allcut, which had been read before the Toronto Branch in November, 1922. Mr. Allcut's paper outlined a system of inspection and testing, with particulars for iron and steel materials and supplies, which should be of great value to any concern organizing or reorganizing an inspection department. The present paper may be considered in a sense a sequel to it, since it discusses the *service* of metals as affected by quality and suitability of material, and by features of mechanical design.

Materials in service may be compared to individuals in society. Few of us get our names into the papers unless it is for fraud, murder or divorce. Occasionally it is because we have been happily married for sixty years, or have lived a hundred, or have given a million dollars to some university, (McGill still needs your millions), but more often it is the bad actors that receive the attention. An axle breaks; then it has to be explained: who is to blame for the lives and rolling-stock lost. So it is in the inspection of failed material, the investigation of the service of metals, that we are chiefly interested.

The inspection department that regulates the purchasing and protects the stores departments should have the personel and opportunity to investigate thoroughly all cases of failed material, and the critical reports made by them should not be received as censure, but welcomed as advice worthy at least of serious consideration. From records compiled in this way most valuable data can be obtained.

A local physician of many years' experience claims that one of his important functions is to combat the tendency of his patients to ascribe their indisposition to some one particular cause; that piece of pie, those wet feet, etc. Usually the condition is the result of a combination of factors. So it is with service failures. Improperly qualified persons, even though experienced and generally wide-awake, may easily miss the vital factors when investigating a failure, and report it as due to "a large, rusty flaw" which is merely a sympton.

Classification of Failures

Failures, in general, may be classified as being due to one or more of the following factors:—*Primary factors;* (a) faulty design, (b) unsuitable material, (c) bad material. *Secondary factors;* bad workmanship, accident, abuse.

Let us dispose of the secondary factors first. Bad workmanship is inexcusable, but it seems to be a necessary evil and should be guarded against by supervision of work and subsequent rigid inspection of product. By "accident" is meant a condition altogether unforseen, which cannot be met by any precaution or factor of safety, such as the failure of some other part than the one under investigation. Thus in serious train wrecks, due to failure of material, it may be impossible to determine the primary factors. Abuse, due to ignorance, carelessness or malice, often results in preventable accidents which we need not consider at present.

Failures due to Faulty Designs

As a metallurgist, the writer is inclined to state that most failures are due to *faulty design.* The Canadian pioneer of aviation, Mr. McCurdy, told us, at a meeting of the Montreal Branch of *The Institute* how the first attempt to fly from Florida to Cuba failed because the engine crankshaft was too small. You may say that is hardly a fair example because the requirements were unprecedented; but were they? That excuse can scarcely be entertained in regard to the failure of the first Quebec bridge, in the investigation of which the commission found that the materials, workmanship and methods of erection were beyond criticism. The behaviour of materials is much more easily determined than the behaviour of structures, and designers *should know* the limitations of their materials; for example, that Bessemer steel may be unsound and brittle, or that castings cannot be depended upon like forgings.

Chilled Cast Iron Wheels

In cases of persistently recurring failures it is obviously a question of design. An outstanding example is that of the chilled cast iron car wheel. This is a marvelously

efficient unit of construction. As most of you know, it is made by pouring molten cast iron of the proper composition into a mould consisting of sand where it forms the body of the wheel, and of a heavy cast iron ring, or chiller, to form the tread and flange of the wheel. Where the molten iron lies against the chiller it freezes quickly and retains its carbon in the combined form, giving intensely hard, brittle, white cast iron. This gradually merges into comparatively tough grey cast iron in the plates, brackets and hub, where the metal has cooled and frozen slowly in contact with the sand cope, drag and cores, allowing part of the carbon to crystalize out as graphite, (see figure No. 1). These wheels have been made in enormous numbers for years and years. They have been made for about seventy-five years, and now about 25,000,000 are in use in North America. The foundry practice may be said to have reached perfection, and when the output of a foundry is regulated by intelligent and conscientious inspection it is almost impossible for a wheel to get out that is not according to specifications. Of course, if the specifications limiting depth of wearing chill and brittleness on the one hand, and softness and toughness on the other hand, were more severe, wheels near the present limits would be rejected and the margin of safety would be increased, because it is usually these that fail in service. But increased rejections would increase costs, and it is economy to balance cost against the risk of failure. At the time of which the writer has knowledge, of wheels removed from service on Canadian Pacific Railway lines for wear and failure, the wheels of C.P.R., manufacture had given about 15 per cent longer service than wheels of other makes. This is credited to the inspection. Inspection can eliminate *bad material.*

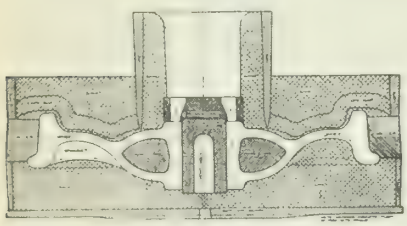

Figure No. 1.—Cross-section of Car Wheel Mould showing direction of flow of Metal.

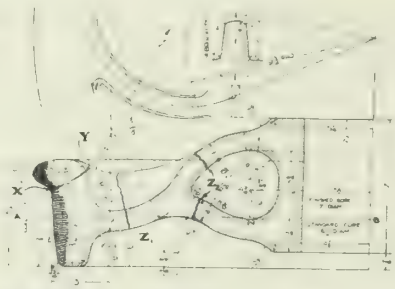

Figure No. 2.—33-inch Cast Iron Wheels for cars of max. gross weight not to exceed 161,000 lbs.

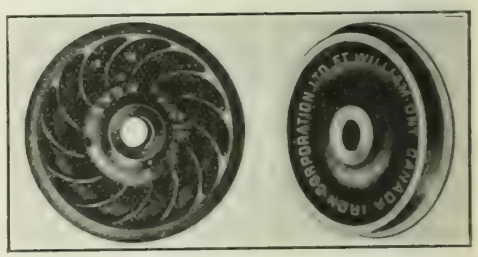

Figure No. 3.—Standard type of Car Wheels.

Series of Tests of Chilled Cast Iron

Much effort has been expended in trying to find *more suitable material* than plain carbon chilling cast iron. Ferro-alloy manufacturing companies have published the results of tests on chilled wheels containing, or treated with their material, that greatly exceeded the specification test requirements; but *any good* chilled wheel will greatly exceed the specification test requirements. Fifteen years ago the writer, working under Dr. Alfred Stansfield, M.E.I.C., Dr. Milton Hersey, and H. H. Vaughan, M.E.I.C., made an extended series of tests on chilled cast iron. Unusually pure mixtures were made; mixtures containing unusually large amounts of the common deleterious impurities were made; and mixtures containing various alloys. The net conclusions were that iron carbide, the chief constituent of chilled white cast iron, had such striking characteristics that it was practically unaffected by any ordinary amount of other ingredient. In another very extended investigation of old wheels with respect to their sulphur content, carried out at the works in connection with the use of low-sulphur charcoal pig-iron costing about 25 per cent more than coke iron, similar results were obtained. In fact the better wheels had a little higher sulphur content, in the average, than the inferior wheels. In other words, an ordinary good chilled cast iron wheel, having the proper depth of hard chill in the tread, changing gradually to tough grey iron in the body, properly moulded and properly annealed, is a perfect metallurgical product, and improvement is entirely in the hands of the designer. Figures Nos. 1, 2 and 3, show the present standard design. It is made in several weights for cars of different total gross weights. Except for the different weights and slight differences in proportions, that is in details of shape, it is practically the same as the design originated by Washburn sixty or seventy years ago. Notice the graceful curves: the ensemble would make a nice architectural ornament; but the idea that these curves afford any resilience is ridiculous on the face of it. These curves, reinforced with more curves, are like a strong balloon with extra hydrogen forced into it to increase its buoyancy; and they don't help the moulder.

Two Types of Failures in Chilled Cast Iron Wheels

These wheels are subject to two kinds of serious failure: First, cracks start in the throat of the flange, at the point marked X in figure No. 2, and grow in the usual manner, by cleavage of the long crystals of iron carbide, (which, of course, are at right angles to the chilling surface), in the direction indicated by the lines, until they approach or emerge at the point marked Y, and the flange breaks off in service, or may be knocked off with light blows of a hand-hammer, resulting in derailment. Second, the heating effect of the brakeshoe friction causes expansion of the tread of the wheel and it becomes too big for the body and tries to get away, forming a crack as shown at Z_1 or at Z_2 and Z_3. In bad cases, (severe braking applied to hard or badly annealed wheels) a section of the tread will actually jump right out, resulting in a wreck. The same effect is produced by the "thermal test" in which a ring of molten cast iron, about, $1\frac{1}{2}$ inch thick, is formed against the tread of a wheel lying on its back in sand, and strain-gage measurements on wheels artificially subjected to brake-heating actually show elongation of the radii, concentrated at Z_1 or Z_2 according to the weight, hardness, and rate of heating. Now what structural engineer would design a cast iron column, or worse still a tension member, in the form of a human backbone or bow-leg? Figure No. 4 shows a proposed design for cast iron wheels which, the writer believes, would eliminate both the types of failure described above. The pattern shown has been calculated to weigh 690 pounds with one-inch plates, as compared with 690 to 710

pounds actual weight for the M.C.B., 675-pound wheel with plates less than one inch thick. A crack starting in the throat of the flange, if it ever did start, would be much less likely ever to reach *Y*. The rim, or outer edge of the tread also, would be less liable to be broken off, or "stripped". Heat developed in the tread by brake-friction would be absorbed by a much heavier tread, and would be conducted away more rapidly by the two plates, which are heavier. The smaller stresses due to the smaller temperature difference, would be better resisted by the two heavy, straight plates than by the lighter, more curved plates, in which is produced a bending or tearing stress.

Summarizing the above and other advantages claimed, we may say:

(1) Shape of tread and supporting plates; much less danger of stripped flanges or stripped rims.

(2) Straight plates; metal disposed for useful strength; no cracked plates or broken wheels.

(3) No brackets on back of wheel to interfere with evenness of chill.

(4) No pockets; simplified moulding and cleaning. A wheel foundry foreman, when consulted, did not anticipate any trouble in producing this wheel. With an adapted flask, the mould might be "swept" without a pattern.

(5) Plenty of room for names, numbers, dates, etc.; also plenty of room for chaplets and core legs.

(6) Probably more effective dissipation of brake-heating due to air circulation through the two sets of core-leg holes, induced by the rotation of the wheel.

To shorten a long story , the proposed wheel has never been tried, even to see how it would behave in the foundry and inspection room.

Other examples could be cited to show the prevalence of bad designing as a cause of service failures. For instance, in phonograph and other large spring motors, a moment's consideration will show that the spring thickness, the hub size, and the shape of and method of fastening the ends must be such that in the change from the loose to the fully wound position, or vice versa, the elastic limit of the material will not be approached too closely. But phonograph springs persistently break,

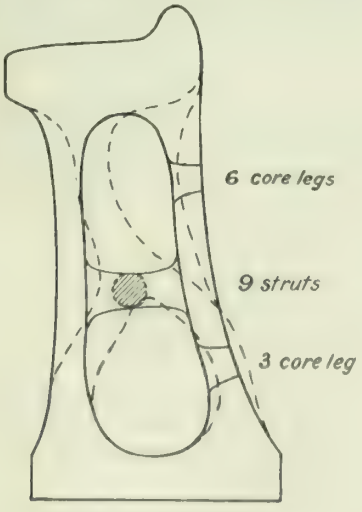

Figure No. 4. Design for Chilled Cast Iron Wheels.

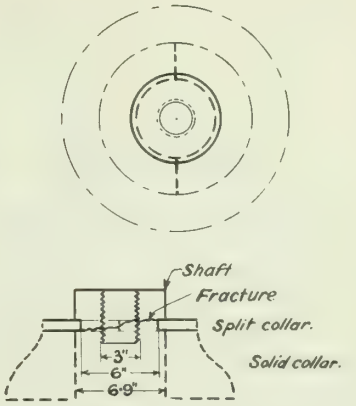

Figure No. 5. Sketch of broken Generator Shaft.

and examination shows that these conditions have not been fulfilled.

Unsuitable or Bad Material Resulting in Failures

Let us now consider the case of failures due to unsuitable material, such as mild steel used where medium hard steel should be used, or to material in unsuitable condition such as cast steel, unannealed. Material in unsuitable condition may be considered as bad material, so that unsuitable material and bad material, as causes of failure, merge into each other. Also, as stated previously, failures are generally due to a combination of contributing causes. We might therefore consider a few important service failures in detail and see what were the contributing causes.

Case No. 1:- Failure of Vertical Turbine-Generator Shaft

This was a shaft from a vertical turbine-generator set weighing thirty tons and having the thrust bearing at the top. The bearing consisted of a heavy solid collar fitting the shaft and receiving the thrust through a two-piece lighter collar bolted to it and fitting in a groove near the end of the shaft.(see figure No. 5). In the end of the shaft was a three-inch hole threaded for an eye and extending below the groove. Failure took place by the end pulling off the shaft. The fracture started at the upper corner of the groove and extended most of

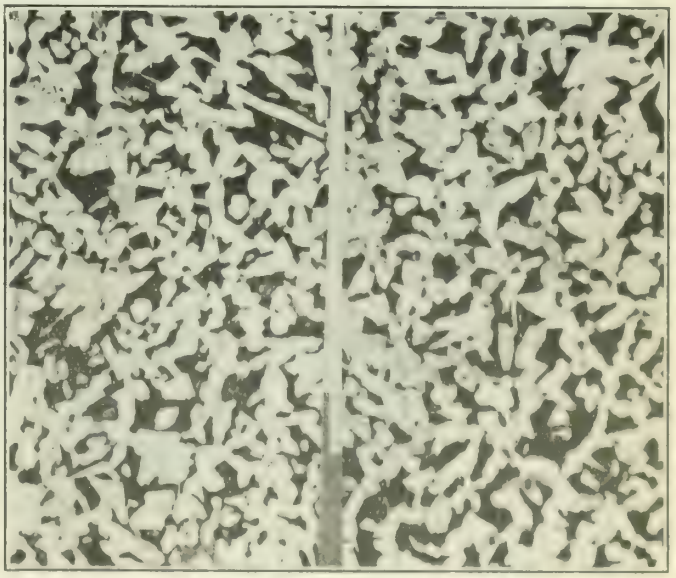

Figure No. 6. Figure No. 7.

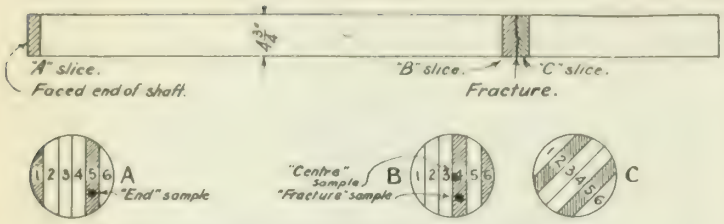

Figure 9.—Sketch of broken Crane Trolley Shaft
(Shaded strips were received for examination).

the way around, and down to a point including the lower corner of the groove. The fracture appeared moderately fine-grained and showed silkiness, indicating ductility in the metal, over the area last to part, namely the downward extending point. The rim bearing on the collar was polished by vibration and showed very decided fin- at the dividing line of the split collar. The relative motion of the shaft and the split collar (not rotational, of course, but a rocking motion) was also shown by the flow-fin all around the outside corner of the rim. This indicated poor fitting, or operation with the split collar loose on the solid collar. The fin did not have the appears ance of having been produced at the moment of failure.

tranverse hardness, 137. These figures correspond approximately to an ultimate tensile strength of 71,000 pounds per square inch, which agrees with the chemical analysis and microstructure of the steel.

The chemical analysis, which was; carbon, 0.34 per per cent, manganese, 0.53 per cent, phosphorus, 0.016 per cent, sulphur, 0.040 per cent indicates good quality basic open hearth steel, but a steel below the accepted lower limit of strength for material for this purpose.

A microscopic examination showed the steel to be reasonably fine-grained, sound and clean, but it also showed the heat-treatment, or lack of it to be quite unsuited to produce the required physical properties and more especially the required "notch toughness". Figure No. 6 is a radial section of the rim, that is near the starting point of the crack. Figure No. 7 is a tranverse section from the downward projecting point, that is near the lower corner of the groove. Both photomicrographs show the steel, after polishing and etching with nitric acid, at a magnification of seventy-five (75) diameters. Both photographs show sharply defined areas of pearlite (the iron-iron carbide eutectoid), and crystals of ferrite, (pure iron) corresponding to a steel of the composition

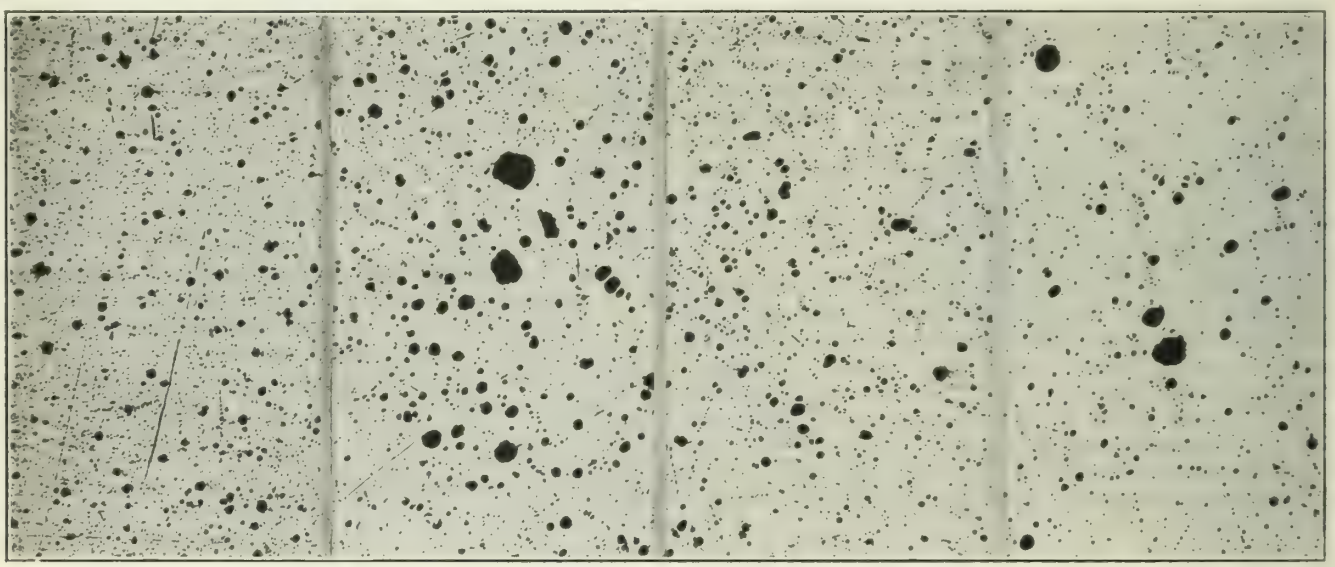

Figure No. 9.—A5S1. Figure No. 10.—C5S1. Figure No. 11.—A5C1. Figure No. 12.—C5C1.

It is believed the design would have been improved at this point by making the split collar considerably thicker, as this would stiffen it, allow for fillets at the corners, and increase the resilience of the neck of the shaft. The absence of noticeable fillets in the corners of the groove in the shaft was apparently the worst defect in the design. Another serious mistake in the design was the boring and threading of the three-inch hole in the end of the shaft down to a point below the groove, giving a two-fold "notch effect". This could have been avoided by lengthening the shaft and keeping the bottom of the hole well above the level of the groove. The inadequacy of the design was very pronounced, as the failure took place comparatively soon after the crack started to form. This was shown by the slight amount of polishing in the fracture. It was not a typical, slow-growth "fracture in detail", and it is questionable if the best of material would have been able to last indefinitely.

Brinell hardness tests were made at four points with the following results:— Longitudinal hardness, 143;

given above when slowly cooled from a moderate temperature. The pearlite, while not typically laminated, as in slow cooling from a high temperature, is distinctly lamellar. In places the so-called Widmanstatten, or ladder-like, structure is apparent.

Conclusions:—Causes of failure.

(1) Bad mechanical design.
(2) Unsuitable grade of steel.
(3) Unsuitable heat treatment.

Remedies:—

(1) Thicken the split collar and provide the groove in the shaft with generous fillets. Extend the shaft and remove the effect of the threaded hole in the end.
(2) Use steel suitable for heat-treated forgings, having a carbon content from 0.40 to 0.55 per cent, and the other constituents about the same as in the present steel.
(3) Heat-treat the shaft by oil-quenching and tempering, to produce fine-grained, sorbitic pearlite

and a minimum of excess ferrite. It would then have a tensile strength of about 85,000 pounds per square inch, with a proportionally higher elastic limit and a much higher "notch toughness".

Case No. 2:- Failure of Crane Trolley Shaft

This was a shaft from a crane trolley, that failed in service, dropping a ladle of molten copper matte, and causing the death of one or more men. Figure No. 8 shows the approximate position of the break and of the slices cut from the shaft for investigation; the shaded strips only were received for examination. The samples showed that failure resulted from "fracture in detail", that is by the slow development of an initial crack, at or near the surface of the shaft, and probably originating at a mechanical flaw in the surface, or at an internal defect in the metal near the surface. Only a third of the fracture faces, (that is two strips out of each six), was received, but the indications were that the fracture in detail included more than half the cross-sectional area of the shaft before final failure took place.

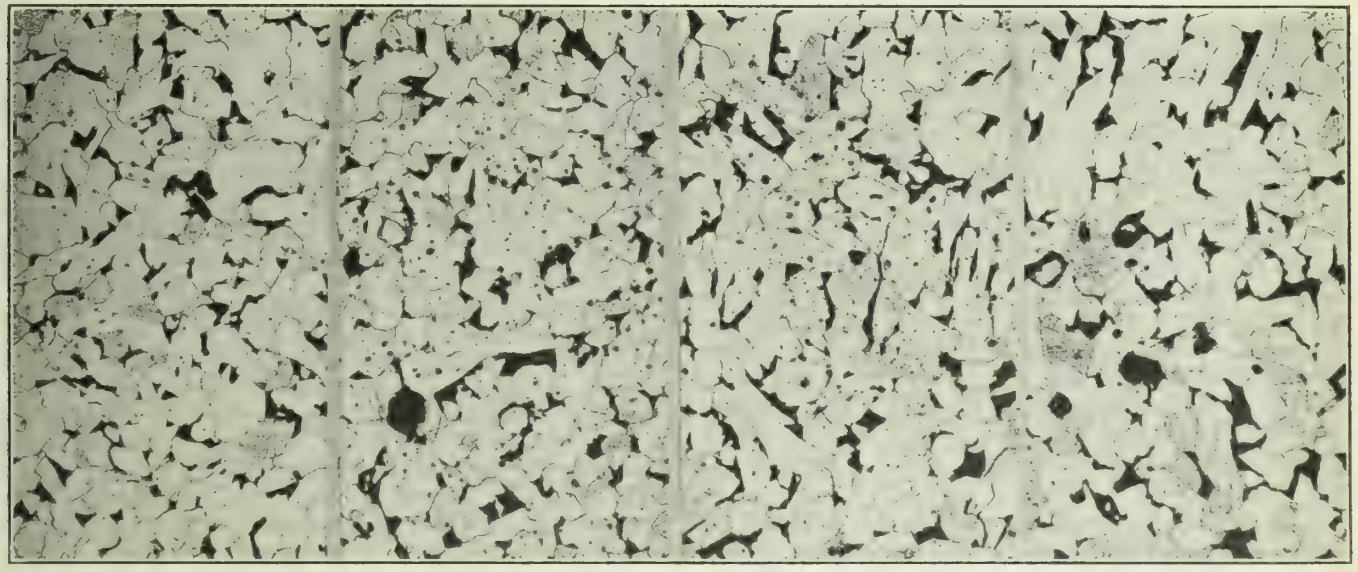

Figure No. 13.—A5S2. Figure No. 14.—C5S2. Figure No. 15.—A5C2. Figure No. 16.—C5C2.

Chemical examination:—Drilling were taken from strips *A-5* and *B-4* at the positions shown and were analyzed with the following results:

	A-5 End End of shaft.	*B-4 Centre* Axis of shaft at fracture.	*B-4 Fracture* Middle of radius at fracture.
Carbon.....	0.125 per cent	0.110 per cent	0.120 per cent
Manganese.....	—	—	0.060 per cent
Sulphur.....	—	—	0.067 per cent
Phosphorus.....	0.148 per cent	0.122 per cent	0.147 per cent
Silicon.....	—	—	0.040 per cent

Etching of strip *C-5* showed that the metal was steel, not wrought iron, and for steel this analysis indicates very low grade material. Probably the steel was made by the acid Bessemer process. The phosphorous is double what might be allowed; the manganese is only one-tenth of the desirable content; in view of the low manganese the sulphur is high; the silicon is low, and finally, the carbon shows that the steel is not even of the suitable grade for the purpose. Steel for axles and shafting should contain 0.30 to 0.50 per cent carbon.

Metallographic examination:—Strip *C-5* was surfaced and deeply etched for macroscopic examination. As stated above it showed the material to be steel, not wrought iron as was first suggested by the analysis. The metal was medium grained and uniform in structure, except that near the surface and to a depth of about ¼ inch it was more porous, due to surface blowholes in the ingot. Small sections from the centre, (marked *C*), and the surface (marked *S*), of the shaft were cut from strips *C-5* near the fracture, and from *A-5* at the faced end of the shaft, and were prepared for microscopic examination.

Photomicrographs *A-5-S-1* and *C-5-S-1* (figures Nos. 9 and 10) show the appearance of the polished specimens cut from the surface of the shaft, at a magnification of seventy-five (75) diameters. It will be noticed that the *C* sample, a cross-section near the fracture, appears more porous than the *A* sample, taken from the end of the shaft, and it may have been nearer the upper and more porous end of the original ingot. Photomicrographs *A-5-C-1* and *C-5-C-1* (figures Nos. 11 and 12), are corresponding views of cross-sections cut from near the centre of the shaft. While the metal is sounder than at the surface. the sample from *C* is again more porous than that from *A* and the same explanation applies. All photographs show the metal to be extremely porous. Photomicrographs *A-5-S-2*, *C-5-S-2*, *A-5-C-2*, and *C-5-C-2* (figures Nos. 13, 14, 15, and 16,) are views of the same cross-sectional specimens, etched with dilute nitric acid and photographed at a magnification of seventy-five (75) diameters. They all show the typical appearance of steel of about 0.12 per cent carbon, cooled normally from a reasonable rolling temperature. The bulk of the metal is ferrite, or iron, containing dissolved phosphorus, etc., with intercrystalline areas of pearlite. The *S* photographs were taken at about ⅛ inch from the surface. There is practically no difference between the *A*, (end of

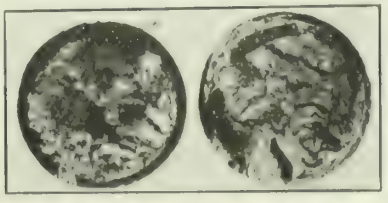

Figure No. 17.—Fracture-face .X 1¼

Figure No. 18.—Section deeply etched .X 1¼.

Figure No. 19.—Sketch showing position of photomicrographs.

shaft), and *C* (fracture) sections, which was one of the points on which informa tion was asked by those for whom the investigation was made. The *centre* photographs show a slightly coarser grain than the *surface*, as would be expected, due to the lower temperature of the outside of the bar when the rolling operation finished.

Conclusions: (1) The shaft seems to have been of ample proportions, judging from the extent to which the fracture in detail had progressed before final failure took place.

(2) There was no appreciable difference in the metal at positions *A* and *C* in the shaft, except a slightly greater porosity at *C* due possibly to the fracture being nearer the top end of the bar, that is originating from the top end of the ingot. There had been no crystallization, or growth of crystal-size of the metal under stress. The idea has often been advanced that the crystalline grains of steel under stress, especially alternating tensile and compressive stresses such as occur in shafts, grow in size, causing the steel to become brittle or weak. This idea, which is now known to be incorrect, has probably arisen because, other things being equal, steel in which a coarse grain was produced by overheating in the original manufacture is more brittle and fails oftener than properly manufactured steel of normal grain size.

(3) The steel was not of the proper grade for the purpose, being much too soft and weak. Also, it has been found that steel of this grade, (0.10 to 0.15 per cent carbon), does not machine as well as steel with, say, 0.25 per cent carbon or over, apparently due to the small, isolated, hard particles of pearlite sticking on the edge of the tool and tearing through the soft ferrite. Tears such as these, linking up the blowholes, would constitute the mechanical flaws referred to above as starting points for a fracture.

(4) The metal was not of good quality, apart from the suitability of the grade. It was very impure, especially with respect to the phosphorous, and is porous all through.

It was very porous near the surface of the shaft due to surface porosity of the original ingot. This would encourage the start and growth of a fracture in detail, such as caused the failure.

Recommendations: In addition to careful design and the use of proper materials, there should be a periodic inspection of vital parts of machinery, such as this shaft. Fractures in detail are quite common; they take considerable time to grow, and they may be easily seen if they are made accessible. They occur at the points of maximum bending in shafts and axles, at the fillets in journals and crank-pins, and at other points of reversing stress in machine and structural members.

Case No. 3:- Failure of Wrought Iron Anchor Bolt of Stiff-leg Derrick.

This was a wrought iron bolt, one of the bolts anchoring a stiff-leg derrick, which broke, dropping the boom and killing two men. The report of the accident described the derrick as having a forty-five (45) foot boom. The boom fell while holding a two-ton dimension stone over a waggon. It was not stated at what radius the boom was working at the time of the accident, but presumably it was low down, putting a maximum load on the anchor-bolt, as the boom must have fallen suddenly on the men that were killed. Presumably, also, the boom was nearly in the plane of the mast and the stiff-leg that was released by the breaking of the bolt. The bolt was described as passing up through the foundation sill from the lower side, and as having the nut on the upper side of the goose-neck on the foot of the leg. The bolt broke off just under the nut.

The bolt was actually $1\frac{13}{16}$ inches diameter. It was threaded with a "V" thread, pitched five per inch, and having a diameter at the root of only $1\frac{13}{32}$ inches. There is no doubt that Whitworth thread would be better for a critical position like this, so that here again we have faulty design entering in as a contributing factor. The "V" thread cuts down the effective diameter of the bolt appreciably more, and, which is more important, its sharp groove assists the starting of a crack, or sudden failure under an impact load. The appearance of the fracture of the failed bolt, (figure No. 17), suggested that it was a case of the latter, sudden failure under impact load, in the present instance. There was no sign of a flaw or crack, except a very small triangular area, at the surface, in the crystalline part of the fracture, which was probably merely accidental dirt. Failure apparently started at the root of the thread on the side of the bolt nearest the mast, where the goose-neck, pulling eccentric-

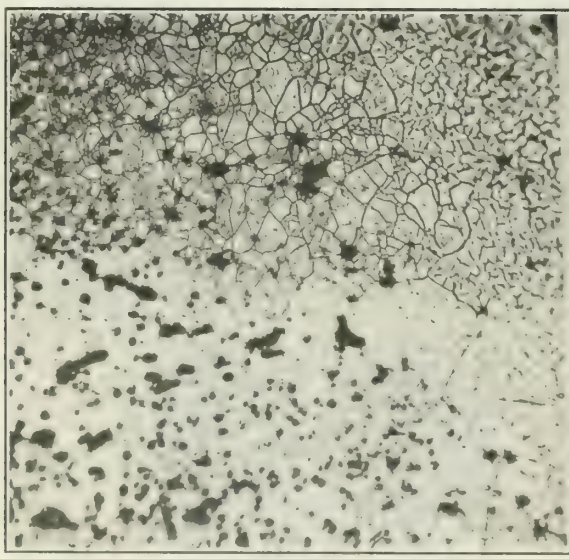

Figure No. 20.—3A.

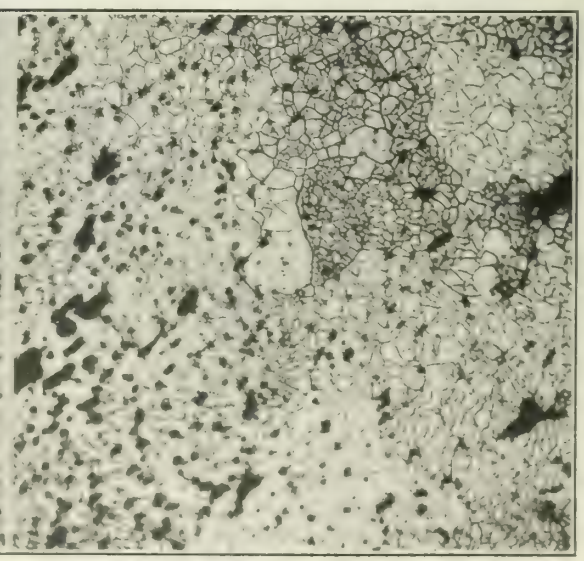

Figure No. 21.—3B.

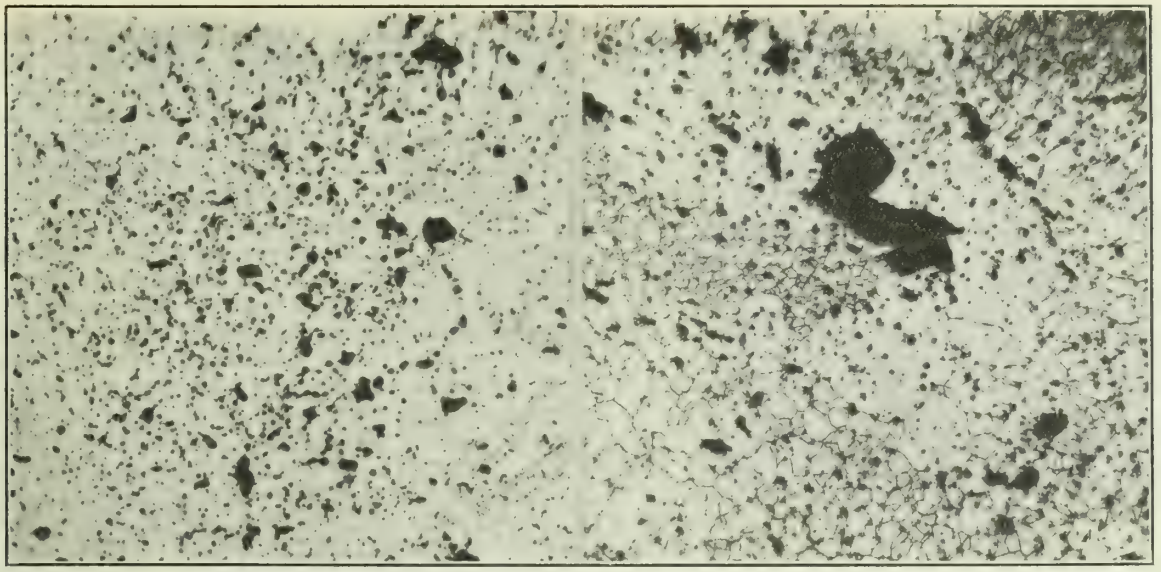

Figure No. 22.—4C.

Figure No. 23.—4D.

ally, caused a locally intensified stress. A sudden overload resulted in the crystalline fracture, after which the remainder of the bolt quickly failed with a silky or fibrous fracture. The silken-sided fibres to the right of the crystalline area,(figure No. 17), agree with this explanation. It seems very probable that the bolt was greatly overloaded immediately before the accident, by lowering the boom until the stone was over the waggon and then stopping it with a jerk.

A complete cross-section was made 1¾ inch above the fracture. It was roughly polished, deeply etched in dilute sulphuric acid and photographed at a magnification of one and one-quarter. (see figure No. 18). This shows clearly the structure of a low-grade wrought iron, made by faggotting a variety of scrap. The boundaries of some of the areas showing in the etched section may be identified in the fracture face by deep cracks. Just in front of the centre of the etched section may be seen a slag patch about ⅛ inch square. The crystalline part of the fracture is represented by two different, comparatively uniform areas of the etched section in the corresponding position (left front quarter,) while the typically fibrous, silky, and partly silken-sided fracture in the right front quarter is represented by a much mixed area in the etched section. Sections from these two parts of the bolt, half an inch above the fracture face, (and therefore 1¼ inch below the etched full-section), were prepared by polishing and etching in picric acid, and were examined under the microscope, but no difference was found sufficient to account for the difference in the fracture face. As stated above, it is believed the crystalline area of the fracture was produced by sudden failure under an impact load.

Photomicrographs at a magnification of seventy-five (75) diameters, with normal illumination, were taken at several positions as indicated and numbered in the sketch, (figure No. 19). . The microscopic study of wrought iron, especially inferior imitation wrought iron like this sample, is always a facinating piece of work. An endless variety of appearances is to be found. In the present case eight microsections or fields of view, were photographed, as the specimen presented unusual features which the writer hopes to investigate more fully some day. For present purposes it will suffice to say that, as stated above, the microscopic examination showed this bolt to have been made from a very low grade imitation wrought iron, made by faggotting a variety of scrap, heating the faggot to a welding temperature and hammering and rolling it into a bar. Figure No. 25 shows a cross—and longitudinal-section, respectively, of typical genuine wrought iron for purposes of comparison.

An analysis of mixed drillings from five ⅜-inch holes in the front half of the section showed the phosphorus to be 0.31 per cent which is extremely high.

Conclusions: (1) The bolt was a very poor grade of so-called wrought iron.

Wrought iron is a standard material for certain parts, like this bolt, which are subjected to shock, but only the best puddled iron should be used; and it is now believed that properly oil-toughtened and tempered steel of about 0.40 per cent carbon is superior.

(2) The unnecessarily sharp "V" thread cut in the bolt increased its liability to failure.

(3) It seems probable that the bolt was subjected to a heavy impact load at the time of the acci-

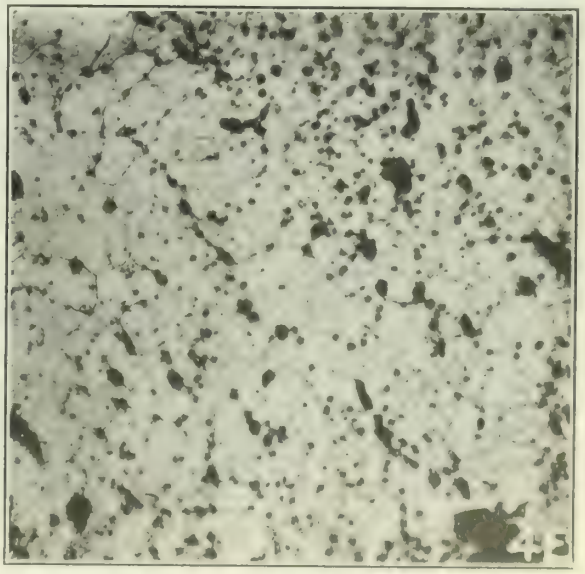

Figure No. 24.—4E.

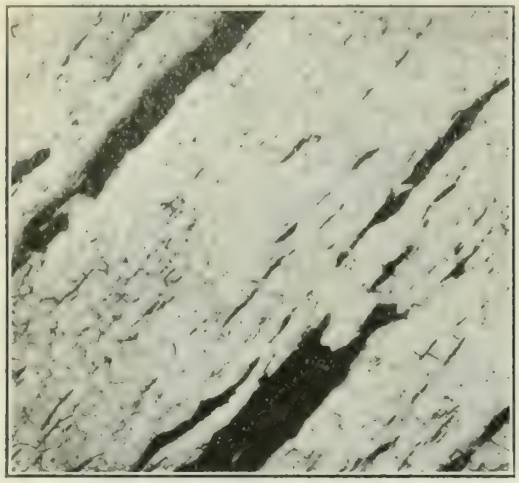

Figure No. 25.

dent, by the boom being lowered and stopped with a jerk.

Thus we have in this case a combination of bad material, faulty design and possibly abuse.

Case No. 4:—Failure of Large Cast Iron Cylinders for Drying Rolls of Paper Machine

This deals with some very large cast iron cylinders, intended for drying drums of paper-making machines, that developed cracks during machining. These castings were hollow cylinders 72 inches in diameter by 166 inches long by 2 3/8 inches thick, open at both ends, and plain, except for an internal rim near each end. They were cast vertically in moulds with brick cores and were allowed to cool twenty-four hours in the mould before being "shaken out." After being machined inside and outside they were tested under low steam pressure. During the test, certain dryers were found to have longitudinal cracks about two feet long, running from about the middle toward the end. Two specimens, cut from defective castings, were received for metallographic examination. Samples for microscopic analysis were cut from the interior of the metal. It was not believed that the failures were due to local defects such as occur in seamy rolled material, or in complicated castings, so the samples were cut at a short distance from fractures in order to show the normal structure of the metal.

The two specimens were very similar. Photomicrograph figure No. 26, shows one polished and photographed under normal illumination at a magnification of seventy-five diameters. It is seen to have a large amount of graphitic carbon in very large flakes. This corresponds to the coarse, black fracture of the metal as seen by the naked eye. Photomicrograph figure No. 27 shows the other sample etched in picric acid and photographed under normal illumination at a magnification of seventy-five diameters. This photograph shows the graphite to be imbedded in a matrix of pearlite, (equivalent to 0.9 per cent carbon steel), with rather large areas of excess cementite, (iron carbide). From this appearance we would judge the combined carbon to be very high, probably over one per cent. The graphite is of course, very weakening, and at the same time the high combined carbon causes the metal to be hard from a machining standpoint, and its brittleness adds to the weakness caused by the graphite. We would say that the total carbon content of the metal was much too high, and that the cupola mixture should have contained more steel scrap or hard cast iron scrap of good quality, such as chilled iron car wheels, in place of some of the pig iron. A heavy casting such as this dryer should not require extremely hot metal and a excess of coke in the cupola charge should be avoided. From the description of the conditions received we are inclined to believe the cracking took place in the mould, due to the weakness of the metal and the rigidity of the core. It is understood that the information and recommendations in the report on these castings solved the problem, and although our information in regard to the case is incomplete, it seems to be a good example of how a metallographic examination often may go immediately to the root of the trouble.

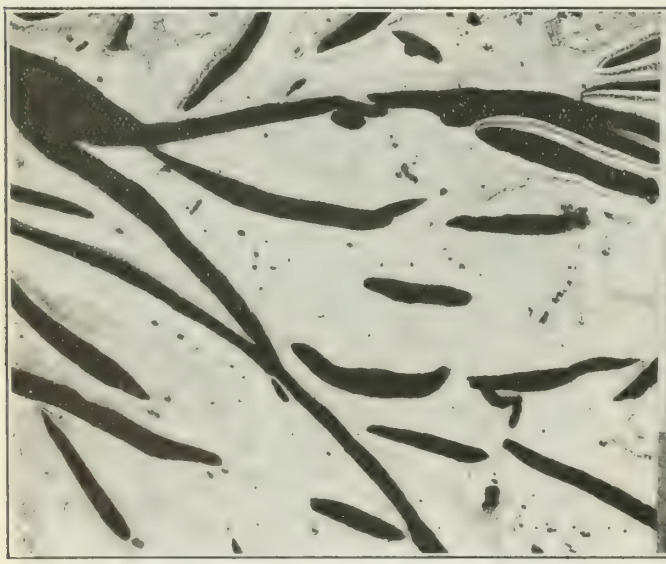

Figure No. 26.—2A.

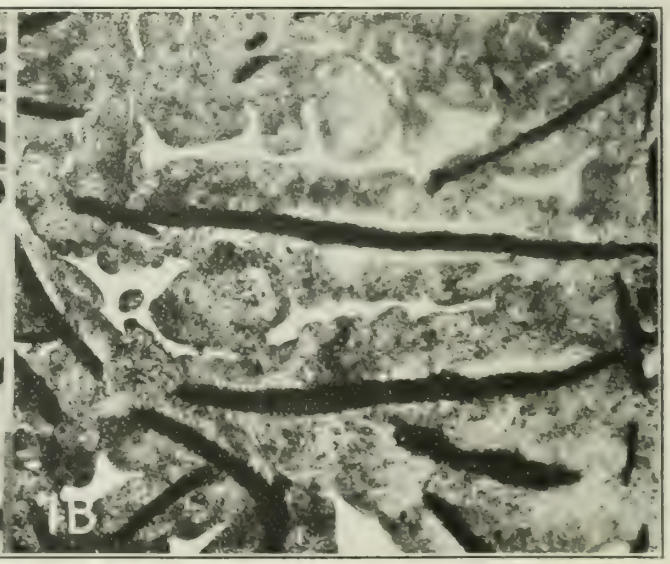

Figure No. 27.—1B.

A Method of Calculating a Fair Rate for the Transportation of Western Coal

An Attempt to Show a Method of Calculating a Fair Rate for the Transportation of Coal in Train-load Lots from Alberta to Ontario points, with Suggestions for a Suitable Equipment to Handle Such Traffic

M. J. Butler, C.M.G., M.E.I.C.,
Past-President, The Engineering Institute of Canada.

Paper read before the Toronto Branch, The Engineering Institute of Canada, November 8th, 1923.

Is it possible to allocate to freight service, the costs per train-mile, as distinguished from passenger service? Professor William Z. Ripley in Railroads Rates and Regulations, 1923, page 70, states:

"So many expenditures are incurred indiscriminately on behalf of the service as a whole, being an indispensable condition for operation of the property at all, that no logical distinction of expenses, even as between passenger and freight traffic is possible."

If this is true and it is usually accepted by authorities, how then are we to say just what rate of freight will prove to be profitable? It seems to show that there is a way whereby we may fairly estimate, that if we succeed in earning, on a new business the *average train-mile earnings* we shall at least have a rational basis to work with. There is one measure of effective operation and that is to concentrate in the train load the maximum number of tons, the physical character of the railroad will carry, to provide locomotives powerful enough to haul the heaviest trains, to provide cars of large capacity so as to keep down the dead load to a minimum and run all such trains solid from division point to division point, allocating the engines and cars exclusively to the special business. To quote from Professor Ripley, page 88:

"The train load is generally adopted to-day as the unit of operation, measuring the cost of the service. It is a fact that, within certain limits, the cost of handling a train does not vary greatly with its capacity... Eaton, in his Railroad Operations, concludes that from 30 to 50 per cent of cost is independent of the train load. The effect is that any increment in the paying load very materially decreases the cost of operation per ton."

Potential Long Haul Traffic

We have in the Canadian National Railways a great system, with, at present, insufficient traffic offering to adequately meet the enormous fixed charges. Yet in the province of Alberta there are very large fields of high class coal and in the province of Ontario a market for a very large business: the ideal long haul, that will justify a special equipment, and enable a steady uniform flow of heavy tonnage.

To quote from Professor Ripley under somewhat similar conditions, a rate must be named that will secure the business, "And one comfort may be uncovered in so doing. The lowered rate may so stimulate new business and enlarge the volume of traffic, that it may be handled at much lower cost. In fact, this consideration alone in absence of all competition may induce a lowering of rates at certain points out of line with the general schedule. This incentive, conditioned by the fact of increasing returns, is always in the background. The destiny of many places is manifested in terms beyond the control of the carrier. Soil may be poor, climate or population adverse to progress, but some particular places enjoy peculiar advantages for growth. Not to stimulate new business at these points where traffic might be cultivated, even without rivals in the field, is little better than allowing it to escape over a competitors line of rails, were they present.

"Density of traffic, page 85, so indisputably has this law that an expanding volume of business up to a certain point may profitably be carried at a continuously lowered cost, been proved, that it is estimated, by so competent an authority as the Engineering Review, that provided sufficient tonnage be available for 2,000-ton freight train loads a cost of one mill per ton-mile can be attained.

"This, of course, does not imply that any railroad in actual operation, carrying all kinds of freight including a large proportion of local traffic can in the immediate future hope to attain this result. It is intended only to show that, provided the volume of traffic be large enough, the cost of operation tends to decline as a matter of course, until a congestion for the existing plants has been reached. At this point a new cycle of costs of operations and profits makes its appearance. There is in effect, but one principle that actuates traffic officers in naming a rate, and that is, *what will the traffic bear?*"

The rates quoted by the traffic manager of the Canadian National Railways, Mr. Dalrymple, are prohibitory and evidently were made with the purpose of prohibiting bringing Alberta coal to Ontario points, the temporary rates named by Sir Henry Thornton, while reasonable from the experimental standpoint, with the inadequate equipment in use, will not be profitable to the railway.

Necessary Equipment

It would seem to be the part of wisdom to learn what is being done elsewhere in the way of equipment provided, where, the conditions are sufficiently parallel, i.e., a larger steady low grade traffic to be moved from point of production, the mines, to the point of shipment, on the lakes or seaboard.

The Great Northern Railroad owns 69 Mallet locomotives. Locomotive No. 2,022 handled a 16,000-ton train of ore over a 114-mile division in six hours forty-five minutes; grades 0.4 per cent and one grade of 0.6 per cent. The Chesapeake and Ohio, the Norfolk and Western and the Illinois Central Railroad coal roads, are well equipped with Mallet-type locomotives, steel coal cars of 50, 75, 80, 100, and 120-ton capacity. The Virginian Railway Company, a coal road, in 1920, operating 523.57 miles of road, hauled 100 and 120-ton cars of coal from Princeton, West Virginia, to Roanoke, Virginia. The standard train is 8,500 tons of mixed cars, but the grades, with the locomotives owned, can handle 15,000 tons when sufficient empty and load brakes are available to get them down a 1.5 per cent grade. They have fourteen miles

of 0.6 per cent grades against the loaded movement over the Allegheny mountains. The maximum grade, other than this, in the direction of loaded traffic is 0.2 per cent. They have two sections of 1.5 per cent grade, one eight miles in length, and one eleven miles in length in the direction of the emply movements. Rolling stock owned to handle the freight consists of the following:

Consolidation,	2-8	tractive power,	29,400 lb. each	8
Mikado, M.A.,	2-8-2	tractive power,	45,200 lb. each	6
Mikado, M.B.,	2-8-2	tractive power,	56,000 lb. each	42
Mikado, M.C.,	2-8-2	tractive power,	60,800 lb. each	18
Mallet, A.A.,	2-6-6	tractive power,	70,800 lb. each	4
Mallet, A.C.,	2-6-6	tractive power,	90,000 lb. each	8
Mallet, A.B.,	2-8-8-2	tractive power,	97,400 lb. each	1
Mallet, A.D.,	2-8-8-2	tractive power,	115,000 lb. each	6
Mallet, U.S.,	2-8-8-2	tractive power,	101,250 lb. each	20
Mallet, A.E.,	2-10-10-2	tractive power,	147,200 lb. each	10
Triplex,	2-8-8-8-4	tractive power,	166,300 lb. each	1

Cars in freight service are as follows:

Box, capacity	80,000 lb.	536	
Stock, capacity	80,000 lb.	848	
Flat, capacity	80,000 lb.	186	
Flat bottom gondolas	218,000 lb.		574
Flat bottom gondolas	105,000 lb.		2,985
Hopper coal	100,000 lb.		148
Hopper steel coal	105,000 lb.		2,176
Hopper steel coal	110,000 lb.		999
Flat bottom steel coal	110,000 lb.		993
Total			7,875

Capacity, December 31, 1920, 512,330 tons.

The quantity of coal handled in the year was:

Anthracite, 9,686 tons.
Bituminous, 7,145,731 tons.

Mileage of loaded freight cars north and east	53,126,394
Mileage of loaded freight cars south and west	2,583,540
Mileage of empty freight cars north and east	415,944
Mileage of empty freight cars south and west	50,895,227

This shows a practically one-way load with returned empties.

The approximate distance from Alberta coal fields to Toronto, all rail is 2,500 miles, according to the evidence of Mr. Mallory given before the House of Commons Committee. The average length of division on the National Railways is 137.5 miles. Good practice shows that solid through trains may be safely run through two divisions per day, or 275 miles at an average speed of fifteen miles per hour, changing crews only at divisional points. The time the train is in motion is say, eighteen hours; number of divisions, sixteen; total time requisited for such a train one hundred and forty-four hours. Twelve hours may be added for incidentals, making one hundred and fifty-six hours from coal spur to a Toronto yard.

To start with, two trains per day would be the minimum business that would fairly test out the possibility of a profitable business. What equipment would be required for a service of two trains per day? With sixteen divisions to cover, two trains per day, sixty-four locomotives would be required. As locomotives must be shopped for repairs from time to time an addition must be made of say six, making seventy locomotives to be provided of the 2-8-8-2-class with a tractive power of 101,250 pounds each. Allowing sixteen pounds per ton to cover resistance of train load, this type of engine would handle a gross train load of 6,300 tons. If seventy-five ton coal cars are used, the dead weight of the car is 32.5 tons and the weight of car loaded is 107.5 tons each, or a train of fifty-eight cars, with a tonnage of 4,350 tons of coal.

Haulage Costs

The gross earnings per train-mile necessary to be had in order that the business may be profitable to the railway should be about five dollars per train-mile, hence we get, allowing 5,000 train-miles per 4,350 tons of coal, an average price or cost of $5.75 per ton.

If, however, the railway company seeks to carry on this business using the Mikado type locomotives with an average tractive power of 60,800 lb. and with fifty-ton coal cars, the gross weight of the train would be 3,800 tons, or say fifty-three cars, and 2,650 tons of coal, and the cost would be, on the same basis, $9.43 per ton.

Cost of Equipment

It will be necessary to provide, to handle two trains per day using seventy-five-ton cars, the following:

2,000 cars at a cost of $4,000 each, or	$ 8,000,000
64/2-8-8-2 Mallet locomotives at $90,000 each	$ 5,760,000
Total equipment	$13,760,000

The necessary vans, it is assumed, are already available.

A total of 8,700 tons of coal per day would be delivered in the Toronto district and not less than three hundred days per year would be devoted to it, thus bringing forward 2,610,000 tons of coal. Needless to remark, the coal to bear so heavy a transportation charge must be of the best quality and compare favourably with the best anthracite coal on the market, and the price at the mines f.o.b. cars, must be on an economical basis, comparable with Pennsylvania mining costs.

The hauling capacity of this type of Mallet locomotive west-bound, allowing resistance of twenty pounds per ton would be 5,000 tons; the weight of the returning empties would be about 1,900 tons. It would therefore be practicable to add a considerable number of loaded cars to the extent of limiting length of train that could be safely handled through the passing tracks, yards, etc., thereby reducing the cost per ton of coal by the amount thus earned.

Discussion

R. A. C. Henry, M.E.I.C.,
Director, Bureau of Economics, C.N.R., Montreal.

The speaker of the evening, Mr. M. J. Butler, was deputy minister and chief engineer of the Department of Railways and Canals for some years. I did not have the honour of being an employee of that department during Mr. Butler's tenure of office, but was associated with that department for a period of over eleven years.

Mr. Butler in his paper, which is entitled "A Method of Calculating a Fair Rate for the Transportation of Western Coal", has touched upon one phase of a very important question, namely, the utilization of Alberta coal in the acute coal area of the province of Ontario. This subject has held considerable prominence in the public mind for the last two or three years.

Transportation is undoubtedly quite a considerable factor in this problem. I think it quite in order that the matter should be carefully and fully gone into by *The Engineering Institute of Canada* and, as you all know, it is now receiving the very serious attention of *The Institute*, a fuel committee having been appointed a year or more ago for the specific purpose of dealing with this question in a comprehensive manner.

I take it to be the desire of the speaker of the evening and of *The Engineering Institute* as a whole that any suggestion which has been put forward in the paper as to any method for calculating a fair rate to be charged

for the transportation of coal, under the conditions named, should be very carefully analyzed as to its practicability and subjected to the acid test, so to speak, before receiving support.

Mr. Butler suggests a method of calculating a fair rate for the transportation of coal for domestic purposes from Alberta to the acute fuel area and arrives at a conclusion, based upon certain assumptions, that $5.75 per ton for the railway haul from Alberta to Toronto would be a remunerative rate for the service performed by the railways.

Some of these assumptions are cited below:

(1) That the average receipts per freight train mile is a fair rate when applied to any specific train mile.

(2) That a uniform movement could be maintained throughout ten months of the year.

(3) That there is no difference in train loading on different Divisions by reason of variations in ruling grades.

(4) That open top car equipment can be used.

(5) That no additional expense would be required for increased facilities to take care of the special equipment used.

(6) That the coal cars could be kept in a sort of shuttle movement with practically no delays in loading and distribution at Ontario centres.

With respect to the first point, based upon a statement appearing in a treatise by Professor Ripley that the average receipts per freight train mile would be a proper basis for determining what would be a fair and reasonable rate to be applied for transportation of coal from Alberta to points in Ontario, I am rather inclined to think that even Professor Ripley himself would hesitate to apply that line of reasoning in case of a specific train which was known to be of disproportionate dimensions when compared with the average train.

Take as an example the year 1922, the average gross tonnage per train on the undermentioned railways was as follows:

Canadian National Railways	1,170
Canadian Pacific Rly. (approx.)	1,285
Norfolk and Western Rly	2,136
Virginian Railway	3,244

Whereas the gross tonnage of the hypothetical train chosen by Mr. Butler is 6,300 tons, or nearly six times the average size of the Canadian National trains for the year 1922 and twice the size of the average train on the Virginian Railroad.

The average earnings per train mile on the following railways, for 1922, was as follows:

Canadian National Railways	$ 4.88
Canadian Pacific Railway	5.41
Norfolk and Western Rly	7.90
Virginian Railway	(figures not to hand)

Take as a simple illustration the very important question of interest and depreciation charges.

On an average Canadian National train; that is a train with a gross tonnage of 1,170 tons, the interest and depreciation would amount to $1.05 per train mile.

Taking one of the large trains used in the handling of grain from Winnipeg to Port Arthur the interest and depreciation would amount to $1.75 per train mile.

Whereas the interest and depreciation on the hypothetical train to which Mr. Butler refers would be $2.66 per train mile.

So that in the cost of the average train mile on the Canadian National System for 1922 and the train mile which Mr. Butler used in his illustration there would be a difference of $1.60 per train mile.

With regard to the second point — that a uniform movement could be maintained throughout ten months of the year, this condition, which everybody knows, is entirely dependent upon commercial conditions. It is all very well to theorize as to what can be done provided a regular daily movement of traffic can be maintained, but the fact remains that the traffic does not move regularly; it is subject to seasonal variations and before a regular movement could be established it would be necessary to change the commercial conditions. It is quite apparent that it would be a rather serious condition to have a substantial movement of coal from Alberta to Ontario points occur at the same time as the maximum movement of grain from the prairies to the head of the lakes, and this is likely to be one of the conditions with which the railways would be faced by reason of commercial considerations.

Furthermore, even assuming that the performance which Mr. Butler suggest could in other respects be maintained, the equipment necessary to bring down, in a period of five months, the quantity of coal which could be brought down on a regular daily schedule over a period of ten months, would require double the equipment, probably lying idle for the balance of the year, thereby doubling the fixed charge.

With regard to the third point, in the hypothetical train which Mr. Butler adopted, he did not take into account any variations in the size of the train by reason of difference in train loading. A rough calculation would indicate that, due to this feature alone, assuming all other conditions the same as Mr. Butler assumed, it would require an additional 800 cars to be added to the 2,000 suggested, thereby largely increasing the investment.

With regard to the fourth point, that open top car equipment can be used, a great many expressions of opinion have been advanced upon this point. I do not know personally whether it is practicable to bring Alberta coal to Ontario points in open top cars or not. This is a point which would have to be demonstrated in advance of any investment being made in open top equipment, because it would be a very serious matter to design box cars of the capacity suggested. Perhaps it would be possible to develop a car with a moveable top which would possibly overcome some of the disadvantages of the box car, but to this would have to be added the disadvantage of having to remove the top when loading and unloading.

With regard to the fifth point, that no additional expense would be required for increased facilities to take care of the special equipment used, Mr. Butler has indicated that with respect to the Mallet locomotives referred to, Mr. Duff, engineer of standards, Canadian National Railways, said that the bridges on the line used would be over-stressed to the extent of from 10 per cent to 25 per cent, dependent upon length of span. This may be very true, but if we will endeavour to ascertain what the Virginian, and Norfolk and Western railroads are doing, I think we will find that their bridges are constructed to take care of a loading equivalent to Cooper's E-65 or E-70, whereas the bridges on the Canadian National lines affected have been designed for a loading not exceeding Cooper's E-50.

Next comes the question of rails. Most of the rails on the line in question are either 80- or 85-pound rails. On the Norfolk and Western they are finding it necessary to adopt a much heavier type and there are no 80-pound rails on the Norfolk and Western main lines, there being quite a substantial mileage of 85-pound rails, but mostly 100-pound rails and the tendency seems now to be to increase this weight to 130 pounds. Furthermore, there are other railway facilities which such a radical change in the type of equipment suggested would undoubtedly require remodelling, thereby increasing the capital expenditure involved.

With regard to the sixth point, that the coal cars could be kept in a sort of shuttle movement with practically no delays in loading and distribution at Ontario centres, if we take, for example, the performance of the hypothetical train which Mr. Butler suggests, we find that the average distance travelled for each day in the year for each of the 64 locomotives, which he purposes to use in this traffic, would be 131 miles and the average car miles per day for each of the 2,000 cars used in this service for each day of the year would be 242 miles.

For the year 1922 the Norfolk and Western was able to get from its freight locomotives, 49 miles per loco. day.

The Virginian, 44 miles per loco. day.

The Canadian National Railways with all its serviceable locomotives was able to get for the month of September, 1923, an average of 94 miles per loco. day.

The average mileage per locomotive on the Canadian National Railways for each day of the five months, May to September inclusive, (1923), was 66 miles per loco. day.

With respect to cars, the average car miles per day on the following railways was as follows:

Norfolk and Western (1922)	31	miles
Virginian (1922)	27	miles
C.N.R. (for month of Sept. 1923	25	miles

It can be easily seen that no such mileages as have been suggested under the hypothetical conditions have ever been maintained for any extended period on any of the roads named.

You can very easily appreciate with a train of 58 cars starting from one mine, but destined to 58 different territories at points in Ontario, it would be an absolutely impossible matter to distribute those cars and collect them up again, so as to maintain the schedule suggested.

Mr. Butler very aptly points out that the law of increasing returns applies within certain limits; that is up to the point of saturation and then a new cycle of operation commences when additional facilities are required.

It is, I think, a great mistake to assume that any very substantial portion of the total operating expenses of a railway, except in the early stages of development, are independent of traffic and an extended study of the actual operations, as far as those operations could be studied from the statistical reports of class one railroads in the United States for several years, indicated that with increased business higher standards were set and the proportion of the total operating expense which varied with traffic correspondingly increased. Perhaps this phenomenon which to a considerable extent appears to have upset the general idea upon this subject is due to psycological considerations. The more prosperous a railroad is, the more that railroad spends in the way of operating expenses, with the result that the increased volume of business actually has the effect of increasing the expenses, not absolutely proportionately, but possibly to the extent of 85 per cent, whereas the prevailing opinion has been that possibly a much larger proportion of the total expense than that would be independent of traffic.

Mr. Chairman, I submit that the application of a rate for the transportation of coal on the basis of the average earnings per train mile, as suggested, is absolutely unfair and does not stand the acid test as being a reasonable method.

For a number of reasons, some of which have been pointed out, this matter, as you know, has been the subject of some discussion on the part of the president of the Canadian National Railways and certain experimental rates have been put into effect for a limited time for the purpose of stimulating this traffic. I think it would be unfair at the moment for me to say what I consider would be a fair rate for the transportation of coal from Alberta, for the reason that the Fuel Committee of *The Institute* has appointed a sub-committee, of which I am a member, to consider this question. I think it would be entirely out of place for me to express any views upon a definite rate at this time.

S. B. Wass, A.M.E.I.C.,
Canadian National Railways.

One point which has not been mentioned by any of the previous speakers, is the fact that both the Canadian National and Canadian Pacific railways have constructed their roundhouse, turntables, and other facilities, for locomotives up to about 85 feet over all length. In order to reduce the cost of hauling coal to $5.75 per ton, Mr. Butler has assumed the use of Mallet locomotives which are much longer. To accommodate these longer locomotives very extensive alterations would be necessary at almost every locomotive terminal. This would involve a very large capital expenditure, for which no amount has been included in the estimated cost.

Coke Manufacture with By-Product Recovery

An Account of the Manufacture of Metallurgical Coke with Particular Reference to the Process of By-Product Recovery.

Edward C. Tonge, A.M.E.I.C.,
Testing Engineer, Coke Oven Department, Dominion Iron and Steel Company, Sydney, N.S.

Paper read before the Cape Breton Branch, The Engineering Institute of Canada, April 17th, 1923.

The process of carbonization is utilized to obtain from coal certain products varying in quality and quantity according to the methods employed to suit the requirements of any particular industry. So, while in the manufacture of gas by coal distillation the output of gas is of primary importance, in the metallurgical industry the chief consideration is the residual coke, and in the more recent field of so-called low temperature carbonization the main object of the process is to obtain an easily ignited semi-coke and at the same time a large yield of fuel oils. The market for the various products is the important factor in establishing a plant and individual requirements call for modifications of design for any particular process; however, the general principles of coal carbonization and the recovery of by-products are broadly speaking the same for each industry.

It is the intention in this paper to give an account of the manufacture of metallurgical coke with particular reference to the process of by-product recovery, as exemplified in the plant of the Dominion Iron and Steel Company, at Sydney, N.S. This installation is typical of modern coke oven practice on this continent and also includes a coal washer and a sulphuric acid plant which are not commonly found in American plants as part of the equipment.

The processes involved may be conveniently grouped under the following headings:—

1. Washing the coal.
2. Carbonizing to produce coke, including coal and coke handling and heating of the ovens.
3. Condensation of tar and ammonia liquor.
4. Recovery of ammonia as ammonium sulphate.
5. Extraction and rectification of benzols.
6. Manufacture of sulphuric acid.

The finished products are coke, ammonium sulphate, tar, motor fuel, naphthalene and road oil, with a surplus of coke oven gas and sulphuric acid for steel plant requirements.

Raw materials required for these operations besides the raw coal are lime, sulphur and small quantities of nitrate of soda, all of which are used indirectly for the manufacture of the ammonium sulphate; also absorbing oil and some caustic soda for use in the recovery of benzols.

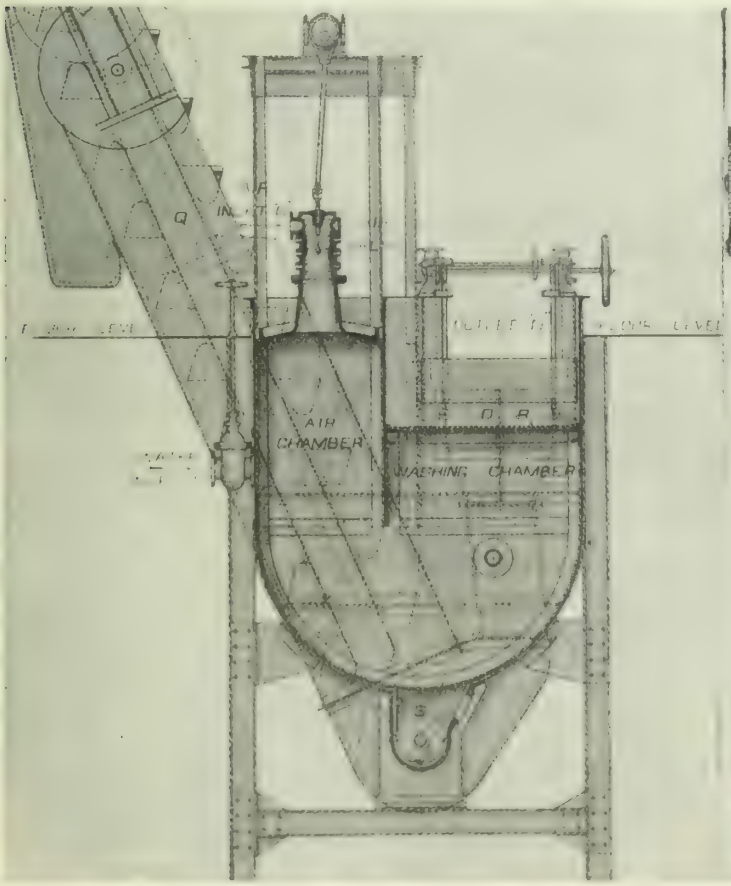

Figure No. 1.—Baum Washer Box (end elevation .

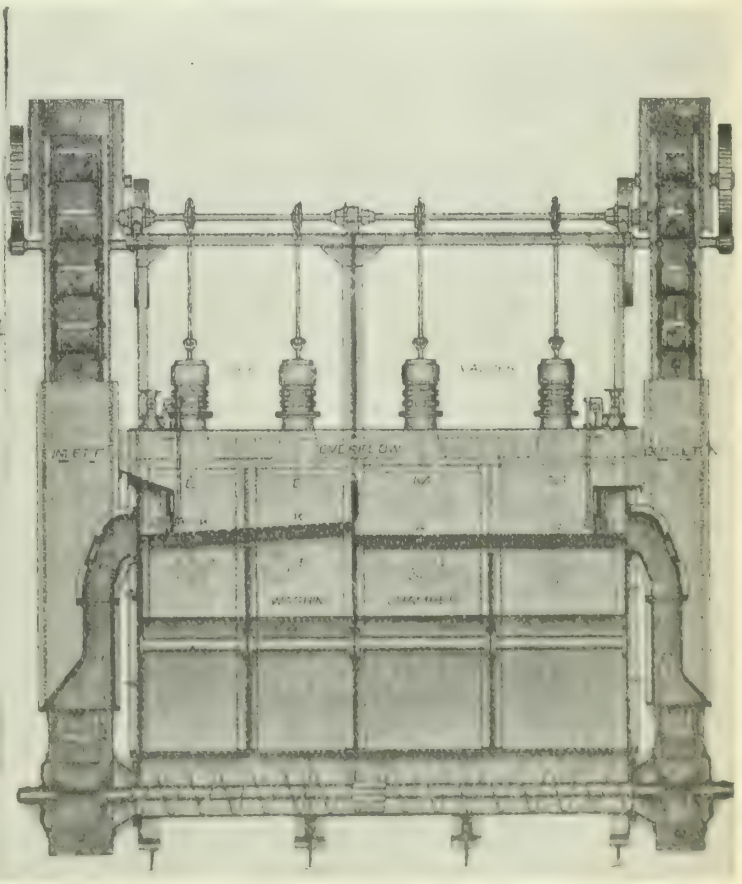

Figure No. 2.—Baum Washer Box (front elevation .

Washing the Coal

Coal from the mines is broken to a suitable size, about ¾-inch maximum and treated in a "Baum" washer. This consists of wash boxes through which the raw coal passes with water and is separated into washed coal and refuse; screens for the removal of coal under ¼-inch size; rewash boxes for this fine coal; slurry settling tank and screens; endless draining bands of hoppers in which the fine coal is drained; and disintegrators through which the coal finally passes before reaching the conveyor belt for delivery to the coke oven plant.

The principle of the actual washing is that of gravitation, with water as a medium for handling the separation. As an illustration of the wash boxes used in the "Baum" washer they might be considered in cross-section as plain U-tubes. In the one limb the coal is flowing along in a stream of water, in the other, by an arrangement of air valves, pressure is alternately applied and released in a closed chamber above the surface of the water. This gives a pulsating movement to the water and so to the coal which is tending to form a bed on the screen fixed at a suitable depth below the surface. Under these conditions the heavier particles, i.e. the slate, pyrites, etc., find their way to the bottom, while the coal remains at the top of the moving bed. It is carried over the outlet into a receiving trough and the heavy refuse, taken off a few inches below the coal, falls into a bucket elevator and is so removed. Any fine slate passes through the screens in the wash box and is moved along to the elevator by means of a helical screw. The coal is carried over ¼-inch vibro screens where fine coal and water drain off, the former accumulating in the bottom of a sump below. The larger coal is transferred by a scraper conveyor to the disintegrators while the coal in the sump is elevated to a rewash box. In rewashing this fine coal the pulsation of the water is much more gentle than in the first operation on account of the air chamber being reduced and the operating side of the box increased in area, this is to give the fine slate more time to separate. The rewashed coal falls into two draining bands and is spread over a large area of draining surface throughout perforated boxes. These are attached to the endless bands and carried slowly along over an uneven roller bed which causes the hinged sides of the boxes alternately to press and release the mass of coal so as to assist drainage. After a passage of about one hour, the coal falls from the boxes as they empty themselves over the scraper conveyor regulating the feed to the disintegrators and here rejoins the larger coal, the whole receiving intimate mixing and some disintegration before passing to the ovens. The very fine coal which accumulates in the water used throughout the process is separated by pumping all drainage to an overhead settling tank in which the slurry gravitates to the bottom. It is drawn off to slurry screens of fine mesh and vibrating at high speed and is delivered in a reasonably well drained state to the boxes below, carrying the rewashed coal.

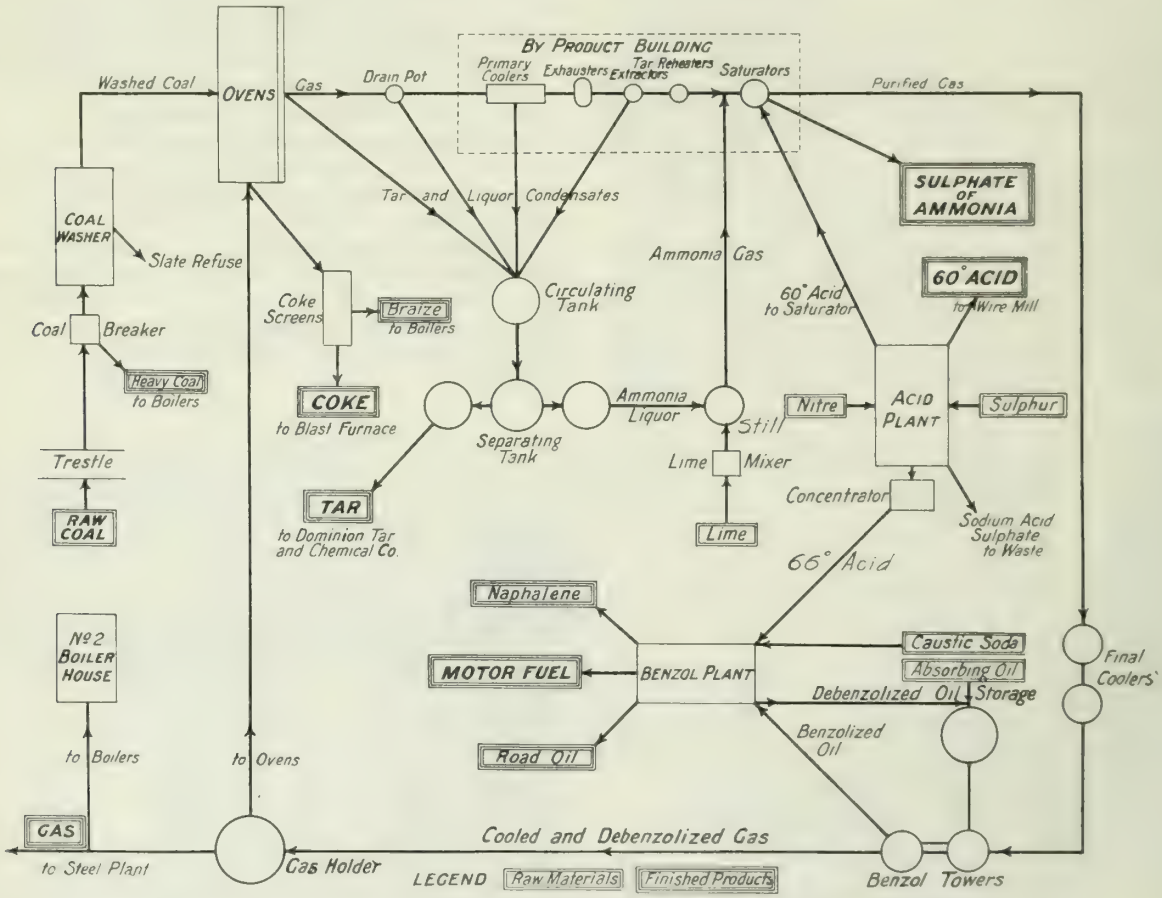

Figure No. 3.—Materials Flow-sheet for Coke Oven Plant of the Dominion Iron and Steel Company, Sydney, N. S.

The coal leaving the washer contains about 11 per cent moisture and 50 per cent of it will pass a ¼-inch screen. Raw and washed coals have the following average analysis:

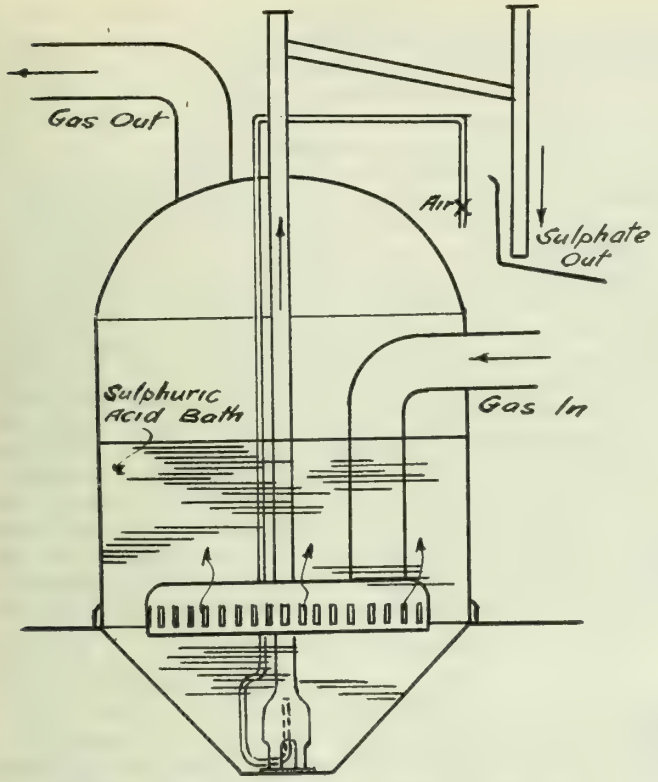

Figure No. 4.—Direct Process Saturator for Ammonia Recovery.

	Raw coal	*Washed coal*
Sulphur	2.50	1.75
Ash	9.00	4.50
Volatile matter	33.50	35.00
Fixed carbon	57.50	60.50

Carbonization

The ovens are of the Kopper's Cross Regenerative type and consist of two batteries each containing 60 ovens. The individual oven is a narrow brick chamber of the following dimensions:—

Length, 37 feet 6 inches.

Width, 15¾ inches pusher side, 18¼ inches coke side.

Height, 8 feet 7 inches from floor tile to top of coal. It has a capacity of about 11¼ net tons of coal, (dry basis).

In the heating system a battery is a unit, but every oven is capable of independent control and has its own regenerator. Between the oven chambers are sets of 30 vertical flues, each flue supplied with gas at the bottom and all connected at the top by a common horizontal flue. The regenerator is situated beneath the oven and connects with the flues by air ports corresponding to the gas nozzles which are removeable and graduated in size, being larger towards the centre of the oven to counteract the effect of increasing temperature and decreasing pressure of the gas. The nozzles receive their gas from a horizontal duct leading from the fuel gas main which runs the length of the battery. The battery is divided longitudinally in the heating system so that for each oven 16 flues are operated from the pusher side and only 14 from the coke side, there being a greater width of coal to be carbonized by the heat from these latter flues. The draft for each vertical flue can be regulated by slide bricks in the horizontal flue above, and the oven draft

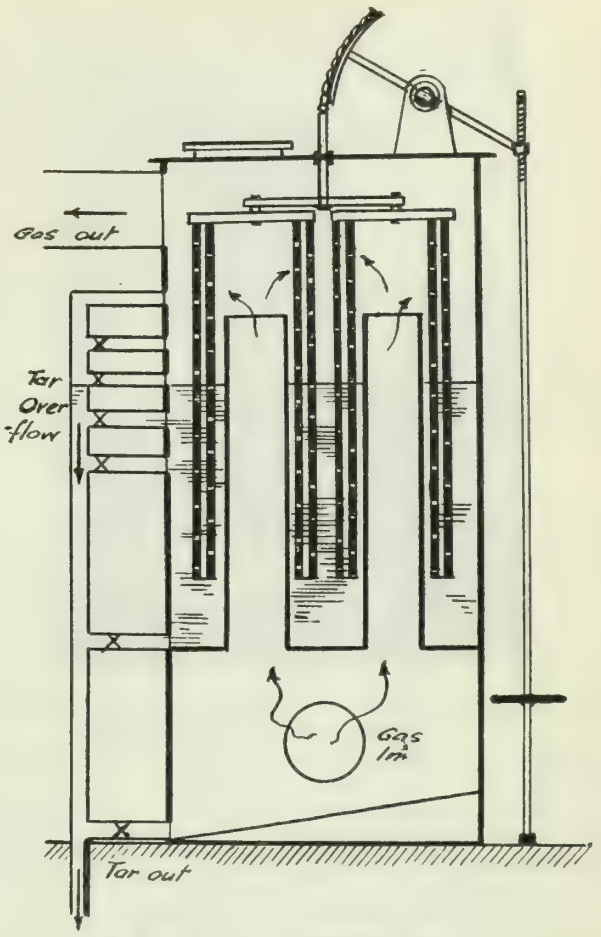

Figure No. 5.—Tar Extractor.

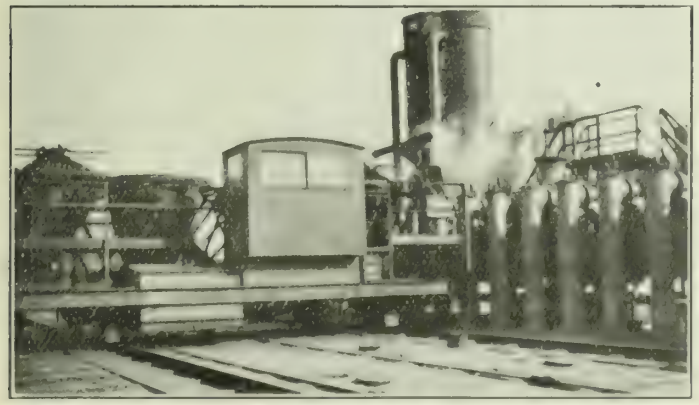

Figure No. 6.—Top of Battery showing charging car about to release coal into ovens.

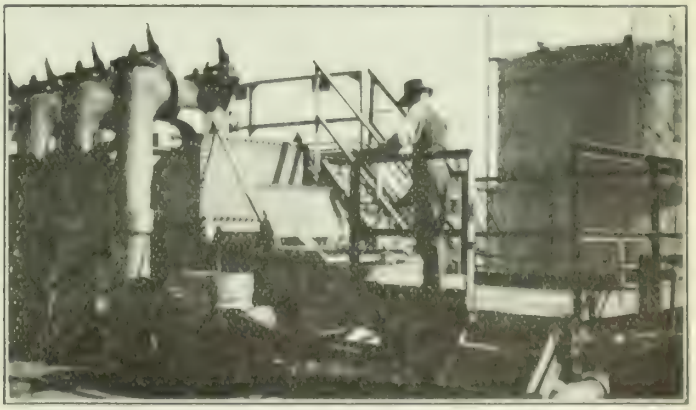

Figure No. 7.—Top of Battery—End of Gas collecting main showing "Tar Chaser" removing pitch from screen.

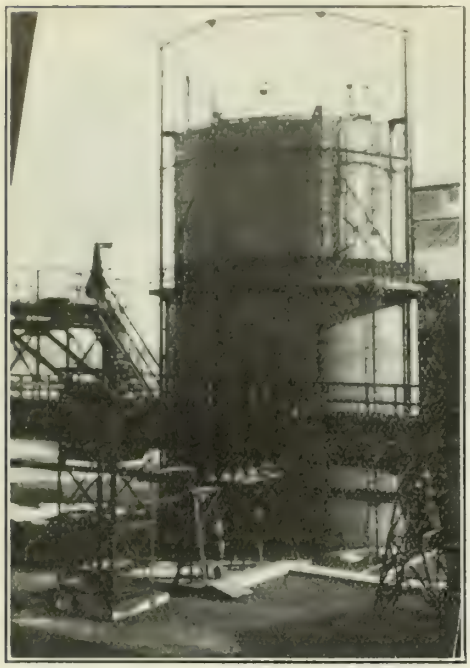

Figure No. 8.—Cross-over Gas Main leading from Battery Collecting Main to By-Product Building.

as a whole is adjusted by a butterfly damper between regenerator and stack flue.

Combustion takes place upwards on the one side, preheated air being supplied from the corresponding half of the regenerator. The gases pass into the horizontal flue, down the flues on the other side and through the air ports into the opposite half of the regenerator, giving up their heat in passing and finally being drawn into the stack flue. After half an hour, the flow is reversed by controls operating the gas cocks and dampers, the gas then burning in the opposite direction.

The ovens are charged from the top out of a larry car equipped with four bins which receive their load of washed coal from the storage bunker midway between the two batteries. Charging is carried on over a scheduled time table according to the output of coke required for the blast furnaces, and the heat maintained in the flues is regulated to enable this to be accomplished. The ovens have been operated over a large range of coking speeds from a period of 48 hours down to a minimum time of 17 hours per charge. This short coking time, which requires an average flue temperature of nearly 2,600° F., means an output of 168 oven charges in 24 hours or a production of about 1,250 tons of furnace coke. The coke is discharged from the ovens by means of a ram and falls into a receiving car in which it is carried to the quenching station where water is sprayed over it for 30 to 35 seconds. It is finally dumped on the coke wharf, whence it is elevated by a belt conveyor to the screening and loading station.

Condensation

The gas which distils from the coal is taken care of by a system of gas mains leading to the condensing house and recovery plant. Ascension pipes connect the ovens to the collecting main through which a constant stream of tar and liquor is pumped to prevent accumulation of pitch. Some of the heavier constituents of the crude gas are deposited and there is a certain amount of condensation taking place throughout the subsequent passage of the gas along cross-over and suction mains. The gas is under a slight pressure leaving the ovens, sufficient to prevent air from being drawn into the chambers. After leaving the collecting main it is drawn along by the pull of the exhausters and enters the primary coolers where it is cooled from about 100° C., to 25° C., by passage around water tubes carrying a flow in counter current system to the gas. The bulk of the remaining tar and the ammonia liquor are condensed, flowing to the hot drain tank and eventually being pumped into a separating tank where tar and liquor are drawn off to storage.

The gas now enters the exhausters under its maximum suction and is passed through to the pressure side of the system. The last trace of tar, which exists as a kind of fog in the gas, is removed by passage through the tar extractors. Here the progress of the gas is baffled through a double walled bell or basket suspended from the top and perforated so that the small openings in the inner and outer walls are not in direct line. This has the effect of first dividing the gas into fine streams which then impinge upon a flat surface and so coalesce into drops which drain into the seal below. The tar is not treated further in the plant, but is pumped over to the Dominion Tar and Chemical Company's tanks and is subsequently submitted to distillation for tar products.

Ammonia Recovery

At this stage the gas is passed through reheaters supplied with exhaust steam from the engines and its temperature is raised to 60° C. This is necessary to prevent any condensation taking place in the direct ammonia recovery process to which it is now submitted. It is first augmented with ammonia gas from the stills which handle the liquor formed during the earlier stages of the operations. The gases pass down into the contents of a lead-lined saturator and are distributed over a large area inside by means of a circular *cracker* pipe of inverted U section, bubbling through vertical slots into the surrounding solution. An acid content of about 7 per cent is maintained by the addition of 60° Be., sulphuric acid, as a result of which there are continually forming, from the saturated solution, crystals of ammonium sulphate. The *salt* is blown up from the bottom by means of an air syphon, into a lead pan where it drains until sufficient has accumulated to charge into the centrifugal drier. This is a perforated cylindrical container in which the salt is sprayed with water and "whizzed" for fifteen minutes reducing the moisture content to about 2 per cent and the free acid to 0.25 per cent.

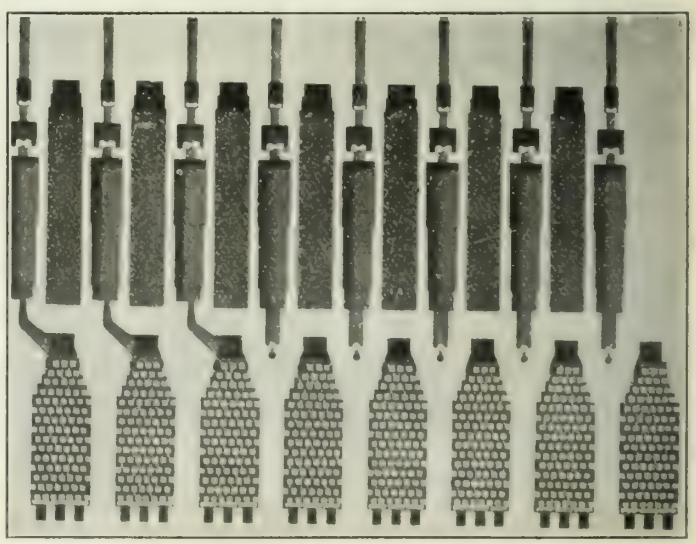

Figure No. 9.—Cross section of Ovens, Flues and Regenerators.

The process of liberating the ammonia gas from liquor in which it is combined with other constituents calls for the use of lime in addition to straight steam distillation. This takes place in the ammonia liquor still, which is made up in sections, each holding a tray upon which bubbling hoods rest covering the openings leading from the tray next below. The liquid contents overflow by sealed pipes downwards through the sections and steam is introduced at the foot of the still to effect the distillation. The still is in two parts on separate bases, the one receiving fresh liquor and removing free ammonia by effect of steam alone, the other being supplied with milk of lime which reacts with the downcoming liquor and releases the fixed ammonia remaining. The primary mixing of lime and liquor takes place at the base of the first column but the mixture overflows into the second and lower one where the removal of ammonia is completed, the waste liquor passing out at the bottom. Steam and ammonia gas leave the still at the top and are carried by covered piping to the inlet of the saturators. The ammonia-free gas leaves the saturator through an acid trap which retains any spray and proceeds to the final cooler, a 60-foot tower, where the upgoing gas is cooled by descending water and at the same time some naphthalene is removed.

Benzol Recovery

The gas is now in a suitable condition for benzol extraction which is accomplished by passing it through two 100-foot towers, packed with wooden grids over which an absorbing oil is sprayed, being thus brought into intimate contact with the gas. The oil becomes enriched with benzols and is pumped over to the benzol plant for the recovery process.

This consists essentially of distillation operations, the oil being first stripped of its content of benzols by passage through a continuous still. The oil is preheated and brought into contact with steam in a column made up of superimposed trays over which the rich oil flows, the vapours being carried off at the top while debenzolized oil leaves at the bottom and passes to a cooler prior to going back into circulation for further scrubbing of the coke oven gas. The vapour on condensation and separation from water is known as light oil or crude benzol and is treated in an intermittant still to produce a purer product which, however, has to undergo a washing process with strong sulphuric acid to remove impurities unaffected by distillation. The washing with acid is followed by one of caustic soda to remove acidity and the washed benzol is charged into the final still for production of motor fuel. Residual oils from the crude benzol stills are allowed to stand in open tanks, when naphthalene settles out and is "whizzed" dry for shipment; the oils remaining from the final stills being utilized for road treatment.

The gas leaving the benzol towers passes to the holder for distribution. About 40 per cent required for the oven heating system and the remainder is boosted to a suitable pressure for use in the boilers and steel plant furnaces.

Sulphuric Acid Plant

The sulphuric acid plant is an addition which is very uncommon to coke oven plants on this side of the Atlantic, but a brief mention will complete the cycle of operations as conducted on the Sydney plant.

The acid is produced by burning Louisiana sulphur and treating the gases evolved; the feed being regulated according to the amount of acid required for plant purposes. Sodium nitrate is used to produce nitric acid which plays an important part in the conversion of the sulphurous gases into the finished product containing about 77 per cent sulphuric acid, (60° Be).

For use in the benzol washing process a stronger acid is made by concentrating the 60° Be., acid with direct heat to a 66° Be., product or 93 per cent sulphuric acid.

Yields per Ton of Coal

The yield of products obtained in the Sydney plant from one net ton of dry coal is as follows:—

Total coke	1,440 lbs.
Total gas	11,500 cu. ft.
Ammonium sulphate	28 lbs.
Tar	10.5 gallons
Motor fuel	1.8 gallons

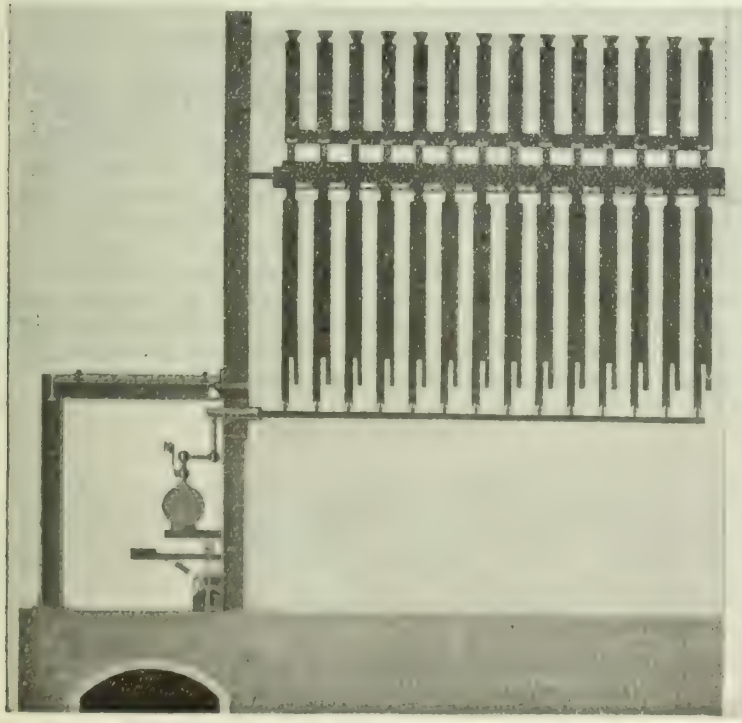

Figure No. 10.—Longitudinal section showing Flue (coke side) Arrangement.

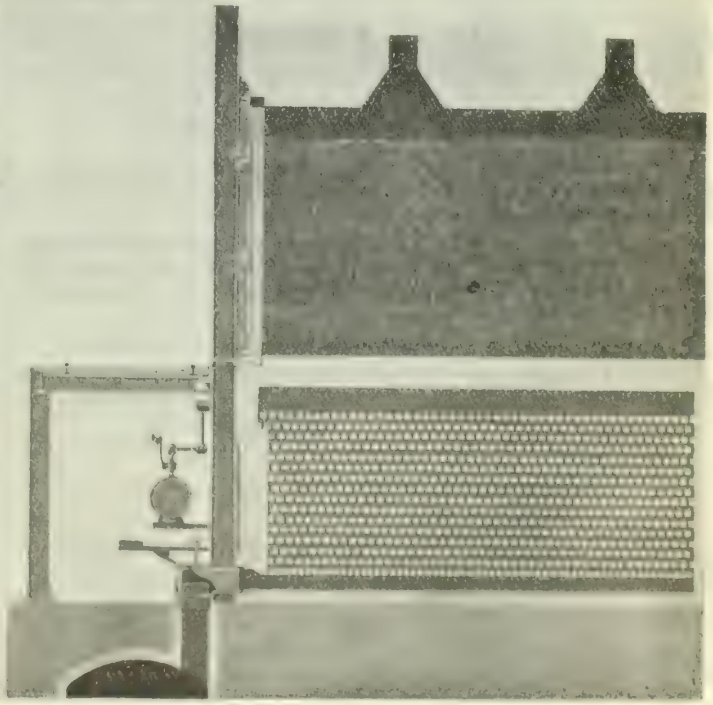

Figure No. 11.—Longitudinal section through Oven (coke side) and Regenerator.

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The Secretary's Message

Due to the belief that in our broadened objects lie a greater hope to achieve success we have many added pleasant memories of engineering gatherings during the past year.

May the years to come increase and intensify that spirit of friendship and good fellowship which is fast becoming the characteristic spirit prevailing at meetings of The Institute, for in that direction is a sure path to greater influence and standing.

For what of progress the past year has brought let us be thankful.

May the Christmas season be one of gladness to all, and the New Year one of greater joy and prosperity is the sincere wish of your secretary.

Fraser S. Keith.

Annual Meeting at Ottawa

Many members of *The Institute* recall with considerable pleasure the enjoyable professional meeting held in Ottawa in February nineteen nineteen, and many are looking forward in anticipation to the annual general and general professional meeting already announced to be held in Ottawa, Wednesday and Thursday, January twenty-third and twenty-fourth, the general meeting to be convened in Montreal on the morning of January twenty-second for the purpose of appointing auditors and nominating scrutineers to count the officers' ballot. The meeting will then adjourn to reconvene in Ottawa at ten o'clock on the morning of the twenty-third, at the Chateau Laurier.

Apart from the general business of *The Institute* which must be transacted, Council has already approved of the programme for the professional meeting, in which social events predominate.

The men of the Ottawa Branch are ideal hosts and entertainers, and all who plan to attend the meeting are assured of an enjoyable visit to the capital city. It is anticipated that it will be one of the largest gatherings of engineers ever assembled at an annual meeting.

Programme

Wednesday—January 23rd.

Morning: 9.00 a.m. Registration.
10.00 a.m. Reports of Committees.
Reports of Branches.

Noon: Luncheon — Chateau Laurier. His Excellency the Governor-General of Canada will be present.
Address by Doctor Charles Camsell, M.E.I.C., Deputy Minister of Mines.

Afternoon: Unfinished business.
Report of Scrutineers.
Inauguration of newly elected President.

Evening: Banquet and Smoker. (Somewhere in Quebec.)

Thursday—January 24th.

Morning: Professional Meeting. Papers and speakers being selected.

Noon: Luncheon.
The Centenary of the Rideau Canal.—
Biography of Colonel Bye, the engineer.
Speaker — Mr. Hamnett P. Hill.

Afternoon: Visit to Deschenes.

Evening: Ball.

Amendments to By-laws

The final report of the Legislation and By-laws Committee was submitted to the Council of *The Institute* at the regular meeting held on November nineteenth, nineteen twenty-three, a progress report having been previously submitted to each councillor recommending certain amendments to the by-laws. The report of the committee, together with suggestions from councillors, was fully discussed, it being finally resolved that certain amendments were advisable and should, in accordance with the by-laws, be submitted to the membership for discussion at the annual meeting, preceding a vote of the corporate membership later regarding their adoption.

Proposed Changes

Section 12. Amend to read:—

The officers of *The Institute* shall be a president, five vice-presidents, one councillor from each branch having less than two hundred corporate members, two councillors from each branch having two hundred and less than four hundred corporate members, three councillors from each branch having four hundred corporate members, and an additional councillor from each branch for each two hundred corporate members over four hundred.

Section 13. Amend the first paragraph to read:—

The term of office of the president shall be one year, of the vice-presidents two years, and of the councillors one year, except in the case of councillors representing branches entitled to two or more

councillors. The term of office for such councillors shall be two years for those representing branches entitled to two councillors, and three years for those representing branches entitled to three or more councillors. At least one councillor shall be elected each year from each branch.

Section 18. Add under list of standing committees:—

An engineering sections committee.

Replace paragraph four, section 18, by paragraphs one and two, section 24:—

The council at any time, may appoint special committees to report upon engineering subjects or upon other matters of interest to *The Institute*. The annual general meeting may recommend to the council the appointment of special committees, and such recommendations shall be considered by the council at the first meeting following the annual general meeting.

Special committees shall perform their duties under the supervision of the council, and shall report to the council.

Section 21. First paragraph, fourth line, change the word "meeting" to "meetings".

Section 22. Replace the third paragraph by the following:—

The right of prior publication of all papers accepted to be read at a branch or professional meeting is reserved by *The Institute*. Any such paper not accepted for publication shall be returned promptly to the author. No paper shall be considered eligible for any of the prizes of *The Institute*, which has been published elsewhere prior to its publication by *The Institute*. unless published with the consent and approval of the publications committee, officially transmitted by the secretary.

Section 24. (New section.) Engineering Sections Committee.

The engineering sections committee shall be composed of a chairman who is a member of council, and a representative from each branch. This committee shall promote the establishment of sections corresponding to any of the recognized branches of the engineering profession, such as chemical, civil, electrical, mechanical, mining, hydraulic, railway, industrial, highway, municipal and structural, in the various branches of *The Institute*.

This committee shall be responsible for the formation and continuation of sections in *The Institute* corresponding to any of the generally recognized branches of the engineering profession by correlating and co-ordinating into *Institute* sections, similar sections of the various branches, with such officers and activities as the council may from time to time approve.

It shall encourage and promote the exchange of papers between similar sections of the various branches, and shall assist the papers committee in securing papers for professional meetings.

Section 25. (Newly numbered section.) Adoption of Specifications (This appeared as paragraph (b) under section twenty-four.)

Renumbering of sections. Renumber all sections thereafter, changing present section twenty-five to twenty-six.

Section 27. New title: — Consideration of Applications for Admission or for Transfer.

Change first sentence to read:—

Immediately upon receipt of an application the secretary shall forward copies of all papers and correspondence in connection therewith to the secretary of the branch, if any, to which the applicant belongs.

Section 38. Delete the words, "except as provided in by-law 41".

Section 39. Amend to read:—

At the time of his election a corporate member may compound all future annual fees by a single payment of two hundred and fifty dollars. A corporate member in good standing after ten years of corporate membership may compound his future annual fees by a single payment of one hundred and fifty dollars, and after fifteen years of corporate membership by a single payment of one hundred dollars. The money thus received shall be invested and only the income thereof used for the current expenses of *The Institute*. Should an Associate Member compound his fees, he shall be subject to section 26 as regards transfer, and shall also be required to pay a transfer fee.

Section 53. Add the words "and juniors" after "corporate members", six words from the end.

Section 66. Add:—

Vacancies in the nominating committee as announced at the annual general meeting shall be filled by council from the nomination or nominations submitted by the branch in which the vacancies occur.

Section 67. Amend paragraph four to read:—

The officers' ballot shall be forwarded by the nominating committee to reach headquarters not later than the fifteenth day of September, for presentation to council at a meeting to be held not later than the thirtieth day of September, and should be accompanied by a letter of acceptance of nomination from each nominee.

Amend paragraph five to read:—

The council shall examine the officers' ballot submitted by the nominating committee. If the council find a nominee ineligible for the office for which he is nominated, or should the consent in writing of a nominee to appear on the officers' ballot not be furnished before the first meeting of council in October, or should any nominee after such consent withdraw his name, such name shall be deleted, and the council shall substitute another name therefor. The words "Proposed by Nominating Committee" and "Proposed by Council" shall be printed conspicuously on the ballot, to indicate the manner of nomination of all nominees.

Section 68. Amend first paragraph to read:—

Not later than the seventh day of November, the secretary shall mail to each corporate member of *The Institute* the officers' ballot, as prepared by the nominating committee and the council.

Student Centre for Canadians Attending the Sorbonne

Six hundred years ago a small sailing ship each year could be observed leaving the Firth of Forth, bearing the youth of Scotland bound via the Channel, to Havre and the Seine for the great student centre of Paris. On arrival, they were installed in a section of the Sorbonne afterwards called the Scotch College, and which became one of the centres of international intellectual life. The effect of the annual migration to and from Paris has been far reaching and throughout the succeeding years greatly facilitated the rapprochement between Britain and France culminating some twenty years ago in the Entente Cordiale. It did more — it made for international thinking — it built up far reaching friendships — and gave those fortunate ones, who could take advantage of studies in France, a truer perspective and better knowledge of their fellowmen and inspired them to carry back to their native heath much culture and art with which to shape their careers.

To-day, with transportation facilities so improved, that with a minimum effort and less relative expense, students can leave Canada and study at the Sorbonne, no building has, as yet, been provided for them, no union for the development of college friendships; but with these once established, many spare hours might be devoted to the discussion and development of the brand of Canadianism we all realize is required if we are to play the role of mediator between the republic to the South and our Kin in both Britain and France.

The door is open for an endowment of $100,000 which will finance a Canadian Students' Building in Paris. This will indicate in tangible form our appreciation of France's offer, for she has given Canada suitable ground free of charge, on the site of those last Fortifications of Paris now being demolished. This will always be associated in our minds with the last war and the part that Canada played, 1914-18. The time is ripe and we do not want to see the work of centuries wasted. It is Canada's privilege to speak out and let the world know that we appreciate our heritage and will work to further this cause. *Contributed by W. F. Drysdale, M E I.C.*

OBITUARIES

Percival W. St. George, M.E.I.C.

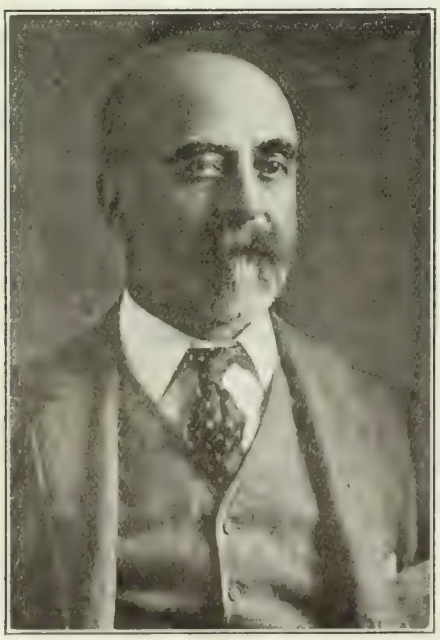
Percival Walter St. George, M.E.I.C., whose death occurred at his home in Montreal on November twelfth, was one of the three surviving charter members of the Canadian Society of Civil Engineers, a man who took a prominent part in the profession for a third of a century. He was a member of the first Council, and for eight years as councillor and four years as vice-president was actively associated in the development of the engineering profession.

He was born on October 22nd, 1849, in the ancient royal burgh of Forres, in Elginshire, Scotland, the youngest son of the late Colonel J. D. N. St. George, of His Majesty's Ordnance Department. After being educated in France and at the University of Edinburgh he came to Canada in 1866. He was first employed in the engineering department of the Nova Scotia Railway and then on the survey for the Intercolonial Railway. In 1870 he became the assistant engineer of construction of that system and later took part in the survey of the Northern Colonial Railway, a work which occupied him until 1875. That closed his railway career in Canada.

In 1875 Mr. St. George entered the service of the City of Montreal. In 1876 he was appointed deputy city surveyor, a post which he held until 1883, when he left Montreal to take the position of divisional engineer on the Norfolk and Western Railroad in Virginia.

In November, 1883, Mr. St. George returned to Montreal to receive the appointment of city surveyor and that important post he filled with conspicuous ability until he resigned in 1900. Thereafter he practised his profession in Montreal as a consulting engineer.

During the time Mr. St. George was city surveyor he devoted a great deal of attention to the prevention of the flooding of the lower parts of the city which had been one of the problems unsolved for many years, causing enormous damage to property, and prepared a plan which practically eliminated flooding in the city. He also inaugurated an extensive paving programme during his regime, and was the inventor of the sewer gully which bears his name. Mr. St. George was a member of the Royal Flood Commission and a commissioner of the proposed drydock for Montreal.



PERCIVAL W. St. GEORGE, M.E.I.C.

Besides *The Institute* he held membership in the Institution of Civil Engineers of Great Britain. He was a member of St. James Club, member of St. Paul's Lodge, A.F. & A.M., and was first president of the Engineers' Club. In religion he was an Anglican, being at one time warden of the Church of St. John the Evangelist. Latterly he worshipped at the Church of St. James the Apostle.

Mr. St. George married Miss Flora Stewart Townsend, daughter of the late Rev. Canon George Townsend, rector of Amherst, N.S., and Elizabeth Stewart, who was the daughter of the Hon. Justice Alexander Stewart, C.B., Master of the Rolls and Judge of the Vice-Admiralty Court. He is survived by his widow, four sons and two daughters — Mrs. J. R. Kinghorn, of British Columbia; Mrs. Walter A. Wilkins, Major Frank T. St. George, Harry L. St. George, Percy T. St. George, all of Montreal, and Stewart F. St. George, of London, Eng.

Referring to the death of Mr. St. George, the *Montreal Star* in an editorial headed "A Faithful Servant", said —

> Montreal has been served by many men faithfully in the past, but by none whose services were more devoted and effective than the late Percival St. George. For many years engineer and city surveyor, he planned and carried out the extensive dyke, revetment wall and sewer construction work that freed the city from the annual floods that used to create such widespread damage and inconvenience. It was at a critical period in the affairs of Montreal that Mr. St. George took charge of his department, and he brought to bear upon his work a patience, a thoroughness, and a devotion that broke down all obstacles and won the support of the citizens. He inaugurated a better paving movement, and he lived to see many of his pet schemes carried to fruition. He was a man of culture and broad outlook, and his interest in civic affairs was by no means confined to his own department. Popular in social circles, where he exercised a good deal of influence in his day, and one of the best known clubmen of the city, Mr. St. George was for many years a prominent figure in the city's life, and he enjoyed in a very large degree the respect and esteem of a wide circle of friends and acquaintances. His death removes a faithful servant of the city who set a fine example of loyalty and sacrifice.

Charles Albert Bigger, C.E.,D.L.S.,O.L.S.,A.M.E.I.C.

A prominent figure in Canadian engineering and surveying circles, Charles Albert Bigger, C.E., D.L.S., O.L.S., A.M.E.I.C., assistant director of the Geodetic Survey of Canada, passed away suddenly at his office on the afternoon of Friday, November 10th, 1923. In this death the Dominion government loses a most valued employee.

Mr. Bigger was at work as usual all day at his office in the Geodetic Survey building at the Central Experimental Farm, and appeared to be in the best of health. Shortly after four o'clock in the afternoon he was found dead in his office by a member of his staff.

The late Mr. Bigger was seventy years of age, and was born near Paris, Ont., on August 15, 1853. He was educated at high school in Toronto and at the Royal Military College, Kingston. Early in his career he made engineering his profession and practised for years in Ontario, the Northwest and British Columbia.

It was in 1901 that he first entered the employ of the Dominion government, and conducted surveys of the international boundary in southeastern Alaska and in southern Quebec. When the Geodetic Survey of Canada was commenced in 1905, under the late Dr. W. F. King, Mr. Biggar was appointed as the assistant superintendent, and his painstaking care has been reflected in the high class work which has been performed by that organization.

In scientific instrument construction and care, the late Mr. Bigger was recognized as an authority. On two occasions he was sent to Europe and also to the United

CHARLES ALBERT BIGGER, C.E.,D.L.S.,O.L.S.,A.M.E.I.C.

States to supervise the construction of special apparatus for the Geodetic Survey of Canada.

He did not take an interest in fraternal circles, but the Ottawa branch of the Royal Astronomical Society mourns for him as a past president, while he was also an associate member of *The Engineering Institute*. He was to have occupied a seat at the head table at a luncheon on November 14th, which was given by *The Engineering Institute of Canada* to Robert S. Whipple, a noted English scientific instrument authority.

In religion Mr. Bigger was a Methodist, and was a member of Dominion Methodist church. Formerly, for several years, he was a member of Eastern Methodist church, and was a member of the choir of that church.

He is survived by his widow, formerly Miss Louisa Brennan, whom he married in 1877, and one daughter, Mrs. John Dawson, of San Francisco, Cal. Two sisters and one brother also survive.

The funeral was held at 2.30 o'clock on Monday, November 12th, from his late residence, 141 Cartier Street, to Beechwood cemetery. The funeral service was conducted by Rev. W. T. G. Brown, pastor of Dominion Methodist church.

La Verne Franklin Stokes, S.E.I.C.

Sincere regret is expressed at the death of La Verne Franklin Stokes, S.E.I.C., which occurred in British Guiana on August 12th, 1923, while engaged on exploration work in that country.

The late Mr. Stokes was born at Sombra, Ont., September 17th, 1896, and upon returning from active service in the Great War, he entered the Faculty of Applied Science of the University of Toronto with the class of 1923, receiving his degree of B.A.Sc., in civil engineering last spring. Shortly after graduation, in company with two class mates, Mr. Stokes left for British Guiana to undertake exploration work of the diamond fields. The party encountered great difficulties in river navigation and also in securing suitable labour. When some distance inland, where it was impossible to secure medical assistance, Mr. Stokes contracted malaria, which resulted in his death. Mr. Stokes joined *The Institute* as a Student on February 17th, 1920.

PERSONALS

H. E. Harcourt, Jr.E.I.C., is managing director of Industrial Minerals Corporation of Canada, Limited, Toronto, Ont.

G. S. Dawson, A.M.E.I.C., has been transferred to the Reclamation Service at Ottawa from the Irrigation office in Calgary.

Ray F. Armstrong, A.M.E.I.C., formerly town manager, Woodstock, N.B., is a staff member of the Citizen Research Institute of Canada, in Toronto, Ont.

I. H. Forster, S.E.I.C., has accepted a position with Horton Steel Works, Bridgeburg, Ont. Mr. Forster graduated from the University of Toronto this year.

S. F. Workman, A.M.E.I.C., recently accepted a position with the Public Works Department of the province of British Columbia, at Vancouver, B.C.

J. H. Bradley, A.M.E.I.C., has resigned from the Canadian Bridge Company, Limited, Walkerville, Ont., to join the staff of Holcroft and Company, 6545 Epworth Boulevard, Detroit.

Mellis U. Ferguson, M.E.I.C., who has been engaged in consulting engineering and contracting at Galt, Ont., has taken charge of the engineering work for the town of Port Hope, Ont.

W. B. Pennock, Jr.E.I.C., is with The Canadian Fairbanks-Morse Company, Limited, at Windsor, Ont., Mr. Pennock is a graduate of McGill University of the class of 1915.

E. A. Dunn, S.E.I.C., has joined the staff of James, Proctor & Redfern, Limited, Toronto, Ont., having formerly been with the British American Oil Company, Toronto.

J. R. S. Sutherland, A.M.E.I.C., of Stirling, Scotland, has left for West Africa where he will be district engineer, Gold Coast Railways, Deviations, Dunkeva, Seccondee, West Africa.

H. S. Cameron, A.M.E.I.C., who has been with the Good Roads Board at Morris, Man., is now on the staff of the Public Works Department, Reclamation Branch, Winnipeg, Man.

C. W. Taylor, S.E.I.C., and L. L. Roquet, S.E.I.C., both of the class of 1923 in mechanical engineering of McGill University, are with the Studebaker Corporation, 720 South Michigan Bend, Ind.

W. R. Conibear, Jr.E.I.C., previously with the Hydro-Electric Power Commission of Ontario, is now on the staff of Canadian Allis-Chalmers, Limited, John and Franklin Streets, Niagara Falls, Ont.

C. E. Bulmer, S.E.I.C., is with the Hamilton Technical Institute instructing in design and draughting. He was previously on the engineering staff of the General Motors of Canada, at Oshawa, Ont.

Wilfred S. Lowry, S.E.I.C., E. Collyer, S.E.I.C., T. W. Kennedy, S.E.I.C., L. C. Moorhead, S.E.I.C., and J. B. McClure, S.E.I.C., of the class of '23 of Queen's University, are with the General Electric Company at Lynn, Mass.

C. Oldrieve Thomas, A.M.E.I.C., has resigned from the staff of the Hydraulic Department of the Dominion Engineering Works, Limited, estimating branch, to accept a position on the designing and estimating staff of the Canadian Vickers, Limited.

J. L. Rannie, M.E.I.C., delivered a lecture on November 23rd, to the forurth year civil class of McGill University on the errors in astronomical observations due to the deflection of the plumb line. Mr. Rannie is in charge of the triangulation work of the Geodetic Survey of Canada.

Captain E. H. Harrison, M.C., M.E.I.C., of East Grinstead, Sussex, England, is municipal engineer for the Anglo Persian Oil Company, Limited, Mohammerah, Persian Gulf. Captain Harrison was engaged on engineering work in Manitoba and British Columbia for some time prior to going overseas in 1915.

T. B. Patterson, S.E.I.C., has been resident engineer for Foundation Company on the foundation test of a large storage warehouse in the city of Quebec until recently transferred by the company to the construction work on the Drummondville power development dam of the Southern Canada Power Company.

C. G. Steers, Jr.E.I.C., of the Public Works Department, Ottawa, who was temporarily transferred to the Port Arthur office, left for Ottawa on November 4th, preparatory to taking up residence in London, Ont., where he has been transferred permanently as junior engineer in the London office.

W. Ray McClelland, Jr.E.I.C., who graduated from McGill University in metallurgical engineering in 1922, has been appointed to the position of metallurgist on research work with the Milford Electrolytic Iron Company, 48 Broad Street, Milford, Conn., and is the only representative of a Canadian university on the staff of this company, all the others being graduates of Massachusetts Tech.

Appointed Assistant Director of Surveys

Thomas Shanks, B.A.Sc., D.L.S., M.E.I.C., who has just been appointed assistant director of surveys in the Department of the Interior, Ottawa, was born at Moose Creek, Ontario. His earlier education was obtained at the Ottawa Collegiate Institute and the Ottawa Normal School. After nine years spent in public school teaching, he entered the School of Practical Science, Toronto, to take a course in civil engineering, including a study of hydraulics and strength of materials, graduating in 1900 with the degree of B.A.Sc. In his third year at the "School" he won the prize in civil engineering. In may 1900 he entered the topographical surveys branch, Department of Interior, Ottawa, as a draughtsman. For three months during the summer of 1900 he was employed in the field as articled pupil and assistant to the surveyor on photo-topographical survey of the Crow's Nest Pass coal area. The winter of 1900-01 was spent in the Calgary office of the topographical surveys branch compiling and draughting the map of the Crow's Nest area. During the season of 1901 he was engaged severally as assistant on the sub-division of townships in southern Alberta, photo-topographical survey of the Selkirks, B.C., and on the survey of base lines. In December 1901 he returned to the Ottawa office of the topographical surveys branch and shortly afterwards was placed in charge of the preparation of instructions to surveyors for their field work. In 1902 he obtained his commission as a Dominion Land Surveyor. In 1904 he was made assistant chief draughtsman, in 1911 he became chief draughtsman, and in August 1914 became assistant surveyor general. In February 1921 Dr. E. Deville, Hon.M.E.I.C., the surveyor general, took charge of the surveys bureau of the Department of the Interior, when Mr. Shanks was placed in charge of the topographical surveys branch which position he has held up to his present promotion. Mr. Shanks is a member of the Rotary Club, Laurentian Club and the Rivermead Golf Club, at the present time being vice-president of the two latter clubs. In fraternal circles he is a prominent member of the Masonic order.

Joins Canadian Vickers, Limited

Max V. Sauer, M.E.I.C., has resigned from the engineering department of the Hydro-Electric Power Commission of Ontario to become hydraulic engineer for Canadian Vickers, Limited, with headquarters in Montreal. Prior to locating in Montreal Mr. Sauer is spending several months in England making an intimate study of the equipment and apparatus manufactured by Vickers, Limited.

Mr. Sauer was born at Plattsville, Ont., on Juen 7th, 1880, and graduated, taking the mechanical and

THOMAS SHANKS, B.A.Sc., D.L.S., M.E.I.C.

MAX V. SAUER, M.E.I.C.

electrical course in the School of Practical Science, University of Toronto, in 1901. He took a post-graduate course in 1902, and received a fellowship, University of Toronto, 1903. Following a brilliant university course he started his professional career as draughtsman with the Ontario Power Company at Niagara Falls, and in the following year became assistant to the mechanical engineer. In 1905 he was chief designer of the Niagara Falls Power Company, Niagara Falls, N.Y., and the following year was construction engineer of the Iroquois Construction Company, Buffalo, N.Y. In 1907 he was chief designer of the Ontario Power Company, and the next year became mechanical assistant to the engineer in charge of the Ontario Power Company. During these years he was responsible for the computation and design of transmission lines and substations, and the design of extensions to the plant. In 1912 he was mechanical engineer for the Ontario Power Company in full charge of design, field, and inspection department. He later became associated with the Hydro-Electric Power Commission of Ontario, and in connection with the design and construction of the Queenston-Chippawa power development he occupied a prominent position.

Mr. Sauer joined *The Institute* as a Student in 1904, and was elected to membership on March 11th, 1913. Mr. Sauer is known amongst his fellow engineers as a man of ability and integrity, which, joined with the fact that he is popular and highly esteemed, indicates that he will add considerable strength to the organization of Canadian Vickers, Limited.

Guelph Complete 1923 Paving Programme

Summary of work consummated during the year, under the supervision of H. S. Nicklin, A.M.E.I.C., city engineer.

First concrete laid May 25th. Completed October 15th.
Yardage 46,000 sq. yds.
Mix used, 1–1½–3.
Type, one course, with integral curb without reinforcing.
Average thickness 7 inches (centre 8 ins. side 6 ins.).
Average area of concrete laid per working day, including short days, 550 sq. yds.
Cost (estimated, but believed to be outside figure).

Subgrading (including excavation, labour on boulevards, sidewalks, etc.,)	$0.44 per sq. yd.	
Pavement Proper:—		
Labour	$0.40 per sq. yd.	
Material	1.18 " " "	
Total		$1.58 per sq. yd.
Plant rental	0.10 " " "	
Engineering at 2% or	0.04 " " "	
Interest on loan	0.06 " " "	
Total		$2.22 " " "

Gravel (pit owned by city) crushed and screened only used, charged to pavement at $0.75 per square yard.
Trucks charged to pavement work at $2.00 per hour.
Teams on subgrading at $0.80 per hour.
All work done by day labour varying from $0.35 to $0.45 per hour.

Concrete Pavement, Dundas Road, Guelph, Ont.

THIS MONTH'S CONTRIBUTORS

Coke Manufacture with By-Product Recovery

Edward C. Tonge, B.Sc., (Tech.), A.M.E.I.C.

The manufacture of coke with by-product recovery is described in a most interesting manner in a paper by Edward C. Tonge, B.Sc., (Tech.), A.M.E.I.C., which appears in this issue of *The Journal*. This paper was presented by Mr. Tonge before the Cape Breton Branch, *The Engineering Institute of Canada*, on April 17th, 1923.

Born at Westhoughton, Lancashire, England, on September 4th, 1894, Mr. Tonge was educated at the Bolton Grammar School, from 1906 to 1912, proceeding thence to the Manchester University School of Technology, graduating from there with the degree of Bachelor of Technical Science in applied chemistry in 1915. He then accepted a position with Messrs. Simon Carvées, Limited, Manchester, spending several months on operation of benzol plants in Yorkshire and Lancashire. In March 1916, Mr. Tonge joined the Royal Engineers serving three years including some overseas service after which time he rejoined the staff of Messrs. Simon Carvées, Limited, as assistant until coming to Canada in September 1919. Upon his arrival here Mr. Tonge was on the heating staff at the coke oven department of the Dominion Iron and Steel Company, Sydney, and was appointed testing engineer on the same plant in June 1920, in which capacity he is still engaged.

Metals in Engineering Service

Gordon Sproule, M.Sc., A.M.E.I.C.

Metals in Engineering Service is the title of a paper presented by Gordon Sproule, M.Sc., A.M.E.I.C., before the Montreal Branch, *The Engineering Institute of Canada*, on April 26th, 1923, and in this paper the author discusses the service of metal as affected by quality and suitability of material and by the features of mechanical design.

Mr. Sproule is a native of Montreal where he was born on April 23rd, 1885. He is the son of the late W. J. Sproule, C.E., assistant engineer of Montreal harbour, under the late Sir John Kennedy for about thirty-five years and was educated at St. Lambert Academy, (Gold Medalist), and Montreal High School and graduated from McGill University in mining engineering in 1908 (B.Sc.); M.Sc., McGill University (metallurgy) 1909 with the Governor General's Medal for Graduate Research. From 1909 to 1910 Mr. Sproule was research fellow and instructor at the same University and spent the next five years with the Canadian Pacific Railway, Angus shops as wheel inspector, assistant engineer of tests and engineer of tests. In 1916, he accepted a position as assistant inspector of steel, Imperial Ministry of Munitions, Montreal, and the next year was engaged in the same work at Hamilton, Ontario. Mr. Sproule became lecturer in metallurgy in 1918 and is still on that work.

ELECTIONS AND TRANSFERS

At the meeting of Council held on November 19th, 1923, the following elections and transfers were effected:—

Members.

HERD, Walter, mining engineer, Dominion Coal Company, Glace Bay, N.S.

HUSSEY, Erwin Howard, C.E. (Univ. of Maine), chief engineer, Minnesota & Ontario Paper Company and all allied interests at International Falls, Minn., U.S.A.

LAVOIE, Edouard, B.A. (Laval Univ.), B.Sc. (Queen's Univ.), supt. of mills, Chicoutimi Pulp Company, Chicoutimi, Que.

Associate Members.

BARLTROP, Ivan Charles, B.A. (Cambridge Univ.), engr., Canada Land & Irrigation Co. Ltd., Medicine Hat, Alta.

BEATON, George, shops supt., Dominion Iron & Steel Company, Sydney, N.S.

CHISHOLM, Christopher Ronald, of New Glasgow, N.S.

HUME, Duncan Clive Mackenzie, (City & Guilds of London Inst.), squadron leader in charge of technical services, Camp Borden, Ont.

MARTIN, Robert McCreadie, B.Sc. (Univ. of Alta.), of Evansburg, Alta.

MICHAUD, Joseph Arthur, asst. engr. dept. of public works, Ontario, Toronto, Ont.

MORROW, Thomas Maclellan, B.Sc. (McGill Univ.), field engr., Shawinigan Engineering Company, La Gabelle, Que.

Juniors.

BRICKENDEN, William Thomas, B.A.Sc. (Univ. of Tor.), sales engr. and asst. mgr. A. W. Cash Co. of Canada Ltd., Toronto, Ont.

DRAKE, Robert Ludlow, junior engr., Reclam. Service, Dept. of the Interior, Ottawa, Ont.

HIGGINS, Thomas James, mgr., Ross Engrg. Co. of Canada, Montreal.

SAMPSON, Cyrus Dexter, designing and dfting., Dominion Coal Company, Ltd., Glace Bay, N.S.

Transferred from the class of Associate Member to that of Member.

COLLIER, Ernest Victor, Lieut.-Col., D.S.O., with Anglo-Persian Oil Co. Ltd., Maidan-i-Napthun, Persia.

Transferred from the class of Junior to that of Associate Member.

STEPHENSON, George Elgin, B.A.Sc. (Univ. of Tor.), county engr. and road supt. of Bruce county, Ontario, residing at Walkerton, Ont.

SWAN, Albert William, B.A.Sc. (Univ. of Tor.), in charge works office and progress for Sterling Telephone Co., Dagenham, Essex, England.

YOUNG, Frank Bennett, asst. canal supt., C.P.R., D.N.R., Strathmore, Alta.

Transferred from the class of Student to that of Associate Member.

MEADD, Howard Elliott, B.Sc. (Queen's Univ.), designing engr., Backus, Brooks & Co. and allied interests, Fort Frances, Ont.

PEARSE, Warwick G., B.Sc. (Queen's Univ.), designer, works dept., City of Toronto, Ont.

SMITH, Campbell Taylor, B.A.Sc. (Univ. of Tor.), member of firm, Rutherford and Smith, St. Catharines, Ont.

Transferred from the class of Student to that of Junior.

DECARTERET, Helier St. George Squares, B.Sc. (Dalhousie Univ.), struct'l dftsman., Trussed Steel Company, Youngstown, Ohio.

IBBETSON, Neale Roberts, charge of reinf. for Cooper Wideman Construction Co. on new sewage disposal plant for town of Springwells, Mich., U.S.A.

McLEAN, Basil M., B.A.Sc. (Univ. of Tor.), petroleum engr., The Sloan and Zook Company, Eldred, Pa.

The following Students were admitted:—

ANDREWS, Donald Cochrane, 68 Arlington Avenue, Westmount, Que.

GRIESBACH, Robert James, Collingwood, Ont.

LLOYD, David Stevenson, Sault Ste. Marie, Ont.

PIPPY, George Alexander, Sackville, N.B.

EMPLOYMENT BUREAU

Situations Wanted

Mechanical Engineer

Mechanical engineer, graduate, A.M.E.I.C., professional engineer of Quebec. Eighteen years experience in mechanical design and construction, factory and power plant, maintenance and operation, production and costs. Good executive ability and aggressive. At present employed as assistant chief engineer of one of the largest industrial plants in the Montreal district. Desires position as chief engineer of industrial plant. Apply box 130-W.

Structural Engineer

Structural engineer, A.M.E.I.C., age 32, varied experience as draughtsman, checker and designer on steel and concrete buildings, hydro-plants, etc., with bridge companies and engineers. At present engaged would change to more progressive concern with assured future. Box No. 129-W.

Situations Vacant

Mechanical Engineer

Opening in an engineering department for an assistant of good training and initiative, with a few years experience along mechanical and paper mill lines. Apply Box 63-V.

Structural Engineer

Structural engineer wanted, experienced in designing steel buildings and bridges, with knowledge of costs. Good opening in executive capacity. Box 61-V.

Royal Canadian Engineers

Through the deputy minister of the Department of National Defence, G. J. Desbarats, C.M.G., M.E.I.C., advice has been received that a few vacancies can be arranged in the near future for the appointment to commissions in the Royal Canadian Engineers. The conditions under which the appointments are made and the rates of pay allowances laid down for the various grades of officers are shown below.

Extracts from paras. 167 and 168 King's Regulations and Orders for The Canadian Militia, 1917.

167. To be eligible for a commission on first appointment to a Corps of the Permanent Active Militia a candidate must be:—

(a) certified by a medical board to be physically fit for military service in accordance with App. VI., Regulations for the Canadian Medical Service, 1914;
(b) between the ages of 18 and 25 on the 1st day of January in the year in which he would be first appointed;
(c) unmarried, and
(d) he must either—
  (i) possess a diploma of graduation or a certificate of military qualification from the Royal Military College of Canada, and be recommended by the Commandant; or
  (ii) Hold a commission in the Active Militia; possess the literary qualifications laid down in para. 168; obtain the long course certificate prescribed in para. 169; and be recommended by the Commandant, R.M.C.; or
  (iii) have served satisfactorily for a period of at least six months as a combatant officer in His Majesty's regular forces, and, if a candidate for the artillery or engineers, in a corresponding arm; or
  (iv) while on active service with a British force have held a combatant commission (if in artillery or engineer candidate, in a corresponding arm), for a continuous period of at least one year, be recommended by the Commanding Officer under whom he served, and possess the literary qualifications laid down in para. 168.

168. A candidate will be accepted as possessing the necessary literary qualifications, referred to in the preceding paragraph, if he:—

(a) has passed the entrance examination to the R.M.C. of Canada, or
(b) has held a combatant commission in His Majesty's regular forces; or
(c) has passed the matriculation examination of a Canadian University or of any chartered British University; or
(d) has obtained a leaving certificate from one of the educational bodies recognized by the Army Council, or a certificate accepted by the Board of Examiners as the equivalent thereof; or
(e) has passed the literary examination laid down in para. 773

Proposed Code of Ethics

In *The Journal* of October nineteen twenty-two there was published a suggested Code of Ethics transmitted with the report of the joint committee on a code of ethics for engineers compiled by representatives of the Founder Societies of the United States, under the chairmanship of Mr. J. G. Christie. It was also announced that a committee had been appointed by the Council to consider this report and the suggested code.

Since then the committee reported making slight alterations and an expression of opinion was requested from the entire corporate membership. In view of these replies the committee has amended its report somewhat, making it more closely approximating the original suggestion of the joint committee of the American societies.

Letter of Transmittal

October 27th, 1923.

Dear Sir:—

The Committee on the Code of Ethics has examined the replies received to date and begs to submit a progress report in connection with its work.

The following is an analysis of the replies received.

1.	Votes in favour, signed, with and without comments	720
2.	Votes against, signed	12
3.	Votes in favour, unsigned	34
4.	Votes against, unsigned	1
5.	No vote, but signed	21
6.	Miscellaneous	134
	Total received	922

Of the 134 miscellaneous votes, the most are in favour of the Code, but considerable valuable criticism and discussion was submitted in connection with Articles 9, 10 and 11, and a few sent discussions regarding Articles 5 and 6, and there are scattered comments on one or two of the other sections.

After considering all the replies received your committee has redrafted the proposed Code and a revised draft is attached hereto for the consideration of Council.

It will be noted that there is practically no change in the spirit of Articles 1, 2, 3, 4, 5, 7, 11 and 12, and that Articles 6 and 8 have been combined. New wording to make the meaning clearer is suggested for Articles 4, 5, 6 and 8. Article 9 has been omitted as impracticable of enforcement under present conditions and because it is doubtful if the clause is really a matter of ethics. Article 10 is in somewhat the same category as 9, but part of it has been left in and modified.

A minor change has been made in the proposed procedure for the selection of the Committee on Professional Conduct.

On the whole, the Committee feels that the new draft represents the views of the membership very fairly. We suggest that the Committee be empowered to prepare extracts from a number of the best comments and criticisms for publication in *The Journal* and that the old and new drafts of the proposed Code be also published at the same time.

Yours very truly,

FREDERICK B. BROWN. M.E.I.C.
F. P. SHEARWOOD. M.E.I.C.
Committee on Code of Ethics.

Original Draft

1. — The engineer shall carry on his professional work in a spirit of fairness to employees and contractors, fidelity to clients and employers, loyalty to his Country and devotion to high ideals of courtesy and personal honour.

2. — He should refrain from associating himself with or allowing the use of his name by an enterprise of questionable character.

3. — He shall advertise only in a dignified manner, being careful to avoid misleading statements.

4. — He shall regard as confidential any information obtained by him as to the business affairs and technical methods or processes of a client or employer.

5. — He shall have no interest, direct or indirect, in any materials supplies or equipment used in the construction work of his client or in any firms receiving contracts for his client's work, without in advance informing his client of the nature of such interest and obtaining his sanction.

6. — He shall refrain from using any improper or questionable methods of soliciting professional work and decline to pay or to accept commission for securing such work. He shall not compete with another engineer for employment on the basis of professional charges by reducing his usual charges and attempting to underbid after being informed of the charges named by the other engineer.

7. — He shall accept compensation, financial or otherwise, for a particular service from one source only, except with the full knowledge and consent of all interested parties.

8. — He shall not use unfair means to win professional advancement or to injure the chances of another engineer to secure and hold employment.

9. — He shall refrain from tendering on competitive work upon which he may be professionally acting as engineer and also from acting as consulting engineer in connection with any work upon which he may be acting as contractor.

10. — He shall discourage the practice of consulting engineering by manufacturers and contractors, and endeavour to have all engineering plans and other documents signed by the engineer directly responsible for them.

11. — He shall not review the work of another engineer for the same client, except with the knowledge or consent of such engineer, or unless the connection of such engineer with the work has been terminated.

12. — He should co-operate in upbuilding the engineering profession by exchanging general information and experience with his fellow engineers and students of engineering and also by contributing to the work of engineering societies, schools of applied science and the technical press. He should interest himself in the public welfare.

Administration.—The Council of *The Institute* shall appoint a standing Committee on Professional Conduct, which shall include representatives of various interests, to administer the Code of Ethics. The duties of such a committee shall be to interpret the code and to render opinions on any case of questionable conduct on the part of members, that may be submitted to the committee. These interpretations shall be reported to the Council of *The Institute* who may approve them or take such other action as may seem just and expedient. The report of the Committee on Professional Conduct, when approved by the Council, shall be printed in abstract and in anonymous form, in the annual report of *The Institute* for the instruction and guidance of members.

The Committee on Professional Conduct shall be appointed by the Council holding office at the time of the adoption of this Code, and shall consist of five members, one appointed for five years, a second for four years, a third for three years, a fourth for two years and a fifth for one year only. Thereafter, the Council then holding office shall appoint one member annually to serve for five years, and shall also fill any vacancies that may occur for the unexpired term of any member who has withdrawn. These appointments shall be made from among the elder members of *The Institute* so that advantage may be obtained from their experience and judgment. The committee after appointment shall elect its own chairman and secretary. The committee shall have power to secure evidence or other information in any particular case, not only from *The Institute's* own members, but if it should seem desirable, from men in other professions. The committee may also appoint a sub-committee to consider certain cases when deemed necessary.

This committee shall investigate all complaints submitted to it by the secretary of *The Institute* bearing upon the professional conduct of any member, and after the member involved has been given a fair opportunity of being heard, shall report its finding to the Council of *The Institute*, with its recommendations.

The Council of *The Institute* shall have the power to act on the recommendation of the Committee on Professional Conduct, either (1) to censure by letter the conduct of the member who has acted contrary to the code, if the breach is of a minor character, or (2) to cause the member's name to be temporarily or permanently stricken from the roll of *The Institute*, or (3) to proceed against the member as provided by law.

Comments

The following comments apply to the draft of the Code of Ethics as first sent out to the membership, and were submitted by various members in connection with the request for criticism of the proposed code.

Clause 1. Object satisfactory, but does not properly cover the case of an alien engineer practising in Canada.

Clause 4. Does this clause prevent the use of his own data on a research for his firm after terminating his employment? Some firms have made unfair contracts with chemists in this respect.

Do not see why an engineer in taking a new position, is not entitled to install improved methods, which were practised by a former employer.

Clause 5. The extreme case of the conditions of this clause makes it unacceptable to me. Why should I tell my client that I own five shares of a bridge company's stock just because this bridge company is supplying the steel for a job I am engineering?

It seems that the word "financial" should be inserted before the word "interest" in the first and fourth lines in clause No. 5.

An engineer's interest in materials, etc., should be of the highest order.

I think this might rather be given as sound advice than laid down as law! If one does not rob a man, there is nothing dishonest in neglecting to tell him one could if so minded.

Clause 6. I have established agencies in various foreign countries and in two or three places in the U.S.A. These are held by engineers who do not specialize in my line but who solicit work for me. If they are successful in securing any they receive a certain fixed percentage of the fee. They often advertise themselves on their letterheads as my representatives, and everything is on the square and above board. This I deem to be perfectly legitimate and ethical, but perhaps *The Institute* does not. I should like to hear from *The Institute* on the matter.

This is very applicable to consulting engineers. The American Societies are proposing to collect a fee from all their members who obtain employment through the Society employment agency. This should be taken into account in this article.

Clause 8. While I consider it a duty to uphold the interests of other engineers, there are times when duty to ones client may necessitate a criticism of engineers on his staff; how does this clause apply to such a case.

Clause 9. This is good advice but I think should not be made law. An honest man may be a partner in a firm of contractors and also engineer on the job. To act honestly in these two positions need not be unprofessional conduct.

Will this prevent firms such as X-Y-Z from designing and carrying out the construction? If so I don't think it can be enforced.

Does the word "contractor" mean any firm who installs work for an owner. Is there any distinction between doing the work at a fixed cost after competing for same or doing the work by buying the material, hiring labour for the owner and receiving percentage on same? In the latter case I do not see why consulting work cannot be done at the same time by the same firm if they are qualified to do so. Most of the large engineering firms to-day purchase materials and install plants for the owners as well as design them.

I object to section 9 as there is a regular part of our business to both advise upon and tender upon gear work. The matter of giving technical advice is so inextricably mixed in with the actual supply of gear drives that we would not attempt to separate them.

Clauses 9 and 10. My reason for voting no against paragraphs 9 and 10 is that upon many cases in my capacity as consulting engineer I am called upon to give recommendation regarding work which is directly allied to my business as contractor, and very frequently I am instructed to carry my recommendations to a conclusion. In so doing, I feel that I am not breaking any proper code of ethics, but on the other hand of assisting my client and the profession as a whole, as I consider my company is more capable of carrying out my own recommendations than is anyone else.

Clause 10. I think such consulting work is permissable if done by an engineer properly authorized, and if plans, etc., are signed by him.

It seems to me that the "Code of Ethics" as drawn would be a very proper one for an association of consulting engineers, but for an *Institute* like ours where the consulting engineers are only a very small proportion of the membership and in which I think it can be claimed that there are equally prominent engineers advising governments, corporations and contractors, Clause 10 of the Code transgresses every principle of ethics in setting up the consulting engineer as above the very large majority of the membership.

Although I object to engineers employed by manufacturers and contractors doing consulting engineering free of charge, nevertheless I do not think they should or even can be excluded from a certain amount of consulting engineering work. I would therefore suggest the word "free" be inserted before the word "consulting" and paragraph 10 would then read "He shall discourage the practice of free consulting engineering, etc."

Is not fair to certain engineers in the employ of large manufacturing companies. They are rendering service for their employers in a consulting capacity that very few independent engineers could give and it is given not only to companies who are clients of their employer but also to other consulting engineers in the profession.

If the manufacturer or contractor has information to give why should it not be accepted for what it is worth either by laymen or engineer, the latter of whom would probably require proof.

Specialty manufacturers are in some cases in a better position to give advice than the consulting engineers.

In my opinion article 10 needs revision. Some of the best works of the Age have been made possible by the engineering organization maintained by large manufacturing and contracting concerns.

There are some kind of consulting engineering, as matters stand now that can be done better by manufacturers of special or intricate machinery, than can possibly be done by any independent consulting engineer. For example, the development of almost all electrical machinery has been in the hands of a comparatively few men in the engineering and drafting offices of a very limited number of companies, and the number of independent consulting engineers who are competent to pass on all engineering details of any electrical installation is so small that the construe Section 10 literally, would bring about an impossible situation in taking of responsibility for electrical installations.

Many engineers, including myself, avail themselves of special technical consulting advice from the engineering department of manufacturing concerns.

Am unable to concur without some understanding as to what is involved in "consulting engineering". Engineers in private practice or in permanent employ of an individual or organization usually find it most advantageous to consult with engineers in employ of manufacturers of particular equipment from time to time.

Clause 11. "With the knowledge or consent of such engineer." Why both the underlined words? If the obligation is to secure the consent of such engineer, the word knowledge is superfluous because consent cannot be obtained without knowledge. On the other hand if it is considered sufficient to simply advise such engineer that one is going to review his work why make the regulation to some extent indefinite by hinting at something more.

Would suggest that the words "or consent" be eliminated as it is sufficient for the other engineer to know that his work is being reviewed and I cannot imagine any case where it would be unethical on the part of one engineer to review the work of another without having the consent of the latter to do so. If a client is not satisfied with the work of his first engineer he should be at perfect liberty to have the work of this engineer reviewed and the reviewing engineer should as a matter of ethics advise the first engineer that he intends to do so.

While the "consent of such engineer" is desirable it should scarcely be made a necessity. This might result in putting the client in the power of an individual engineer, which would be unfair to the client and eventually harmful to the profession.

This clause would appear to prohibit an engineer, employed by the directors of a group of enterprises in a consulting capacity, from criticizing the management of a subsidiary enterprise.

There are black sheep in every flock and if one of those undesirables were discovered by his employers in the middle of carrying out an important project should it be necessary for the employer or the new engineer, whom the employer might, for self preservation, be compelled to consult, to notify the "coloured" individual that his work was about to be investigated by one of his confreres?

I would approve No. 11 if "Consent" were omitted. An employer might be blocked in securing necessary advice to correct errors.

Clause 12. The last line of this clause is scarcely a question of ethics, although I approve of the suggestion.

The one matter I draw attention to is the last paragraph of Section 12, "He should interest himself in the public welfare". From the point of view of the committee who have drawn this up, I believe the sentence is good and had real meaning, but we have come to the point, professionally, of looking upon public welfare as something like a glorified soup-kitchen, so that I do not like it in this connection. I do not think it adds anything to the Code of Ethics. If someone will submit a new wording which will convey the real purpose of public interest without using the word "welfare", I would have no objection whatever to leaving it in, but the present word, I strongly recommend to the Committee that they should eliminate that particular paragraph.

Administration. It should be clearly understood that it is the duty of *The Institute* to secure the evidence and that the onus of proving the misdemeanours or breach of ethics should not rest upon

the complainant. That is to say that the offence should be considered as being against *The Institute* as a whole rather than against the individual.

Any action taken under Sec. 31 of the By-Laws will doubtless give rise to all kinds of ill-feeling if unsuccessful although taken in perfectly good faith and it would be better if the complainant remain in the background after the Council is satisfied as to the justice of complaint.

A deposit sufficient to protect members against expense entailed in defending "complaints not proven" should be required of all complainants.

General Comment. There is no call for an artificial "Code of Ethics". The suggestion is either child's play, or in the nature of an insult to the members of *The Institute*. Are engineers on such a low moral plane that a club in the shape of a threat of expulsion is necessary to induce them to treat others in a civil and just manner? What further criterion of ethics is needed than to treat others as one would desire to be treated under similar circumstances? This "code" has been known at least since the days of Confucius.

If such a "Code of Ethics" as we are now to vote upon should be established I shall mention it only with shame, as I have a far higher conception of the honour and integrity of the members of *The Institute*.

It might be advisable to include most of the above code in the University curriculum. It is not necessary for engineers who have a good moral standard of their own. The others will have little compunction in breaking it, and may even be pleased to accept questionable work, etc., turned down by the more conscientious.

Additional suggested clause. He should as arbitrator or umpire, in a proceeding of arbitration give reasons for his decisions.

Revised Draft

Revised draft by Frederic B. Brown M.E.I.C., and F.P. Shearwood, M.E.I.C., after reviewing nine hundred replies from members.

1. — The engineer shall carry on his professional work in a spirit of fairness to employees and contractors, fidelity to clients and employers, and devotion to high ideals of courtesy and personal honour.

2. — He shall refrain from associating himself with or allowing the use of his name by an enterprise of questionable character.

3. — He shall advertise only in a dignified manner, being careful to avoid misleading statements.

4. — He shall regard as confidential any information imparted to him as such as to the business affairs and technical methods or processes of a client or employer.

5. — He shall inform his client or employer of any business connections, interests or circumstances which may be deemed as influencing his judgment or the quality of his services to his client or employer.

6. — He shall avoid attempting to obtain employment or professional engagement or advancement by competitive underbidding, by unjustly criticizing other engineers, or by other improper or questionable methods.

7. — He shall accept compensation, financial or otherwise, for a particular service from one source only, except with the full knowledge and consent of all interested parties.

8. — He shall discourage the practice of free engineering designing and advice by manufacturers and contractors.

9. — He shall not review the work of another engineer for the same client or employer, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.

10. — He shall co-operate in upbuilding the engineering profession by exchanging general information and experience with his fellow engineers and students of engineering, and also by contributing to the work of engineering societies, schools of applied science and the technical press.

The Council of *The Institute* shall appoint a standing Committee on Professional Conduct, which shall include representatives of various interests, to administer the Code of Ethics. The duties of such a committee shall be to interpret the code and to render opinions on any case of questionable conduct on the part of members, that may be submitted to the committee. These interpretations shall be reported to the Council of *The Institute* who may approve them or take such other action as may seem just and expedient. The report of the Committee on Professional Conduct, when approved by the Council, shall be printed in abstract and anonymous form, in the annual report of *The Institute* for the instruction and guidance of members.

The Committee on Professional Conduct shall be appointed by the Council holding office at the time of the adoption of this Code, and shall consist of five members, one appointed for five years, a second for four years, a third for three years, a fourth for two years, and a fifth for one year only. Thereafter, the Council then holding office, shall appoint one member annually to serve for five years, and shall also fill any vacancies that may occur for the unexpired term of any member who has withdrawn. These appointments shall be made from among members of *The Institute* selected as representative of various branches of engineering so that advantage may be obtained from broad experience and judgment. The committee after appointment shall elect its own chairman and secretary. The committee shall have power to secure evidence or other information in any particular case, not only from *The Institute's* own members, but if it should seem desirable, from others as well. The committee may also appoint a sub-committee to consider certain cases when deemed necessary.

This committee shall investigate all complaints submitted to it by the secretary of *The Institute* bearing upon the professional conduct of any member, and after the member involved has been given a fair opportunity of being heard, shall report its finding to the Council of *The Institute*, with its recommendations.

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Association of Professional Engineers of the Province of Ontario

The fourth and last quarterly meeting of the council was held in Toronto on October 13th. At this meeting the report of the executive and the financial statement were adopted; a Code of Ethics approved; and the nominating committee were appointed and an auditor for the fiscal year ending October 31st, 1923.

On or before November 1st, the nominations for president, for vice president and for ten councillors are to be mailed to the registrar, who shall prepare a ballot and send a printed copy to each registered member on or before December 1st. These ballots are to be returned on or before December 31st, 1923.

With the Ballot will be sent to members a printed copy of List of Members and Financial Statement.

Registrations to October 13th, 1923		Deduct the following	
Civil branch	659	Members who have died	3
Mechanical	93	Registrations deferred	2
Chemical	21	To be cancelled	1
Electrical	155		
Mining	105		
Total	1,033		

The Registrations at October 13th, 1923 are therefore 1,026

Nova Scotia Power Commission signs Contract for Large Block of Power

The Nova Scotia Power Commission of which K. H. Smith, M.E.I.C., is chief engineer, has recently signed a contract with the Albany Perforated Wrapping Paper Company of Albany, New York, to furnish that company at West River, Sheet Harbour, with 4,600 h.p., of electric energy. The price for this power delivered at 2,300 volts is about $21.30 per h.p. per year.

For the purpose of furnishing this power the commission will erect a second generating station on East River Sheet Harbour. This station will operate at a head of about 100 feet and will have an ultimate capacity of about 9,000 h.p. It willl be erected at tidewater about four miles below the development at Malay Falls on the same river which the commission is just now completing.

Engineering Firms Amalgamate

A new organization to be known as Babcock-Wilcox and Goldie-McCulloch, Limited, has taken over the Canadian business of Babcock and Wilcox, Limited, and the business of Goldie and McCulloch Company, Limited, with the exception of the vault, safe and safety deposit department of the latter company. The capitalization of the new company is three million dollars, with head offices and works at Galt, Ontario, and branch offices in Vancouver, Winnipeg, Toronto, Montreal and the eastern provinces. The business of the new company will be under the direct management of R. O. McCulloch and A. R. Goldie. The new company will continue the manufacture of Babcock-Wilcox boilers, super heaters, economizers, stokers and boiler accessories, and the Goldie-McCulloch engines, pumps, turbines, condensers, and other power equipment.

Trade Publication

De Laval Steam Turbine Company are distributing a twelve-page phamphlet, describing the De Laval flexible coupling, which may be secured upon application to the company's Trenton, New Jeesey, office.

Official Opening of St. John Drydock

An event of interest in engineering circles occurred in St. John on October 29th, when the drydock at Courtenay bay was opened for the first time and a ship docked for repairs. It had been planned to dock one of the boats of The St. John Drydock and Shipbuilding Company Ltd., the builders and owners of the drylock, for demonstration purposes at the official opening, but a few days previously the Norwegian tramp stramer, M. H. Konshaven, Captain John Palander, reached port partly disabled and in need of a survey of hull below water line. The necessity for this drydock was shown before it had been barely completed.

The date of opening had been set several months in advance when much construction work remained to be done. However the drydock was in readiness for opening ceremony which was performed by Lord Byng, Governor-General of Canada. Included in the guests in attendance were:—Lt. Gov. Todd of New Brunswick and Lt. Gov. Cockshutt of Ontario, Grant Hall, A.D. McTier of the Canadian Pacific Railway, Sir Henry Thorton, J. C. Dalrymple, S. J. Hungerford, M.E.I.C. of the Canadian National Railways, Hon. Dr. J. H. King, K. M. Cameron, M.E.I.C., chief engineer of the department of Public Works, Hon. F. B. Carvell of the Board of Railway Commissioners, Lt. Col. E. G. M. Cape, M.E.I.C.

The marine slipway had been completed to such an extent that a tug was hauled out on it before the opening day. Some work remains to be done to complete reinforced concrete buildings and to install machinery in the several shops.

The manager of The St. John Drydock and Shipbuilding Company Ltd., is F. M. Ross. Other members of *The Institute* connected with this company include E. G. Cameron, A.M.E.I.C., chief engineer, V. S. Chesnut, A.M.E.I.C., N. K. Cameron A.M.E.I.C., W. V. Delaney, S.E.I.C., C. S. Bennett Jr. E.I.C., C. C. Langstroth, S.E.I.C.

The directors of this company are James Playfair, Midland, Ont., D. S. Pratt, Toronto, George McAvity, affiliate E.I.C., St. John, W. E. Phin, Hamilton, Ont., W. J. Sheppard, Waubauschene, Ont., Lt. Col. Thomas, A. Duff, Toronto, James B. Craven, New York, John E. Moore, St. John, F. W. Grant, Midland, Ont. and D. L. White Midland, Ont.

1. C. S. Bennett.
2. W. H. Chisholm.
3. R. E. Armstrong.
4. F. W. W. Doane.
5. Mrs. F. W. W. Doane.
6. C. A. Fowler.
7. N. F. Ballantyne.
8. H. D. Macauley.
9. R. B. Turner.
10. G. N. Hatfield.
11. W. F. Miller.
12. H. S. Van Scoyoc.
13. F. A. Bowman.
14. G. H. Waring.
15. J. Cumberford.
16. J. F. Paige.
17. P. E. Porter.
18. L. L. Theriault.
19. P. A. Freeman.
20. Lt.-Governor W. F. Todd.
21. Frank M. Ross.
22. R. Goldie.
23. John H. Clarke.
24. C. H. Wright.
25. V. S Chestnut.
26. G. G. Murdoch.
27. Moses Burpee.
28. W. F. McKnight.
29. Barry Wilson.
30. Herbert Phillips.
31. H. R. Logie.
32. K. C. Cairns.
33. R. Moore.
34. B. E. Bayne.
35. W. T. Earle.
36. G. A. Vandervort.
37. J. A. Moore.
38. A. A. Dodge.
39. J. S. Vaughan.
40. T. E. D. Snow.
41. E. A. Thomas.
42. A. R. Crookshank.
43. P. McKenzie.
44. K. L. Dawson.
45. E. T. Cain.
46. Prof. F. R. Faulkner.
47. H. A. Brown.
48. B. Faraday.
49. H. G. Evans.
50. B. E. Norrish.
51. Fraser S. Keith.
52. W. G. Chace.
53. G. G. Hare.
54. F. P. Shearwood.
55. Geoffrey Stead.
56. G. T. Medforth.
57. G. E. Martin.
58. F. G. Goodspeed.
59. H. F. Bennett.
60. A. G. Tapley.
61. W. F. Burdett.
62. G. S. Macdonald.
63. D. W. Munn.
64. C. M. Crooks.
65. H. E. Barnett.
66. A. A. Turnbull.
67. Prof. F. L. West.
68. J. M. Lamb.
69. C. McN. Steeves.
70. B. Allen.
71. R. H. Cushing.
72. S. C. Webb.
73. Dr. E. A. Smith.
74. James Gilchrist.
75. F. P. Vaughan.
76. S. R. Weston.
77. J. N. Flood.
78. A. E. Oulton.
79. J. S. Armstrong.
80. K. M. Cameron.
81. A. L. Brown.
82. G. L. Dickson.
83. W. Harrison.
84. E. G. Cameron.
85. W. J. Johnston.
86. F. W. Holt.
87. J. A. Grant.
88. J. T. Turnbull.
89. M. J. Murphy.
90. K. S. Pickard.
91. G. C. Torrens.
92. Prof. H. W. McKiel.
93. J. P. Mooney.
94. W. J. Fitzpatrick.
95. G. H. Thurber.
96. D. R. Smith.
97. Grover Keith.
98. L. K. White.
99. C. C. Langstroth.

St. John Drydock Facts

Dimensions of drydock.—

Length of keel blocks 1150 feet.
Minimum entrance width 125 feet.
Draft on entrance sill, H.W.O.S.T. 42 feet.
Inner docking chamber length 500 feet.
Outer docking chamber length 650 feet.
Minimum draft entrance wharves, L.W.O.S.T. 32 feet.

Drydock equipment.—

Ten 15-ton capacity electric capstans.
One 15-ton travelling crane, useable at any point around drydock.
One 60-ton fixed derrick on fitting-out wharf.
Compressed air and electrical energy available at all points around drydock.
Self-contained fire protection system.
Sewerage disposal system for docked vessels.
Electrically operated unwatering pumps, capable of emptying drydock in four hours.
Self-contained flood lighting system

Power plant.—

Boiler capacity, normal rating 2,000 h.p.
Generater capacity, 225 o.k.v.a.

Repair shop.—

Machine shop, plate shop, boiler shop, blacksmith shop, joiner shop and loft.

Marine slipway.—

Eighteen hundred tons deadweight capacity. Will accommodate vessels up to 300 feet long, and any draft aft up to 20 feet, with facilities for side slipping.

Rail connection.—

Direct rail connection from main line Canadian National Railways to alongside drydock, marine slip and entrance berths.

Fuel station.—

Crude oil fuel station alongside entrance to drydock.

Construction data.—

Excavation for dock started October 15th, 1918.
Excavation for dock completed July 31st, 1921.
Rock removed, 400,000 cu. yds.
Concrete in dock started July 31st, 1921.
Concrete in dock completed September 22nd, 1923.
Concrete placed, 100,000 cu. yds.
Repair shops started June, 1922.
Repair shops completed October, 1923.
Marine slipway started September 1st, 1923.
Marine slipway completed October, 1923.

Acoustics of Buildings

By F. R. Watson,

Professor of Experimental Physics, University of Illinois, Urbana, Ill.

Reviewed by Douglas Bremner, A.M.E.I.C.

This book may rightly be described as a most valuable contribution to the meagre supply of literature treating upon the important problems of the design of auditoriums for correct acoustical properties, the correction of completed buildings wherein defective acoustics exist, and the treatment of so called sound-proof construction. As might reasonably be expected, a certain amount of mathematical formulae and computations are enumerated, but these have been reduced to a minimum and the author has endeavoured by clear explanations and logical deductions to present the complex problem of acoustics in such a manner as to be readily understood by the engineer or architect who diligently applies himself to the subject under consideration. The chapters treating upon the problems of sound-proof construction such as are encountered in hospital, hotels, apartments and industrial buildings, set forth in a clear and concise manner, the many difficulties presented and describe the result of experiments conducted to overcome the difficulties.

While undoubtedly a great deal remains to be learned regarding the problems of sound-proof buildings, it must be admitted that this book, which is profusely illustrated and written in an interesting manner, will prove of valuable assistance in preventing the design of acoustically defective auditoriums and in remedying the defects in existing buildings. In short, it is a book which can be readily recommended to the designing engineer or architect as an authoritative and most valuable reference upon the subject of acoustics.

This book is published by John Wiley & Sons, Inc., New York.

Announcement of Meetings

Further information may be secured from the Secretaries of the various branches, whose addresses will be found under "Officers of Branches" on page 522 of *The Journal.*

Niagara Peninsula Branch:—
Secretary-Treasurer, R. W. Downie, A.M.E.I.C.

Dec. Mtg. "Symposium on Fuel", at Niagara Falls, Ont.
Jan. Mtg. Address on some phase of electrical development, at Welland, Ont.

Peterborough Branch;—
Secretary, R. C. Flitton, A.M.E.I.C.

Dec. 13th. Lecture on some subject in connection with steam boilers, by T. H. Fenner, A.M.E.I.C., Chief Engineer, General Accident Assurance Company of Canada.
Jan. 10th. Address on "Town Planning", by H. L. Seymour, M.E.I.C., Town Planning Engineer, Toronto, Ont.
Jan. 24th. Details to be announced later.

Saskatchewan Branch:—
Secretary-Treasurer, D. A. R. McCannel, A.M.E.I.C.

Dec. 13th. Address on "International Finance", by Professor W. W. Swanson, University of Saskatchewan.
Jan. 10th. Address on "The Hudson Bay Route", by J. A. Campbell, Commissioner Northern Manitoba.
Jan. 24th. Joint Meeting with Engineering Society of University of Saskatchewan by telephone. Address to be delivered in Saskatoon.

Winnipeg Branch:—
Secretary-Treasurer, P. Burke-Gaffney, A.M.E.I.C.

Nov. 15th and Dec. 6th. Address on "The Economics of Transportation", by Messrs. J. G. Sullivan, M.E.I.C., H. A. Dixon, A.M.E.I.C., J. Sanford Evans, J. W. Porter, M.E.I.C., and Dr. Wallace.
Dec. 20th. Address on "Concrete Mixtures", by W. Walkden, A.M.E.I.C.
Jan. 3rd. Address on "The Composition of Matter", by Rev. Father Morton.
Jan. 17th. Annual Meeting — Association of Professional Engineers.

Montreal Branch:—
Secretary-Treasurer, E. A. Ryan, A.M.E.I.C.

Dec. 6th. Civil Section: Irrigation in Brazil. I. W. McConnell.
Dec. 13th. Electrical Section: The Effect of Power Factor, Load Factor and Diversity Factor. Prof. C. V. Christie, A.M.E.I.C.
Dec. 20th. Annual Meeting of the Branch. Confirmation of the Election Results.

Lethbridge Branch:—
Secretary-Treasurer, George S. Brown, A.M.E.I.C.

Dec. 1st. Address on "Construction and Maintenance of the Banff-Windermere Road (Illustrated), by C. A. Davidson, Construction Engineer, Province of Alberta.
Dec. 15th. Address on "Fire Fighting and First Aid", by Fire Chief Hardy, Lethbridge, Alta.

Toronto Branch:—
Secretary-Treasurer, J. A. Knight, A.M.E.I.C.

Dec. 6th. Address on "Inspection of Materials", by R. J. Marshall, M.E.I.C., President of the Canadian Inspection and Testing Co., Ltd.
Dec. 13th. Address on "Heating", by F. R. Ewart, M.E.I.C., of Ewart Jacob, Armer and Byam, Limited.

A.S.T.M. Tentative Standards

American Society for Testing Materials. The 1923 edition of the American Society for Testing Materials Tentative Standards has just been issued. This volume contains 170 tentative standards issued by the Society as follows:—

No.	*Relating to*	*No.*	*Relating to*
23	Steel, wrought and cast iron.	3	Timber.
12	Non-ferrous metals.	14	Waterproofing.
26	Cement, lime, gypsum and clay products.	7	Insulating materials.
		4	Shipping containers
16	Preservative coatings.	10	Rubber products.
17	Petroleum products and lubricants.	7	Textile materials.
38	Road materials.	3	Thermometers.
4	Coal and coke.	6	Miscellaneous

The term "tentative standard" as distinguished from "standard" is applied to a proposed standard which is printed for one or more years with a view of eliciting criticism, of which the committee concerned will take due cognizance before recommending final action toward the adoption of such tentative standards by formal action of the society.

BRANCH NEWS

Hamilton Branch

W. F. McLaren, M.E.I.C., Secretary-Treasurer.

The branch opened the winter season with a dinner at the Royal Connaught hotel at 6.30 p.m., on November 1st, 1923, when we had the pleasure of having President Walter J. Francis, M.E.I.C., and General Secretary Fraser S. Keith, M.E.I.C., as our guests. Unfortunately our Chairman, J. W. Tyrrell, M.E.I.C., was called away on important business, our vice-chairman, W. G. Milne, A.M.E.I.C., was laid up, while our junior past-chairman and our honorary chairman were out of town. However, the chair was ably occupied by our old reliable Bob Palmer, M.E.I.C., chief engineer of the Hamilton Bridge Works. After a few introductory remarks in his inimitable manner, he called upon William D. Black, A.M.E.I.C., to introduce the speaker of the evening.

Mr. Francis said it was a great pleasure to meet with the fourteenth branch of the twenty-four now established. The twenty-fourth was the Saguenay Branch at lake St. John, where fifty engineers had gathered together at the opening and listened to an address by Sir William Price, who is building there an hydro-electric plant that compares with Queenston.

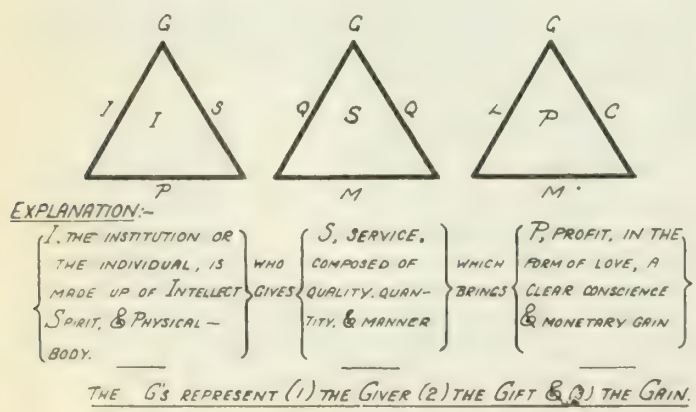
He said the engineers of the United States would like to be in the happy position in which we find ourselves in Canada, in having a national engineering society combining all branches. We are the producers par excellence, but when a university professor asked him, "What is an engineer?", it was small wonder that the public did not know. We must teach them. Our training is as severe as any profession. We are too wrapped up in our individual work. If we saw twelve or fifteen men at a council meeting of the E.I.C., struggling with the problems before them often until midnight and meeting every two weeks, we would appreciate the sacrifice they are making for the membership. Our financial burden is heavy, the expenses to date this year being $68,000.

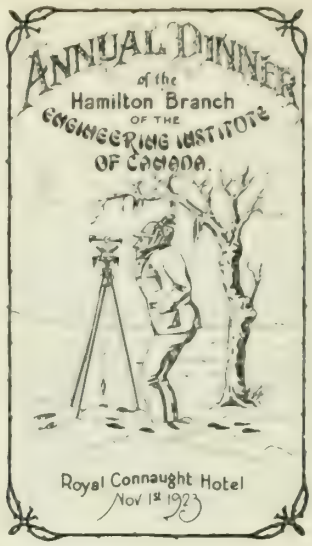
Regarding the circular sent out on "Ethics" about 1,000 replies were received of which 75 per cent approved the rules, but such good points were raised by some of the others, that two rules were being revised.

Regarding "Engineering Students", the speaker said that law students always looked forward to joining their law society and are indeed required to join. We must cultivate the same spirit amongst engineering students. The courses in engineering are so filled with students that we are led to place them in two classes, those who propose following up the engineering profession and those who are taking it merely for the sake of the excellent training.

Referring to the "Fuel question in Canada", the speaker said it was one of the most serious facing Canada to-day, even more so than transportation. *The Institute* has a strong committee working on this problem and good work is also being done by the branches, including the Hamilton Branch.

The speaker closed his address with an eloquent appeal as to our duty in *citizenship*. *Character* is greater than *career* and is developed by service to the community. If we are engineers only, we fall short in our duty. The speaker referred to the principles of *Rotary*. After developing friendship and mutual confidence, then what about service. He profits most who serves best. This he illustrated on the blackboard by the following diagram.





Major Alan Mair Jackson, A.M.E.I.C., made a witty speech introducing Fraser S. Keith, M.E.I.C., who however said that he would like to reserve his address for some future time.

Mr. Fryer, president of the Ontario Society of Architects, extended greetings, and N. R. Robertson, of the legal profession, gave a humourous address.

During the dinner, singing was indulged in and some good solos were rendered by Robt. McFarlane. The bill of fare was the work of one of our members.

The meeting was pronounced one of the best we have had.

Edmonton Branch

W. R. Mount, M.E.I.C., Secretary-Treasurer.

On November 8th, 1923, the first meeting of the 1923-4 season was held. E. G. Hill chief engineer and general manager of Northwestern Utilities, Ltd., was the speaker of the evening.

Some Engineering Details of a Natural Gas Plant

Mr. Hill's company has recently delivered natural gas from Viking to Edmonton for commercial and domestic uses. In consequence of the realization of this long talked of amenity, a meeting with an attendance well above the average in numbers was present to hear Mr. Hill's informal address: "Some Engineering Details of a Natural Gas Plant", as applied especially to the local plant.

It was shown by the speaker that production, transmission, and distribution were the three main features of the Plant.

Engineers had to co-operate with geologists in interpreting the latter's field notes, before it could be decided where and how to drill. The engineer carries out the drilling with apparently antiquated machinery, although he has modernized this old machinery in such a way that same is economical today. At Viking the wells are connected to the main regulating station by steel piping, the same being amply provided with drip-cocks, separators, etc., to take up condensation.

The most modern equipment has been put into the regulating station at Viking, including orifice meters for measuring purposes. The main line consists of 41 miles of 12-inch steel pipe and 36 miles of 10-inch steel pipe; is well located and although passes through some rough country presented no undue difficulties. The S. R. Dresser stuffing-box type of pipe coupling is used throughout, being the best joint known for natural gas purposes; specific gravity of gas in question is 0.62. The trench varies from 3 to 5 feet in depth and is well provided against pipe expansion, condensation, etc.

The main line terminates in a regulating station at city limits, where pressure is reduced from 200 to 25-30 pounds per square inch for intermediate pressure.

The city distribution is by means of intermediate pressure belt lines of 8 inches and 6 inches diameter, feeding into 4-inch low pressure mains and from them to services. Regulating stations are strategically located and equiped with highly sensitive regulators for maintaining a low pressure of 2¾ ounces. All piping is steel and tar-paint coated, laid with apprxomately 24 inches of cover, with dresser joints.

After Mr. Hill's address, which is very briefly summarized above, much added information was brought out. Methods of testing for leaks, manufacture locally of "specials" and oxy-acetylene welding of same, maintenance of lines, organization of crews, etc., and many other points were fully discussed.

Calgary Branch

J. A. Spreckley, A.M.E.I.C., Secretary.
W. St. J. Miller, A.M.E.I.C., Branch Editor.

Oil Refineries Plant

It is with considerable regret that we are unable to publish the interesting paper of C. M. Moore, superintendent of the Imperial Oil Refineries plant, delivered in Calgary this summer. It trasmpires that a ruling exists that such information cannot be divulged for publication prior to full discussion with the directors.

The refinery commenced operations on November 10th, when one of the nine large stills was fired for the first time. This action substantiates the assurance of the local staff that the plant would be operating this fall. The men have been working over time to make up for the delay in arrival of material. The original contract with the city of Calgary called for a 2,500-barrel plant capacity, wherewith the company has planned for a 4,000 barrel capacity. More than 200 men will eventually find permanent employment when running full blast. It was anticipated that the Wyoming oil fields would be relied upon as a source of supply, instead of which the tanks have so far been filled from the Alberta-Montana fields.

Apart from the assured benefits accruing from having a plant of this magnitude in our midst it is to be hoped that a further reduction in the price of gasoline will shortly result.

Precipitation in Calgary District

In view of the exceptionally heavy crop that is being harvested this year it is interesting to note that the precipitation records for the Calgary district show a remarkable increase over the six preceding years, being more than twice the average figure. Taking the figures for the months of April to August inclusive, commonly known as the growing season, and adding to these the precipitation for last September and October there has been a total precipitation of 19.6 inches. On only two occasions has this figure been exceeded during the last 40 consecutive years, namely in 1902 and 1903. During the same lengthy period we find that 15 inches has been exceeded only ten times for the growing seasons. Also that the average figure over the forty years is 12.8 inches.

During the last twenty-five years, up to and including 1922, the average precipitation has been 13.9 inches for these yearly periods and the crop average has been 22.3 bushels per acre. As already mentioned these records are for the Calgary district only which corresponds with the provincial electoral division and therefore includes a certain portion of the irrigated lands east of Calgary, namely the west half of the C.P.R., Western Section tract.

At a recent executive meeting it was arranged that Thos. Lees, A.M.E.I.C., prepare a paper to be read on December 10th, the subject being relative to the quality of water for boiler purposes. This would be read in place of Mr. Dawson's paper previoulsy announced. The latter is to be presented at a later date.

Advocating a more active interest in civic affairs by members of the engineering profession, and emphasizing the responsibility that rests on the engineer as creator of so many fundamental institutions in the community, I. P. MacNab, M.E.I.C., delivered an impressive address before the first of the series of winter season meetings of the Calgary Branch on November 15th, 1923, at the Board of Trade rooms.

Taking as his subject "The responsibility of the engineer in civic affairs," Mr. MacNab opened a line of discussion which was entered into by a number of the members present and was generally accepted as a phase of their work which has been too much neglected by them in the past. Due to engineers being technically trained men and in a world full of technical problems, Mr. McNab expressed the opinion that engineers would be the most capable of executives under the city manager form of government, and that instead of tending to isolate themselves in the technicalities of their particular profession, they owed a debt to the country through their training which ought to be sensed and acted upon.

Toronto Branch

J. A. Knight, A.M.E.I.C., Secretary-Treasurer.
L. W. Wynne-Roberts, A.M.E.I.C., Branch News Editor.

At a meeting of the Toronto Branch on Thursday October 25th, Hon. G. S. Henry, minister of public works and highway in the Ontario government, addressed the members on "The Highways of Ontario".

The Highways of Ontario

Before taking up this subject, Mr. Henry ventured some opinions as a layman on the engineering profession. He said that the engineering profession in this country had great opportunities ahead of it. and thought that an engineer should specialize to be a success, as the man who specialized usually made the greatest headway. According to Mr. Henry, engineers do not take the public into their confidence as much as they should, and as an example, pointed to the question of the Toronto railway viaduct, and further stated that they are not giving information or assistance to solve the various problems which arise.

Dealing with the Ontario highways the minister spoke of the relative needs of various highways, and deprecated the idea of grading and building all roads to an uniform width and type. The correct idea is to build roads that will be serviceable and efficient for the present, suitable for the traffic and the character of the traffic they are to carry. Mr. Henry stated the department was encouraging the counties to build a standard type of road where traffic requires it.

In the three years 1920-21-22 the province gave to counties and townships about three millions of dollars to assist in the maintenance of their roads. Mr. Henry was now desirous of educating the counties to put in a higher class of construction so reducing their maintenance charges, and solving the problem of giving better roads to the people of their county.

In conclusion the speaker appealed to the engineering profession to take part in public life, and as the members had received special opportunities to give the best of their time and talents to the solution of the country's problems.

A vigorous discussion was carried on by Frank Barber, M.E.I.C. J. M. Oxley, M.E.I.C., A. E. Jennings, H. T. Routley, M.E.I.C., and G. T. Clark, A.M.E.I.C., and in replying to various questions, Mr. Henry stated that the maximum load on the highways was ten tons on two axles, seven and one-half being on the rear axle, and that the maximum load on any road will be restricted to what the road is designed to carry. The speed of trucks is also governed by legislation.

Expert Evidence

The meeting of the Branch on November 1st. was held under the auspices of the various engineering organizations in Toronto and proved to be very successful and well attended. The speaker of the evening was the Hon. Justice Wm. Renwick Riddell who gave a very interesting address on "Expert Evidence" to members of the Toronto Branch of the E.I.C., A.I.E.E., A.S.M.E., Canadian Institute of Chemistry, Society of Chemical Industry, and Toronto Chapter of the Illuminating Engineers Society.

Justice Riddell, as pointed out by the chairman, Professor C. R. Young, M.E.I.C., graduated in engineering from Victoria University, forty-seven years ago, and having attained high eminence on the Bench, was particularly well suited to speak to engineers on expert evidence.

His Honour expressed his pleasure in again meeting so many engineers and spoke in part as follows:—

Courts are boards of arbitration to prevent the aggression of the weak, to enable the individual to enjoy happiness owing no obedience except to the laws of the state. Trial at law is the modern civilized substitute for a fight with a club or spear, where men vindicated their rights by physical strength military cunning and cleverness. The employment of a lawyer in these days is equivalent to the obtaining of a champion in the early ages.

Civil law was introduced into Canada in 1792 from England and this law was not a written law, but constituted the customs of the English people which had been declared by judges as such. Whatever legislation may say, the law is exactly what the judges say it is at any particular time. The rules governing conduct and the right of the individual is known as substant of law. Adjective law includes the rules whereby substant of law is applied i.e. rules of practice or methods to be adopted by an individual to obtain his rights. In adjective law witnesses are one of the objects by means of which facts may be established, and persons obtain their rights. Rules of practice, including the question of expert evidence, are framed upon the hypothesis that the normal method of trying parties is by their peers, and also that the trial will be before twelve common men.

There was a time when the primeval jury was composed of 'secta', a retinue of neighbours from the 'vicinage' or vicinity, where the unlawful act was perpetrated, which jury decided the case upon its own knowledge and took countenance of, its own opinions. It is not known where juries originated but they were established within one hundred years after the Magna Carta. Until three hundred years ago witnesses could say what they thought or express their own opinions. Sir Edward Coke, Attorney-General, in the reign of James I, is the first reported lawyer to object to opinion evidence, one of the reasons given being that a judge had to determine and give a positive decision, and secondly it was impossible to indict a man for perjury when he swore only to what he thought.

In civil cases about the beginning of the 18th century the rule was established that a witness must swear to what he knows and in law 'know' means knowledge based upon personal observation. A witness only exercising that knowledge which is ordinarily expected from adult witnesses is not called an expert. In certain cases some witnesses are allowed to give their opinion and this may be called expert evidence. The distinction is drawn between ordinary evidence and expert evidence, sometimes called fact evidence and opinion evidence and sometimes lay evidence and professional evidence, but no terminology is perfectly satisfactory.

The first recorded instance of the use of expert evidence was in 1353 when experts were called in to render assistance to the judge and their communicated knowledge was withheld from the jury. By 1700 this practice disappeared and the present practice came into force

whereby experts may state their opinion upon facts which have been otherwise established.

To be expert, an engineer must have acquired his knowledge by practice or by scientific training. But in order to express his opinion in court an expert witness must first establish qualification by examination to be regarded by the court as such, while an ordinary witness is never first doubted. Opinion evidence is not knowledge obtained from personal observation or knowledge of facts, but is opinion upon these facts.

In closing his address, interspersed by many humorous remarks Judge Riddell gave to the gathering of engineers a code of approved conduct in the witness box. Absolute honesty was the first requisite to the expert witness, he said. A witness should be well prepared, produce standard authority and tell the truth in so convincing a manner that it solicits credulity. A witness should not only " tell the truth but make the truth tell". Evidence should be persuasive and have no, personal element causing distraction. A question should not be answered unti it has been thoroughly understood and then answered briefly and concisely and consistent with the truth.

His Honour remarked that the engineer made the most satisfactory expert witness who came before the courts and trusted that he would keep up his reputation.

After discussion by Professor Bain, A. L. Mudge, A.M.E.I.C., W. J. Hughson, W. Storrie, M.E.I.C., Professor R. W. Angus, M.E.I.C., a very appreciative vote of thanks was tendered Mr. Justice Riddell.

Paper by M. J. Butler, M.E.I.C.

M. J. Butler, C.M.G., M.E.I.C., Past President of the Institute addressed the meeting on November 8th, on "A Method of Calculating a Fair Rate for the Transportation of Western Coal". His interesting paper which was provocative of much discussion, is published elsewhere in this issue as is also the discussion by R. A. C. Henry, M.E.I.C., director of bureau ef economics of the C.N.R.,

Other speakers were H. K. Wicksteed, M.E.I.C., R. H. MacIntyre, and Professor Jackman, department of political science, who said that the matter should be considered from a straight business standpoint and the railways given a reasonable price for carriage. He estimated that it would cost the C.N.R. $9.03 to transport one ton of coal from Alberta to Ontario, and that the cost ot the C.P.R.,would be $9.95, without including interest, depreciation or overhead. He considered the train mile cost not the proper basis as it included all kinds of train, all lengths of train and all kinds of commodities.

S. B. Wass, A.M.E.I.C., of the C.N.R., stated that the cost was made on the assumption that Mallet locomotives would be used. The maximum length of locomotive that could be used was 85 feet, and roundhouse and terminal facilities both on the C.N.R. and the C.P.R. would not accommodate a larger engine.

Professor Tredgold considered that Mr. Butler's estimate for tractive power should be reduced by 15 per cent at a speed of 15 miles per hour. He also pointed out that the resistance used as a basis for computation was insufficient; 6 pounds on the level, and from 20 to 22 pounds on a one per cent grade, (not compensated), should bc eonsidered This would reduce a train to 40 cars and the cost of coal increased to $9.00 a ton and by using the present 60,000-ton locomotive, with a tractive resistance of 20 pounds, the cost would be increased to $13.00 a ton.

Annual Dinner

In place of the annual dinner, the meeting on November 15th. was held in conjunction with the University Engineering Society and a splendid smoker was enjoyed in the East Common Room of Hart House

Those present joined themselves into groups and were taken over Hart House by the students, who derived much satisfaction in guiding their very envious visitors over the building. This perambulation was followed by an excellent programme of music, songs, quartets, boxing and wrestling bouts carried out by the student body under the management of Professor Loudon, M.E.I.C.

Address by the General Secretary

The feature of this part of the programme was an address by Fraser S. Keith, M.E.I.C., general secretary, who spoke of the relationship of the older engineer to the young man, and the interest of the young man in the profession. In asking the question whether the older or established engineer had done all he should to assist the young man, Mr. Keith thought the answer should be 'No' as there were many things an engineer could do to stimulate the interest and activity of the younger students and graduates in the doings of the E.I.C., and the profession generally. The speaker asserted that youth was the time of accomplishment and instanced Hannibal, Napoleon, Watt, the Younger Pitt and many others as men who had performed their most notable achievements before they were thirty. He exhorted the students to accept responsibility, never to shirk hard work, to be careful and painstaking, and above all to cultivate the art of public speaking, so that they might better express their opinions and take their part in the affairs of their profession and the community in which they lived.

On the invitation of the chairman those present, numbering over 140, adjourned to the Great Hall and partook of supper as guests of the branch.

President Francis Reviews the Expansion of The Institute

Professor C. R. Young, M.E.I.C., referred to the pleasure of the branch at the presence of Walter J. Francis, M.E.I.C., president of *The Institute*, at the smoker, and Mr. Francis on rising to speak, expressed his appreciation at being back at Toronto University and speaking to fellow Toike-Oikes. Mr. Francis dwelt upon the expansion of the E.I.C., from its inception and illustrated to the students the great principles for which it stood. He referred to the illustrious engineers who had occupied the presidential chair and remarked upon their loyalty, service and high ideals, in the carrying out of which they had brought *The Institute* to its present high standing. *The Engineering Institute* was a factor in the land, said Mr. Francis, and was recognized as such by the community at large, and would continue to serve in the best interests of the engineers and the public, as long as each and every engineer gave it his loyal and unstinted support in membership, time and influence.

A hearty vote of thanks to all who had contributed to the evenings enjoyment was voted by all present.

London Branch

E. A. Gray, Jr. E.I.C., Secretary-Treasurer.
R. J. Olmsted, A.M.E.I.C., Branch News Editor.

The inaugural fall meeting of the London Branch was held on October 26th, in the Chamber of Commerce, committee room, Tecumseh hotel.

The executive of the London Branch had the pleasure of entertaining at dinner the speaker of the evening, Professor C. R. Young, B.A.Sc., M.E.I.C., professor of structural engineering, university of Toronto, who kindly consented to deliver his address on "The Future of Engineering." He was introduced by C. J. Madgett, A.M.E.I.C., because of "former association."

Professor Young described the struggles of the early engineers, and their achievements. He told how the public confidence had been gained as a result of these achievements; of a demand for the device of these early pioneers because of their success. The demand thus created led the more scientific minds to devote their time to weighty problems, with the result that great strides were made in this profession. He touched more on the ethical side of latter-day engineering, and it was this phase of his address which was responsible for most of the discussion following the conclusion of his address, J. R. Rostrum, A.M.E.I.C., H. Fuller A.M.E.I.C.;, E. V. Buchanan, M.E.I.C., and H. B. R. Craig M.E.I.C., participating in same.

The chairman announced that the resignation of F. J. Bridges, A.M.E.I.C., as secretary-treasurer, had of necessity to be accepted by the executive and that as a token of appreciation of the splendid work performed by him during organization, a small presentation in the form of a silver vase suitably engraved, was to be made to the retiring officer. Mr Bridges acknowledged the gift, expressing his regret at finding it necessary to move from London and the activities of the London Branch.

The following members being present at the meeting:—

E. V. Buchanan, M.E.I.C.	W. M. Veitch, A.M.E.I.C.
R. I. Olmsted, A.M.E.I.C.	H. B. R. Craig, M.E.I.C.
T. A. S. Munford, A.M.E.I.C.	Major P. De la Passey, Jr.E.I.C.
Robert Angus, M.E.I.C.	A. H. Morgan, M.E.I.C.
D. O. Robinson, S.E.I.C.	G. H. Chalmers, Jr.E.I.C.
W. C. Miller, A.M.E.I.C.	R. J. Fuller, A.M.E.I.C.
H. Merton, Jr.E.I.C.	E. A. Gray, Jr. E.I.C.
Chas. Talbot, A.M.E.I.C.	J. R. Rostrum, A.M.E.I.C.
C. J. Madgett, A.M.E.I.C.	H. G. Hayman, S. E. I. C.
W. P. Near, M.E.I.C.	F. J. Bridges, A.M.E.I.C., of Windsor.

Several guests were also among those present.

Major W. J. Forbes-Mitchell, D.S.O., A.M.E.I.C. occupied the chair.

Kingston Branch

A. Jackson, A.M.E.I.C., Secretary-Treasurer.

The first regular meeting of the Kingston Branch after the summer's vacation was held in Carruthers' Hall, Queens' University, on October 14th, with a fairly large attendance. The vice-chairman, T. McGinnis, M.E.I.C., took the chair.

Professor L. M. Arkley, M.E.I.C., gave a very instructive lecture illustrated by slides on "Recent Advances in Prime Movers." The discussion reviewed the history of the steam engine and then merged into the very recent developments in steam prime movers of the stationary and locomotive types.

H. Ryan, mechanical engineer of the Canadian Locomotive Company, Limited, gave a short talk on locomotives and explained a great many points relative to the design of a locomotive.

General Business Meeting

The next regular meeting was held on November 1st, at which meeting the general business of the branch was the important part of the programme.

The Secretary for the past year presented his annual report which was as follows:—

The financial condition of the Kingston Branch still continues to be satisfactory considering the limited number of corporated members attached to the branch. The year's operations were begun with a credit balance in the bank of $137.86 and that credit balance at the present date remains practically the same, being $138.18. The balance sheet showing the receipts and disbursements is attached hereto.

A few new corporate members have been added during the last three months due to the fact that a new distribution of membership throughout Canada has been made by the Council at Headquarters. We have Brockville now in our district and have gained three or four members thereby, and next year the financial gain will be realized.

The present membership of the branch is 12 Members, 28 Associate Members, 2 Juniors, and 40 students.

During the year eleven regular meetings were held, the success of which is due to the energetic efforts of the chairman of the Programme Committee, of which Professor D. S. Ellis, A.M.E.I.C., was chairman. Three meetings of the Executive and two of the Programme. Committee were held during the year.

The secretary wishes to thank all the officers and members of committees for their loyal co-operation and assistance during the year. The success of the branch was due entirely to the general interest shown by officers and members of every grade."

The chairman then called for nomination of officers and members of committees. The following were elected.

Chairman	T. McGinnis, M.E.I.C.
Vice-Chairman	Colonel T. V. Anderson, A.M.E.I.C.
Secretary-Treasurer	A. Jackson, A.M.E.I.C.
Executive	Major G. R. Turner, A.M.E.I.C.
	R. J. McClelland, A.M.E.I.C.
	W. Casey, M.E.I.C.
Programme Committee	G. Smith, A.M.E.I.C. (Convener)
	Le. R. Grant, A.M.E.I.C.
	Wm. L. Malcolm, M.E.I.C.
	D. M. Jemmett, A.M.E.I.C.
	H. B. Hanna, S.E.I.C.

The retiring chairman, Professor L. M. Arkley, M.E.I.C., gave a short address after which T. McGinnis, M.E.I.C., took charge of the meeting:

The chairman-elect then called for impromptu discussions. Professor D. Jemmett, A.M.E.I.C., gave a very interesting description of the art of sailing a dinghy sail boat. He is very well qualified to speak on this subject in so far as he has already won quite a few races at the Kingston Yacht Club and elsewhere.

The next speaker was Professor L. T. Rutledge, M.E.I.C., who gave a short address on the "Construction of the Douglas Library", Queen's new three hundred and fifty thousand dollar library. Mr. Rutledge is engineer on the library during the construction.

Major Turner, A.M.E.I.C., of the Royal Military College gave a description of the various types of bridges used in time of war. Major Turner has had long experience in military engineering and was able to present the subject very clearly.

Niagara Peninsnla Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
R. Hogg, Jr.E.I.C. Acting Branch News Editor.

Trip Over Welland Ship Canal

In the afternoon of Saturday, October 27th, the Niagara Peninsula Branch, met at the Engineers' Club, Thorold, and, escorted by A. J. Grant, M.E.I.C., engineer-in-charge, and several members of his staff they began an inspection of that part of the Welland ship canal which lies between Thorold and lake Ontario.

Descending to the floor of lock 7, the party walked through that structure, examining the filling tunnels, the concrete work, finished and in progress, and the equipment with which the Sir Wm. Arrol Company is doing the work.

At the northern end of the lock the visitors boarded three observation cars provided for their accommodation through the courtesy of Mr. Grant. From here to locks 5 and 6 was but a short trip. Disembarking they climbed a bank beside lock 5, whence a splendid view could be obtained. At their feet lay the pit for lock 5, all rock excavation. Above were the towering walls of lock 6, almost completed, while lower to the right partly obscured by the smoke from locomotives and shovels, was the site of lock 4.

Locks 4, 5, and 6 are twin locks in flight, with a combined lift of about 139 feet. In a distance of little more than 800 yards they overcome the natural barrier known as the Niagara Escarpment. By means of these locks the canal meets the escarpment at right angles, and avoids the circuitous route followed by the present canal.

The concrete work in this sector is being done by the Peter Lyall Construction Company, under the able management of H. M. Scott, M.E.I.C. Travelling towers, 150 feet high, are used to elevate the concrete to the wall forms, and two two-yard mixers working side by side have mixed as much as 1,800 yards of concrete in the ten-hour day.

Fifteen-minute run down the construction railway brought the party to lock one. This lock is almost complete, and considerable time was spent in a thorough examination here. A short time was taken up with a trip to the harbor work at Port Weller, and the party separated, to meet again at St. Catharines for dinner.

Dinner at St. Catharines

The meal was served at the Welland Inn, to about one hundred members and their guests. Following this, addresses were delivered on the subject of Northern Ontario, by Balmer Neilly, secretary of the Ontario Mining Association, and by Professor H. E. T. Haultain, C.E., M.E.I.C., of Toronto University. The addresses were illustrated in a fitting manner by two films entitled 'Smelter Fires' and 'Winning the Gold'. These films, together with an operator and the necessary equipment, were supplied through the courtesy of the Provincial Moving Picture Bureau.

Northern Ontario—Its Development and Tremendous Possibilities

Mr. Neilly, in introducing his subject, spoke of a false impression general in the minds of the people of 'Old Ontario". As children, he said, they had been taught to think that northern Ontario was a barren waste of rock and bush, fit only for lumbering and fur trapping. What a libel! On the contrary, it was a land of vast potential wealth, not only in the key industry, mining, but also in cultivable land. With the discovery of nickle and silver, these erroneous ideas about the north were wiped away, and the country was fast developing into one of splendid achievement.

To the early pioneers much credit is due. There was a great deal of scepticism in the early days about the value of the strike at Cobalt. Many experts went north, and returned, giving as their opinion that the claims were mere pockets. The real Canadian, however remained on, and to him is due the credit for what has been achieved. Many are prone to consider that success is for the most part luck; but nothing can be farther from the truth. Courage and vision alone are the forerunners of success, and nowhere has this proved more true than in Ontario's north country. Many industries will find wide scope in the north, and chief among these, the speaker mentioned agriculture and paper making.

It was thought that crops which survived the late frosts of spring, must in this far north climate succumb to those of the early fall. However, it has been proved by actual trial that corn can be grown and ripened as far north as Kapuscasing. Though the northern summer is short, yet the summer days are long, and growth under the northern sun is very rapid. Furthermore it is a fact that the growing season lengthens as the land is brought under cultivation. It has also been shown that seed from the prairie provinces, which has been brought direct to southern Ontario, does not thrive there. However, if the grain has first been planted in the clay belt, and then brought south, it produces a splendid crop. The speaker predicted that the north country will become the seed bed for Ontario and Quebec, a transition stage from west to east.

Ontario is to-day supplying 30 per cent of Canada's pulp output. One mill established in the north is producing 500 tons of newsprint daily. So well organized is this industry, that a log may reach the mill, be barked and ground, the pulp screened and made into paper, then shipped to Chicago and printed, then sold on the street, and but five short days elapse between the log and the printed page.

The Laurentian Shield crosses Canada on the north. It is of pre-Cambrian formation, and covers an area of two million square miles. In the early days this was thought to be of no value, but it is now known that no formation of the earth's crust offers such great possibilities in the search for metaliferous ores. Of this vast area, less than three per cent lies within the borders of the United States. Yet it is from this three per cent that she takes her supplies of copper and iron in the state of Michigan and Minnesota. In seventy-five years her lake Superior iron ore deposits have made her the great industrial nation which she is today. This year these deposits are producing sixty million tons of iron ore. If with three per cent. the United States can do so much, what cannot Canada do with ninety-seven per cent.

We have been slow in investigating this new country. Our geologists have done splendid work. Nevertheless we have been slow. Now gradually, on the southern marign, we are lifting the curtain which has obscured the wealth that lies beyond.

In 1883 the C.P.R., passed through Sudbury. Copper ore was discovered. When, three years later, the matte was sent to New Jersey to be refined, it was found to contain more nickle than copper. This was not the unmixed blessing that it would seem. Copper and nickle were hard to segregate, and there was no market for the latter. However, with the discovery of the value of nickle steel for armor plate, and the adoption of it, first by France, then by the United States and Great Britain, a satisfactory market for nickle was developed. The Great War doubled the demand for this metal. The demand was met by greatly increased equipment and with energy, and to the great

credit of the industry, it may be said that they supplied this very necessary material all through the struggle at pre-war prices.

Prior to the war, one-half of the entire nickle produced went into armor plate. With the cessation of hostilities, and the consequent reduction in naval armament, this market for nickle was largely lost. With greatly increased equipment, and a very restricted market for the product, the nickle industry for a time was forced to curtail operations. But by the aid of scientific research conducted under the auspices of the nickle company, so many new uses have been found for the metal, that the industry is this year producing and selling thirty per cent, more nickle than at any time during or before the war, and to-day Sudbury is employing four thousand men.

Since the discovery of silver at Cobalt, in 1903, two tons of pure silver have been produced there for every working day. Contrary to reports that this field is petering out, the speaker claimed that production is actually increasing, due largely to the South Lorraine field.

The success achieved at Cobalt bred a new confidence, as a result of which, capital and prospectors were attracted to the north. Day by day, new discoveries were announced, and among them Porcupine and Kirkland Lake, until Ontario is now the largest gold producing province or state in North America. Development is advancing as fast as electric power can be supplied. Some of the larger mines have secured water rights and are proceeding to develop their own power. Our mineral wealth is as yet almost untouched. Mining in Ontario is just getting under way.

On the heels of the miner comes the farmer. He settles on the margin of the mining area. He clears his land, securing cash for his timber from the mines, for his pulp wood from the pulp mill. He cuts hay and again secures cash. He is off to a good start, with cash in his pocket, and a ready market where he secures Toronto prices without spending anything on freight. New communities are established and consolidated in this manner. Ontario is expanding accordingly. Expanding to the north, with an orderly and rapid development. As an instance of this development, the speaker cited the town of Timmins. Thirteen years ago, he said, Porcupine was a wooded area. In 1922 it had a population of 15,000. The town has business blocks of solid brick, and an assessed value of $5,000,000. Its bank clearings equalled a city of 60,000 people in "Old Ontario".

Mining has opened up this new country, has made it a country to be proud of. Yet we should be prouder still of the type of man which it produces. He is a man of courage and endurance, with faith in the province and in himself. Nowhere is law and order so rigidly maintained as in the north. Our M.P.P.'s appreciate the north, and our mining act is admitted to be the best in the world.

"But what does all this mean in a commercial way to Old Ontario?" the speaker asked. In a convincing answer to the question he told how, in 1920, out of a total of $72,000,000 produced from the mines, $56,000,000 was spent on wages, supplies and equipment. A very large portion of this huge sum found its way south, in return for the necessary commodities. This amount of money is equal to the total exports from Canada to no less than thirty-two foreign countries. including South America, India, Australia and New Zealand. It was not obtained with the help of a subsidized merchant marine, of trade treaties or anything else. It was found right in our own backyard.

During periods of business depression, when markets are poor and labor is cheap, the tendency is for mining to speed up. The lower operating costs brought large areas of lower grade ore within the range of profitable production. This drew from the south many of the unemployed, and poured south more wealth, tending in a large way to bring business conditions back to normal. This mining acts to tide the other industries over in times of stress. The mining industry is to the commercial industry of Ontario, what the fly-wheel is to the engine.

In the interval which followed Mr. Neilly's address, the Welland Ship Canal Instrumental Trio rendered some pleasing selections. Then Professor Haultain rose to speak.

The Engineer—The Dominant Man of the North

In a few well chosen words, he so eulogized the former speaker, and bound him so closely with the country of which he had spoken, that in short he might have said, after the famous words of the famous Frenchman, "The North, it is he."

He went on to describe the engineer as 'The dominant man of the North'. He told of the need of the prospector, of the need of capital. But needed by both was the engineer. The financier needed him, not only to estimate the risk involved in the investment of his capital, but also to take charge of operations and to produce an operating profit. Thus the mining engineer must understand finance, and be a man of judgement and foresight. He must take responsibility on his shoulders, and must make money for his employers. The professor expressed the hope that before very long the engineer would find the means also to make money for himself.

A vote of thanks to both speakers was moved by A. J. Grant, M.E.I.C., seconded by F. S. Lazier, M.E.I.C., and heartily endorsed by all present.

The meeting concluded with a short business session.

Cape Breton Branch

D. W. J. Brown, Secretary-Treasurer.

The first meeting of this branch for the 1923 season was held in Sydney on September 18th. The speaker of the evening was J. W. Mullin, B.Sc., A.M.E.I.C., resident manager, at Glace Bay, Nova Scotia, for the Canadian Marconi Wireless Company. Mr. Mullin's subject was the "General Advance of Radio since the Early Days of Marconi". The speaker dealt with the theory and history of wireless telegraphy, discussing many of the difficulties encountered by the pioneers, describing the rather crude early equipment and comparing it with the high speed modern apparatus. The paper was illustrated by photographs. Mr. Mullin closed his address by extending an invitation to the branch to visit the wireless station at Glace Bay, as soon as the extensive additions to the present plant, now being made, have been completed. These extensions include two 600-foot steel towers and several smaller towers. Preparations are therefore being made and this visit will probably be made within a few weeks.

On October 16th, A. P. Theuerkauf, M.E.I.C., presented a paper entitled Metallurgical Re-heating Furnaces for Blooms, Billets and Slabs. This paper was prepared for presentation by Mr. Theuerkauf, before the Maritime Professional Meeting, held at St. John in September, and in Mr. Theuerkauf's absence, was read by Professor H. W. McKiel, M.E.I.C., of Mount Allison University. Mr. Theuerkauf is an authority on steel plant furnaces, and treated his subject in his usual thorough manner. The paper treated of re-heating furnaces generally, and described particularly a large furnace recently constructed in connection with the rail mill of the Dominion Iron and Steel Company Limited, Sydney, of which company Mr. Theuerkauf is assistant chief engineer. This paper was profusely illustrated with slides and large coloured drawings.

M. W. Booth, A.M.E.I.C., steam engineer for the Dominion Iron and Steel Company Limited, addressed the third meeting of the season, taking for his subject the very extensive one of the Application of Fuel to a Steel Plant. Mr. Booth outlined the history of the different branches of iron and steel making, and of the different fuels used, including charcoal, coal, coke, coke oven gas, blast furnace gas and producer gas, describing their applications and limitations.

Halifax Branch

K. L. Dawson, A.M.E.I.C., Secretary-Treasurer.

At the meeting of the Halifax Branch held in the "Green Lantern" on the evening of November first, there were animated discussions on a number of items of more than ordinary interest. Also some important business was transacted.

To begin with, F. A. Bowman, M.E.I.C., W. P. Copp, A.M.E.I.C., and C. A. Fowler, M.E.I.C., were nominated and elected to be the committee to nominate the branch officers for the year 1924.

The chairman announced that the president of *The Institute* thought the fuel question of Canada to be of so pressing a nature that he had written him a personal letter requesting that the Halifax Branch fall in line with the other branches by appointing a fuel committee to investigate the local conditions. He had laid the matter before the executive who had appointed K. L. Dawson, A.M.E.I.C., D. W. Munn, A.M.E.I.C., and Hiram Donkin, M.E.I.C., to act as the fuel committee for this branch in accordance with whatever instructions were forwarded by Council and also along such other lines as they would deem worthy of investigation.

On behalf of this committee its chairman reported that the instructions it had received from the fuel committee of the Council limited its work to the advancement of the economy of the local utilization of the available fuels, and to educational campaigns regarding the proper use of heating equipment and domestic fuel, for the benefit of the householder. In pursuit of this plan the committee proposed to submit a series of questions to each member of this branch which will be of a very elementary nature yet will supply information of a very necessary kind.

The chairman mentioned his delight on seeing so many Halifax members at the Maritime Professional Meeting in St. John on September 26th and 27th, and his regret that other members not present had missed a treat seldom met.

He was always glad to give honour to whom honour is due. The size of the delegation from Halifax was the outcome of the canvassing of the members by F. A. Bowman, M.E.I.C., who in the absence from the city of the chairman and vice-chairman had willingly consented to assist the uncertain ones to make up their minds to go. He considered the thanks of the branch were due to Mr. Bowman and therefore had pleasure in tendering them to him.

Mr. Bowman characteristically belittled the quantity of work which he had done. He spoke of the good time in which all who attended were participants; of the luncheon in the storeroom of the St. John Drydock and Shipbuilding Company, Ltd., where there was an exhibition of very choice blueprints behind a suitable screen; of the excellent dinner on the same day provided in a temporary tent in a

contractors camp at the Musquash Power Development where sixty guests were expected but one hundred and twenty-eight arrived and were accommodated without inconvenience to them or any apparent inconvenience to Mr. Phillips, their host; and of the closing banquet, one of the smoothest-working things he had ever seen. There was not a hitch in the whole proceedings. The control of events maintained by the committee in charge kept even the St. John weather clear and fine for the whole of two succeeding days.

Concluding he moved a vote of thanks to the St. John Branch for working up and carrying out a meeting so splendidly instructive and delightfully entertaining, suffused throughout with the personal element of hospitality and especially in the treatment of the visitors from Halifax.

Professor W. F. McKnight, A.M.E.I.C., remarked that the Halifax bunch had set out sixteen strong, and arrived back sixteen weak, not having had one idle moment from their arrival in St. John until their departure. In his experience no such gathering had offered so many interesting displays. St. John is particularly well provided with exhibits of engineering skill which are a credit to her and to Canada. He finished by saying, "I would not have missed it, except unavoidably, and have great pleasure in seconding the vote of thanks for it as moved by Mr. Bowman".

The motion was carried unanimously.

The verbal and facial expressions of those present were so favourable to making a finer function of our annual meeting than usual that F. A. Bowman, M.E.I.C., C. H. Wright, M.E.I.C., H. W. L. Doane, A.M.E.I.C., and W. F. McKnight, A.M.E.I.C., were appointed a committee to look after all the arrangements and to drum up attendance. The two first mentioned were placed on this committee as a reward for their success in raising the delegation to the St. John meeting.

The chairman called attention to the enlargement of the territory assigned to the Halifax Branch which had been accomplished by the Council during the summer. He then asked D. W. Robb, M.E.I.C., of Amherst, and A. R. Chambers, M.E.I.C., of New Glasgow, as branch district members to express their opinions concerning the possibilities of holding a successful united meeting in a central place such as Truro.

Mr. Robb held that the extension of the field of the Halifax Branch is a good thing and will tend to greater interest in *The Institute* among the members in western Nova Scotia. Branch meetings are interesting and valuable, instructive and socially entertaining. Although he felt that Amherst is the centre of the Maritime Provinces he agreed that it was not the centre of the territory of the branch. He said the engineers of Amherst would lend themselves to a United meeting in Truro, but emphasized the necessity of finding a subject for discussion that would attract. He thought the fuel question would prove interesting. The studies recently undertaken by the Montreal Branch were good and to the point.

Mr. Chambers agreed that anything to further the growth of *The Engineering Institute of Canada* should not be left undone. In his opinion it would be a fine idea to meet in Truro which is central. One of the main points in making it a success would be the attendance of a large number of engineers from Halifax. He agreed with Mr. Robb that the fuel question was big and intricate, also very interesting. Unfortunately the profits from winning coal are very small and people think that the supply is unlimited. The destruction of the coal from vast portions of the beds now being mined in the few short years since large-scale mining began leads us to wonder what the next generation is going to do. We must study conservation and encourage others to do so.

C. H. Wright, M.E.I.C., suggested that a united meeting in New Glasgow to discuss the relation between the water power and the pulp and paper possibilities of the Province would be attractive to a great many members in and around New Glasgow and would probably attract members from further away than Halifax.

After some discussion on the best way in which to give the district members a voice in the direction of the affairs of the branch D. W. Munn, A.M.E.I.C., and F. A. Bowman, M.E.I.C., were asked to prepare a memorandum for the executive requesting such alterations of the by-laws as will change the number of members on the executive from six to ten, of whom four shall be members residing in the branch territory more than twenty-five miles from Halifax, and to have it signed by at least ten corporate members. This memorandum was placed in the hands of the secretary before the close of the meeting and the proposed change in the by-laws will be submitted to the members for letter ballot at the same time as the nominations for officers for the ensuing year.

Colonel F. W. W. Doane, M.E.I.C., began the discussion of the classification, remuneration and scale of fees for engineers as published in the October *Journal* by saying that he knew it was a very difficult matter to satisfy all. He felt that most engineers were in the position of the young lady who was counting the money from her envelope in the time-honoured manner for convenience in separating the bills. When the paymaster showed his fatherly interest by telling her of the dangers accompanying such a method she announced, "Why, Mister, no microbes could live on my salary". After a careful perusal of the report he concluded that it was unsatisfactory because it lacked the details necessary to enable an engineer to establish his proper rating in dollars and cents to an employer who was not an engineer. Usually cities and towns fix the salaries of technical employees after consideration of the salaries paid by cities of similar size. The smallest is generally the ruling salary. Therefore some city sets the pace, a very unfortunate thing for municipal engineers. There should be a standard for cities comparable in size. The city engineer is classified as chief engineer with a minimum salary limit but there is no indication of the effect of the size of the city in discussion on the size of the salary which he should demand and receive. There is a lack of definiteness in the report and nothing which is indefinite can be used in dealing with the general public. He advocated a committee to try to classify all our members according to the scale.

W. A. Winfield, M.E.I.C., said that the report as published should stir us to helpful and constructive criticism. In his consideration it was by no means complete. At first sight the classification to eight grades seems fairly definite yet the whole thing is stultified and almost brought to nought by the abrogation of the names of the classifications. When you are given a grade which has a name and are then told that the name is only a name and as such has no significance there is very little for you to grasp.

A man's duties may give no indication of their size or guide to his value. In the case of the city engineer it should be possible to base his salary on the population of the city. In the case of the industrial engineer the combination of capital and turnover should give an indication of the salary he should receive. But in the report there is no suggestion that these things have any weight.

"When I survey the scale of remuneration I think of my own salary with regret. It will be best to let every man have the chance to classify himself and tell if he would be satisfied to receive the salary set opposite. He should have enough interest in himself to do this. Many members will look on this from different points of view and I desire to hear from them."

H. W. L. Doane, A.M.E.I.C., mentioned the fact that in the final analysis it is upon public opinion that we must depend for the size of our salaries. In order to make an impression on it we must have definite things on which to appeal. He instanced the fact that when a person applies for a policy of accident insurance he gets his classification in such a way as to meet the understanding of any layman. The classification of engineers should be as readily understood.

W. F. McKnight, A.M.E.I.C., W. P. Copp, A.M.E.I.C., C. H. Wright, M.E.I.C., and others spoke on this report.

At the conclusion of the discussion F. W. W. Doane, M.E.I.C., W. A. Winfield, M.E.I.C., F. R. Faulkner, M.E.I.C., were appointed a committee to draw up a questionnaire and submit it to each member of this branch for the purpose of obtaining his opinion of the classification and the remuneration and their workability.

Ottawa Branch

F. C. C. Lynch, Affiliate, E.I.C., Secretary-Treasurer.

Address by Minister of Public Works

Hon. J. H. King, M.D., C.M., F.A.C.S., minister of public works, was the speaker at the first luncheon of the season of the Ottawa Branch of *The Engineering Institute of Canada*, at the Chateau Laurier on October 18th. He took occasion to pay a glowing tribute to the engineering profession for the magnificent contribution it had made to the well-being of the human race in the field of sanitation. The technical knowledge and untiring efforts of the profession had turned some of the world's worst spots into tracks that were fit for human habitation, he declared.

Dr. King's subject was: Public Service Rendered by the Engineering Profession, and he was listened to by a distinguished company of members of the engineering profession and their guests. At the speaker's table with the Hon. Dr. King and the chairman, O. S. Finnie, B.Sc., D.L.S., M.E.I.C., were: Mayor Frank H. Plant, C. H. Keefer, M.E.I.C., G. Heldman, private secretary to Dr. King, Calvin Lawrence, of the Railway Commission, J. B. Hunter, deputy minister of Public Works, Clarence Jameson, of the Civil Service Commission, H. R. Poussette, of the department of Trade and Commerce, G. J. Desbarats, M.E.I.C., acting deputy minister of National Defence, and J. E. Macpherson.

In introducing the speaker, Mr. Finnie said that since Dr. King had become minister of Public Works, he had always proved himself a friend of the engineering profession and *The Institute*, and it afforded him great pleasure to have the honour of welcoming him.

Dr. King thought the profession had never been given a very full amount of consideration by the general public. The knowledge of the man on the street about the engineering profession was very limited, and it was only when some special undertakings came to his notice that he gave much thought to the splendid work that was being accomplished by it.

The engineers, he said, were the body of men who had blazed the trail for the great timber industry, the mining industry and the manufacturing industry of the country, and who had made the business of Canada possible. Canada was a great country with wide stretches of territory and big rivers to be crossed, and it had in its settlement and development offered great opportunities to the engineering profession in its wonderful railway system. The first railway between Toronto and Montreal, known as the Grand Trunk, had been con-

sidered a great undertaking, and then followed Confederation, the construction of the Intercolonial Railway had offered opportunities for the engineering skill of the profession, and when the conception of the Canadian Pacific Railway across Canada from the Atlantic to the Pacific was commenced, it had presented engineering problems that were considered unsurmountable in some quarters, but which had been mastered.

Dr. King paid tribute to some of the great men connected with the projection of the trans-continental line across Canada and to the marvellous achievements in connection with the construction of the spiral tunnel and the passage of Rogers Pass, as well as to the later triumph of engineering skill in the erection of the great Quebec bridge, and the spanning of the St. Lawrence river at Montreal in 1860. The people of Canada owed the engineering profession a great debt of gratitude for its work in railway construction. It had made it possible to settle the vast middle west area and to grow there this year the largest wheat crop in the world.

In the field of mechanical engineering, some marvelous things had been accomplished, including the production of the standard modern train, which was a palace in itself, as compared with those of fifty years ago, and the modern steamship.

In a country with great water power possibilities, the development of electrical engineering was of great interest, Dr. King said, and in Canada it had meant vast advantages to the people. Hydraulic engineers had contributed their quota to the general benefit for the people, by the construction of the great dams that had impounded vast quantities of water for irrigation in the West and turned such arid regions as the Okanagan into fruitful and beautiful settlements. In architectural engineering there had been great advancement, and in the realm of road engineering also big strides had been taken in the direction of the general good. In the field of sanitary engineering the blessings had been in turning some of the world's worst spots into healthy tracts for human habitation.

He considered the work of the engineering profession in the public service of the greatest importance and interest, and felt that the public were realizing to a great degree that the great stretches of territory, and the great rivers of this country made necessary for the government to rely more and more on the profession for solutions of many of its problems.

Standardization of Engineering Products

The standardization of engineering products and the resulting benefits that would accrue to industry from the simplification and unification of manufactured pieces, was the subject of a very interesting address given by R. J. Durley, M.B.E., Ma.E., M.E.I.C., before the members of the Ottawa Branch of *The Engineering Institute of Canada* at its luncheon in the Chateau Laurier on October 31st. Mr. Durley was professor of mechanical engineering at McGill University from 1901 to 1912, and during the war, in 1915 to 1919, he was officer in charge of gauges and standards of the Imperial Munitions Board. He is now the secretary of the Canadian Engineering Standards Association, with headquarters in Ottawa, and is one of the best known authorities on the subject of his address.

A number of prominent men were present at the luncheon, among them being: Dr. Adam Shortt, Commander Phillips, M.E.I.C., G. A. Mountain, M.E.I.C., A. A. Dion, M.E.I.C., E. G. Deville, Hon.M.E.I.C., Dr. D. B. Dowling, A. H. W. Cleave, Hon. Dr. Roche, S. J. MacLean, Dr. H. M. Tory, principal of the Alberta University, Col. O. M. Bigger, A. W. Campbell, M.E.I.C., C. A. Bowman, A.M.E.I.C., Commander Edwards, A.M.E.I.C., T. Shanks, M.E.I.C., Colonel Ogilvie, and C. A. Magrath, M.E.I.C.

O. S. Finnie, M.E.I.C., chairman of the Ottawa Branch, presided and introduced the speaker as an Ottawa man who had done great service in his profession for the good of the country.

Mr. Durley said there was a hazy idea in the minds of the general public as to what standardization meant, and he thought that was to some extent due to the fact that the word standardization was not altogether a happy one to use. He thought that the word simplification or unification would better express the objects that the association he was secretary of had in view.

The effort being put forth was toward a unification of types and sizes in manufactured products, especially such as fencing. Such a standardization would certainly be a measure of economy. There would be no need of carrying such large stocks of various parts and the design would be improved as well as the quality, thus protecting both the purchaser and the manufacturer.

As an illustration of the advantage that standardization brought to industry, Mr. Durley pointed to the work in the automotive industry, where great strides had been made in securing interchangeability of parts and the unification of manufacture. It was largely to this that the automobile manufacturing trade had developed so wonderfully.

Speaking of what had been done in Switzerland, Mr. Durley said that country was similar to Canada in its industrial conditions, being overshadowed commercially by big neighbours, but it had found great benefit from a measure of unification in manufactures and was holding its own.

The interchange of information bearing on the simplification and standardization of engineering products was an accomplished fact to-day internationally, but the ultimate aim of the association was international standardization of products. That was very far in the future, however, though steps in its direction were being taken.

Design and Construction of Scientific Instruments

Robert S. Whipple, M.I.E.E.F. Inst. P., was the guest of honour and speaker at the regular luncheon of the Ottawa Branch of *The Engineering Institute of Canada*, at the Chateau Laurier on November 13th. Mr. Whipple, who is an international authority on scientific instruments, spoke on the design and construction of scientific instruments. While Mr. Whipple's address was necessarily of an extremely technical nature, his audience, practically all engineers, listened attentively, while he explained by means of lantern slides the various instruments. O. S. Finnie, M.E.I.C., was chairman at the luncheon and introduced the speaker. Dr. Deville, Hon.M.E.I.C., moved a vote of thanks.

In introducing the speaker, Mr. Finnie said that it was the first time that the branch had ever had an opportunity of discussing or hearing a lecture on the subject of scientific instruments. The branch was fortunate indeed, he said, to have secured Mr. Whipple to lecture them. Mr. Whipple is the managing director of the Cambridge and Paul Instrument Company of England, and during the war Mr. Whipple was sent to America by the British government to purchase instruments needed in warfare.

Mr. Whipple dealt with the importance of scientific instruments in all lines of endeavour, first, as experimental apparatus and finally as tools. This was aptly illustrated by the fact that the microtome, originally invented for the purpose of obtaining minutest cross sections in experimental work had developed into the rotary cutter with which the butcher sliced bacon and ham. Instruments of all kinds, said the speaker, had greatly increased in cost and in the design of instruments to-day three factors had to be taken into consideration, the need of accuracy, the need of sensitiveness, and the need of producing the instrument with the greatest economy having regard for the use it was to be put to.

Mr. Whipple gave a number of instances of instruments used during the war on guns, aeroplanes, etc., which had cost the British government thousands of pounds more than was necessary owing to their faulty design. An interesting thing related by Mr. Whipple was the fact that almost everyone in Canada carried one of the world's most precise, and marvellous scientific instruments, a watch. A good watch, explained Mr. Whipple would not gain or lose more than a second a day. Taking the number of seconds in 24 hours to be about 100,000, this placed the precision of the watch at 1 in 100,000 which ranked with any other instrument in the world. Good workmanship, said Mr. Whipple was absolutely necessary in scientific instruments but good workmanship could never make up for poor design and both were necessary.

Power Development Storage Reservoirs

Water storage possibilities on the Gatineau river are under investigation by the Quebec Streams' Commission and it was very likely that two large power plants would be established in the near future, O. O. Lefebvre, M.E.I.C., chief engineer of the commission, stated in the course of a lecture on power development storage reservoirs in Quebec at Victoria Museum under the auspices of the Ottawa Branch on the evening of November 15th. Mr. Lefebvre said that the questions of storage facilities on the Gatineau had not yet been solved, but, if the project went through, the flow of water would be regulated to 6,000 second feet and possibly 8,000 second—feet. Several lantern slides were shown.

Mr. Lefebvre shed a most interesting light on the value of the great storage dams constructed in Quebec in recent years under the direction of the Streams Commission. Last winter during industrial tie-ups throughout the province as a result of power shortage following an insufficient head of water, industries on the St. Maurice and St. Francis rivers had carried on without any interruption. This was due to the great Gouin storage dam at the upper reaches of the St. Maurice and a storage dam at St. Francis Lake in Beauce county.

The keeping of water level records had scarcely been thought of until the Quebec Government took up the matter. The Quebec Streams, Commission had spent to date $567,000 on investigation and survey work. This would be refunded in time by companies leasing power sites. Before construction work on storage dams and power plants was undertaken, a special act of the Legislature giving the Commission power to regulate the flow had to be passed. The commission had authority to construct dams and acquire lands to be flooded. No storage dam project was undertaken until there was a guarantee of sufficient revenue to cover interest, maintenance and operation charges.

The commission, Mr. Lefebvre proceeded, had to date completed three storage dams costing over three million dollars. The Gouin storage dam started in 1915 and completed in 1917 had cost two and a half million dollars. It was 1,640 feet long. The Commission was now engaged on the big storage dam scheme at Lake Kenogami in the Saguenay. This dam would ensure a flow of water that would permit certain big industries which had previously been handicapped to operate continuously throughout the year.

Replying to a question, Mr. Lefebvre said the commission had found it did not pay to cut merchantable timber on areas to be flooded by storage dams. The standing timber on the Gouin Dam site had been flooded.

CORRESPONDENCE

Engineering Education in Brazil

Sao Paulo, Brazil
Oct. 24th, 1923

The Editor,
Dear Sir:

I have read with much interest the article on Engineering Education by Professor McKiel, in the July and August numbers but do not think that the changes advocated would be advisable in all cases.

Here in Brazil our institution is influenced on the one hand by American ideas, as our degrees are conferred by the University of New York, and on the other, by the government schools which are largely under European influence. Our connection with the latter has recently become closer as our graduates have been given the same rights as those of the government schools on condition of our teaching the same subjects as the latter.

The engineering course at Mackenzie is of five years beginning at the end of eleven years of grammar and high school. During the school course much more time can be given to foreign languages (French and English) than in North American schools, due to Portuguese being almost phonetic and requiring much less time to learn to read and spell. Due to this and also to the greater efficiency of teaching, when the language is the teachers native tongue (a condition which frequently does not obtain in schools in North America) we are able to complete the languages before entering the engineering school. That this study is not superficial is shown by the fact that the engineering students are able to study the text books used in their course, the larger proportion of which are in English. It should be noted also, that the Brazillian student does not have much difficulty in reading Spanish and can get Italian with very little trouble. We are also able to complete algebra, geometry, (plane and solid), and trigonometry in the high school, as well as to give one year of Chemistry and physics.

The courses are laid out on a basis of twenty periods per week, the theory periods being fifty minutes and the practical usually one hundred and sixty giving approximately six school hours a day or thirty hours a week.

In the first year 357 periods are given to mathematics (analy. cal., descrip. geom. mech.), 119 to surveying and 136 to chemistry, 51 to freehand and shopwork. In the second, 102 periods to law and political economy and the rest to mathematics, physics, surveying, mineralogy etc. The third and fourth years are entirely given to engineering subject but in the fifth, 128 periods are given to administration, (including bookkeeping), and 51 to military engineering.

The course in chemical engineering has some subjects different in the first year but the civil, architecture, mechanical and electrical are the same until the end of the second.

As will be seen the tendency has been away from the so called cultural subjects in the direction of more technical ones, and for the following reasons:

First:—The students do not require the culture subjects so much. The greater part of the students of engineering come from the upper class families and have a wider culture than the average student in North America. They know much more about foreign countries and frequently have considerable musical education. A graduate in engineering is given the courtesy title of Doctor, as is also the lawyer, and many men who never intend to practice, take a law or an engineering course simply for the sake of being a "Doutor".

The Bracillian engineer prides himself on being a gentleman, whereas unfortunately many of our people seem to pride themselves on being "rough necks". I remember when I was in charge of the McGill survey school at Cartierville, the late Professor McLeod got after me because of the lurid language howled around the camp. He said he didn't mind a man telling a friend to "get to H—, off his transit line" as that merely evidenced a proper interest in his work, but that the profanity, etc., in common was unworthy of students and gentlemen.

Second:—The graduate here *does* require a broad knowledge of engineering. Instead of starting in, holding a rod or some similar job, and working up under the training of a good engineer, the majority of our graduates go at once to responsible work, surveying, building, etc., and get no chance to learn from experienced men in the field. In fact many of our students do surveys and build houses before graduation.

Beside the surveying given during the year, the civils have to attend survey camp for a period of three weeks at the end of each of the first three years, and the architectural and electrical students for two years.

That this work is essential is proved by the number of men doing land surveying and laying out highways withing the first year of graduation.

It seems a pity that our English speaking people should be handicapped by having to lose so much time learning to read and spell when it could be so much better employed in other ways. The language teaching in Anglo Saxon countries needs a great deal of improving, the chief being defect that in so many cases the teachers are English speaking. I have seen too many absurd mistakes of people who had been taught English by Brazillians or Germans to have any confidence in a teacher teaching an adquired language. But what seems to me the most important element is to impress on the student the fact that he owes it to his profession to be a gentleman rather than a rough neck. As I remember it, it was a sort of assumed attitude. Our fellows were really just as good as the arts men but they tried to be tough and it grew on them.

It is proverbial that you can't make a silk purse out of unsuitable material, and I confess myself a little sceptical about the arts work making much real difference to men who have not acquired habits of reading and culture in their homes. But if a boy lack those things, and if his English be bad, is not the place to correct these in the public school, rather than in the university? Of Professor Dunlaps list, geology,physics, chemistry, mathematics are, I think, pretty well taught as a matter of course in engineering schools but undoubtedly there is a need for economics, contract law, cost keeping, and practical psycology. This last subject touches engineering on so many points that it would seen to be very necessary. Not having any formal course here, I find it necessary to introduce various points during the teaching of other subjects.

It is interesting to note as showing the tendence of European education that our old four years course(we have only recently changed to five) was criticized severely by the government schools here as being too practical and lacking theory.

E. O. Temple Piers, A.M.E.I.C.
Dean of Engineering School, Mackenzie College

Electrical Engineers' Interest in the Journal

Toronto, Oct. 16th, 1923.

The Engineering Institute of Canada,
176 Mansfield Street, Montreal.

Dear Sirs,—

Returning home I find I have no record of paying my fees for the past year. I do not remember paying them. If I have not paid them the money enclosed will be for the year past. If I have paid them kindly credit me for the coming year.

I received all the *Journals* for the past year. If I have failed to pay my fees I thank you for continuing to send them.

It is my conviction that a great many practising non-member-engineers believe in *The Institute*, as it is the only Canadian society of its kind, but fail to become members due to the lack of reference to electrical industry in *The Journal*. Could not one article a month be published that would be of 100 per cent interest to the electrical engineers? I know that *The Institute* was primarily intended for Civil Engineers. If Electrical Engineers are wanted to co-operate surely more space should be devoted to their work. Am I right?

(*Signed*) A. M. P.

Montreal, Oct. 22nd, 1923.

Dear Mr. P.:—

Acknowledging your interesting letter of October sixteenth, I am pleased to enclose herewith a receipt for fees and *Journal* for nineteen twenty-three.

It is inspiring to receive suggestions from our members and particularly from our student members, showing their interest in *The Institute*, as is evident from your letter. Your suggestion that we give more consideration to the electrical papers in *The Journal* recalls an incident which happened in Toronto last winter — a firm refusing to advertise in *The Journal* because it was too much of an electrical nature. However, such a criticism was very far-fetched.

In *The Journal* we endeavour to give a general survey of engineering development in Canada, accepting the papers from the branches for publication in order of their merit and importance. We are limited to three, or at the most four papers in each month. Of course the Engineering Index has a reference to a large number of electrical papers each month.

On going through the Journal for the year we find the following papers:—

January. Power Factor, by W. H. G. Cam, A.M.E.I.C.

February. No general articles — many references to electrical papers presented before branches.

March. Railway Electrification — leading article, by Arthur L. Mudge, A.M.E.I.C.

The Cost of Industrial Power, by J. A. Burnett, M.E.I.C.

April. Electrons, Atoms and the Ether, by W. B. Cartmel, M.E.I.C., of the Northern Electric Company.

Electricity for Heating Buildings, by G. Gordon Gale, M.E.I.C.

The Cost of Industrial Power, by J. A. Burnett, M.E.I.C., continued.

May. The Principles of Three-Wire Distribution for Electric Railways, by W. Nelson Smith, M.E.I.C.

Electrons, Atoms and the Ether, by W. B. Cartmel, M.E.I.C. (cont.)

June. Electrons, Atoms and the Ether, by W. B. Cartmel, M.E.I.C., (cont.)

July. No electrical Paper.

August. The Operation of an Electrical Distribution System, by C. A. Clendening, A.M.E.I.C., and H. G. Michell, A.M.E.I.C. Leading article.

September. The Valley of the Saguenay.

Power Development in the Saguenay District.

The Valley of the St. Maurice River.

Hydro-Electric Possibilities of Quebec, by Julian C. Smith, M.E.I.C.

October. The St. John Drydock, by E. G. Cameron, A.M.E.I.C.

Particular attention given to the electrical features.

Loud Speakers and Public Address Systems, by H. J. Vennes, A.M.E.I.C., transmission engineer, Northern Electric Company.

What we would like to do would be to have more articles, but the cost of a larger general section makes it prohibitive.

Perhaps you had in mind some definite class of articles in the electrical field, and if so, I would be glad to take the matter up with some of our branches along the lines you suggest, if found to be feasible.

Assuring you that your interest is appreciated, and looking forward to the pleasure of meeting you in Toronto on November fifteenth, I remain,

Yours very truly,

(Signed) FRASER S. KEITH,
Secretary.

Toronto, Nov. 12th, 1923.

Dear Mr. Keith,—

On October the sixteenth last, I wrote you about my dues, and in the same letter made several statements as to my opinion of why more electrical engineers were not members of *The Institute.* On October twenty-second you replied. I wish to say that your reply to me has accomplished one thing at least: it has made me a stauncher member than previously.

I made a very true statement as to why more electrical men were not members, *but I now see that these electrical men, like myself, are not seeing things in the true light.* I do now. They believe that *The Journal* is not giving enough space to articles that would be of greater interest to them.

I have been, up to the present time, a member, not for the benefit I derived from *The Journal,* but because I wanted to be one more to be of assistance in placing the engineer where he should be in Canada. As a Student member I hear non-members say that they did not join because of the lack of interest shown to other than civil fields. I was not looking for greater interest myself, being satisfied that greater work in a much broader field was being accomplished, and of course accepted their reasoning as possibly correct. You might suggest here, that it was up to me to investigate these statements for myself. I did, but due to a bit of misfortune possibly, the result obtained was in favour of the opposition. I carried out my investigation as follows. I went through all my *Journals* from January 1921 to May 1923. I counted all the technical papers given. The total was 103. I then counted the electrical papers and included papers of general interest to be 10 per cent of the total. Of course, this is a very small percentage.

On receiving your letter I decided to check up on my previous results. I certainly made a very grievous error somewhere. This time I made two columns. Going through the various issues I placed a mark in one column for electrical papers and in the other for papers dealing with other engineering branches. Paper ssuch as Alfred Bicknell's "Some Legal Aspects of Engineering Contracts" were entered in both columns as being of general interest. As a result I get the following result, — electrical 37, others 66, total 103, giving the percentage of electrical papers as 35.9 per cent. *This I believe to be a very fair average percentage. If the members were divided into three classes, civil, electrical and mechanical, and chemists and metallurgists, we should consider that we have received a very square deal.* With these figures I will try to convince the others.

It was a pleasure to receive your letter. The very care you took, and the work necessary to compile that convincing data, shows that interest is shown to even the student member, civil or electrical.

Hoping you will accept my apology, I will look forward to meeting you this Thursday.

Yours very truly,

(Signed) A. M. P.

Plane and Geodetic Surveying for Engineers

By David Clark, B.Sc.

Professor of Civil Engineering University of Dublin.

Reviewed by Professor Albert J. Kelly, A.M.E.I.C.

There are a large number of works published on plane and geodetic surveying, but any well written book dealing with the subject, is always welcome.

Clark's Plane and Geodetic Surveying, volume 1, has apparently been written with a view to making the subject as simple as possible. The book throughout is replete with many original diagrams and illustrations.

Several excellent articles, such as that upon the care of the telescope, are worthy of mention. Considerable space has been devoted to chain surveying, a system far more popular in the British Isles and on the Continent, than ih America.

Hydrographical surveying opens up with a discussion of marine surveying, a subject usually neglected in a treatise of this nature, as most authors are content to deal with stream measurements alone.

Tacheometrical surveying has received more than the usual attention from the author, indicating that British surveyors have learned to appreciate the value of this system, as adopted to the surveying of unmapped regions in mountainous countries, and to the surveying of railways routes.

The field methods and routine details to be adopted in the horizontal and vertical control of plane table surveys receive special attention from the author in his chapter on the plane table.

In volume 2, no attempt has been made to treat the subject of geodesy exhaustively for the benefit of the professional geodesist. But on the other hand, the book contains everything that can be considered desirable for the student, and useful to the practising engineer.

Particular attention has been devoted to the subject of Field Astronomy, a subject in which it is necessary that a student acquire a sound knowledge before proceeding to actual observations. Such astronomical determinations as fall within the province of an engineer are well treated.

The principles of triangulation work are clearly and logically set forth. Base line measurement is more than fully dealt with.

Topographic surveying receives further attention, whilst photographic surveying and aerial photography are briefly discussed.

The books on the whole, are quite up to date, volume 2 being a simple discussion of geodesy, in which the treatment of each subject is as clear and concise as can be expected.

The book is published by Constable & Company, Limited, London, Eng.

Mastering Power Production

By Walter N. Polakov.

Reviewed by H. H. Vaughan, M.E.I.C.

The continually increasing rate at which the world is using up its reserve of stored energy is already becoming a cause for anxiety to all thinking people. That within the short term of a century these reserves have been seriously encroached on and in a few hundred years their end is in sight, may not affect existing generations, but their successors will certainly bitterly condemn those who dissipated this wealth with such disregard for the future and with in many cases, such unrestrained waste.

Mr. Polakov has written a comprehensive treatise on the production and distribution of power, in which he not only discusses the general principles governing the efficient production of power but the entire problem of avoiding waste and minimizing the expenditure in investment and expense from the mine to the consumer.

His remarks on the drain on a nations productive capacity resulting from the incomplete or uneconomical utilization of its fuel supplies are most interesting and instructive. They afford a strong argument in favour of more scientific methods in conserving this non-replaceable asset.

His book commences with a discussion of the general philosophy of production problems, and the Power Industry as an economic factor, both of which will repay careful reading. He then proceeds to thoroughly analize the various problems met with in, what is best described by the title of the work, as, "Mastering Power Production".

After discussing the location and equipment of plants, there are six chapters treating exhaustively of the methods of mastering materials, mastering maintenance, mastering labour problems, mastering processes and mastering records. The concluding chapters are on the analysis of expenses and power as a commodity. The book is not a text book, although it should prove invaluable to every engineer engaged either in power plant operation and instruction or the broad consideration of the production and distribution of power.

The book is published by The Engineering Magazine Company, New York.

Preliminary Notice

of Applications for Admission and for Transfer

November 17th, 1923.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in December, 1923.

FRASER S. KEITH, Secretary.

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*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BARRY—WILLIAM HENRY, of 539 Gilmour Street, Peterborough, Ont. Born at Wigan, England, Feb 4th, 1880; Educ., Wigan Tech. Sch. 1895-99 Halifax Tech. Sch 1899-1901. Private study and private tuition in archt'l. design; 1895-99, articled apprentice, J. Sawbridge, engr. and contractor, Wigan; 1900-03, constrn. foreman with S. Greenwood & Sons Halifax, England; 1904, with H M. board of works; 1905 (Jan - July), bldg. contractor, Forest City, Penn U.S.A; July 1905 to date, private practice as architect and constructional engr., Peterborough, Ont.

References: R. L. Dobbin, R. H. Parsons, A. L. Killaly, R. B. Rogers, J. Mackintosh.

CARPENTER—EDWARD EMERY, of Vancouver, B.C. Born at Americus, Kansas, U.S.A., Nov. 12th, 1872; Educ., B.S. (C.E.), Stanford Univ., 1898; 1898-1905, followed rly. engrg. as asst. engr. and locating engr. with various railroads in the U.S.; 1905-09, chief constrn. engr. for Sanderson & Porter, install'n of Stanislaus River Power Development of the Sierra & San Fransisco Power Company; 1909-11, chief engr. for same firm in charge of design and constrn. of power development install'n. 5,000 h.p. initial for B.C. Electric Rly., Vancoucer Is., Canada; 1911-12, chief engr. for Sanderson & Porter, Sooke Lake Water Supply, City of Victoria, B.C.; 1912-15, chief civil engr., Panama-Pacific International Exposition; 1916-23, member of firm, Baker & Carpenter, San Francisco. Engaged in gen. constlg. and executive engrg. practice. At present, consltg. engr., B.C. Electric Rly. Co. Ltd., Vancouver, B.C.

References: R. S. Buck, F. Blossom, A. C. Eddy, G. A. Walkem, P. H. Buchan.

DUNCAN—JOHN MOYLE, of 26 Prince Arthur Avenue, Toronto, Ont. Born at Toronto, Sept. 25th, 1889; Educ., B. A.Sc. (Hons.), 1912 (diploma 1910); 1906-97, dfting. and design, McGregor and McIntyre, Toronto; 1907-08, machine shops, Toronto 1910-11, and 1912-13, dfting and design. Collinwood Shipbldg. Co., Collinwood, Ont.; 1913-14, machine and erecting shops, Wallsend Slipway and Engrg. Co., Wallsend-on-Tyne, England; 1914-19, Engr.-Lieut., Royal Navy; 1921-23, master mechanic, The Babcock & Wilcox Co. Ince., New York (Bayonne, N.J. works). At present consulting engineer, steam power plants, central and district heating plants, specialist in fuel economy, Toronto, Ont.

References: R. W. Angus, C.R. Young, R. E. C. Chadwick, L. R. Thomson, J. M. Oxley.

FITZGERALD—GEORGE G., of 2321 Garnet Street, Regina, Sask; Born at Bailieboro, Ont., Sept. 19th, 1878; Educ., 1896–97, civil engrg. subjects, school of science, Univ. of Toronto. Private study including I.C.S. rly. engrg. and mech. drawing; 1898-1904, three years on Dom. land surveys in British Columbia, and three years dftsman, with International Harvester Co. of Chicago; 1905-17, field engr., Commonwealth Edison Co. of Chicago, on location and constrn. of cable tunnels, steel tower transmission lines, etc.; 1918-19, engrg. dftsman, under direction of Walter J. Armstrong, Ross & McDonald, Montreal; 1919-20, with Russell & Roddick, contractors, Toronto, as engr. on constrn. work for Toronto Harbour Headwall contract; At present supervisor of manual training, Regina public schools, Regina, Sask.

References: D. A. R. McCannel, D. W. Houston, W. J. Armstrong, W. R. Warren, P. C. Perry.

HAY—MARSHALL NEIL, of Shawinigan Falls, Que. Born at Listowel, Ont., May 4th, 1894; Educ., B.Sc. Queen's Univ., 1923; 1922 (summer), with Bailey Meter Co. Ltd., Cleveland, Ohio. At present, mech. engr. for the fabrication dept., Northern Aluminum Co., Shawinigan Falls, Que.

References: J. A. Bernier, L. T. Rutledge, L. M. Arkley, W. L. Malcolm, D. S. Ellis, D. M. Jemmett, A. Jackson, K. P. Johnston.

McDONALD—FREDERICK CHARLES, of Montreal, Que. Born at Sydney, N. S., July 11th, 1885; Educ., high school, Sydney, N. S., 2 years, chief dftsman., Dominion Coal Company; 2 years works mgr., Lymburner Ltd.; 10 years to date, plant engr., Dominion Bridge Company, Montreal.

References: Sir Alex. Bertram, F. P. Shearwood, H. H. Vaughan, J. C. Smith, G. H. Duggan, D. C. Tennant, G. E. Newill, J. S. Whyte.

WARD—HERBERT JAMES, of Shawinigan Falls, Que. Born at Great Yarmouth, Norfolk, England Dec. 17th, 1881; Educ., Shawinigan Falls Tech. Inst. I.C.S.; 1911-date, in continuous service of Shawinigan Water & Power Co. or subsidiaries, under C. R. Lindsey, res. engr. S. W. & P. Co. also supervising engr. Shaw. Engrg. Co. 1911, rodman; 1912-13, leveller; 1913-14, asst. in field and office work; 1914-15, gen. survey work; 1915-17, asst. city engr., Shawinigan Falls (C. R. Lindsey, chief engr.); 1917-18, in charge survey, plans and layout, Three River-Grand Mere highway; 1918, survey and location, 15 miles trans'n. line, Bromptonville-East Angus. In charge concrete road constrn. Shawinigan Falls. Since 1918 in charge designs, plans and estimates of various undertakings. At present res. engr on constrn. of experimental turbine testing station at Shawinigan Falls. Also constrn. of concrete roadway to Shawinigan Water & Power Co. power houses.

References: F. T. Kaelin, C. R. Lindsey, R. Rinfret, H. Dessaulles, G. Claxton.

WOOD—JOHN HUSSEY PEMBERTON, of 686 de l'Epee Avenue, Montreal, Que. Born at Galashields, England, Dec. 5th, 1884; Educ., 1st class college of preceptors, Horsmonden Grammar Sch., Kent, Eng., 1902; 3½ years prior to 1914, in private business in cement specialities of concrete and reinforced concrete; 1914-19, first operator in No. 4, shop on 9″, 12″, 14″ 18″ Llydite shell for Hadfield's Limited, Sheffield. Also shell inspection; Jan. 1919-Nov. 1921, chief engr. to the Soudan govt. for the complete erection and operation of cement plant for irrigation dept of the Blue Nile, for purpose of making own cement (Portland) to be used in the two dams across the Nile; Feb. 1922-March 1923, chief engr of the pulverized fuel dept Messrs. Alfred. Herbert Ltd., England; At present salesman and equipment erector and operator with the Hack Oil Burner Dept. of the Canadian Super Products, Montreal, Que.

References: E. A. Ryan, N. M. Campbell, J. T. Farmer, B. Vernon, W. F. Gronau.

YOST—WINFIELD HANCOCK, of 376 Marlowe Avenue, Montreal, Que. Born at St. Louis, Mo. U.S.A., April 11th, 1880, Educ., Manual Training School of the Washington Univ., St. Louis, I.C.S., McGill night courses, 1901-02, dftsman., detailer and checker on rly. freight cars, American Car & Foundry, Co., St. Louis, 1902 (Feb.-Nov.), chief dftsman., western mech'l dept., 1902-03, detailer and designer steel freight cars, for same company; 1903-05, designing, inspecting and bldg. sample cars for the Rodger Ballast Car Co. of Chicago, Ill. 1905-06, experimental engr for the Rodger Ballast Car Co., the National Dump Car Co. of Chicago and the Dominion Dump Car Co. of Montreal; In March 1906 sent to Montreal by Mr H. S. Harvey, president of the three above mentioned companies, to organize and take charge of the mech'l dept. of his Canadian company now known as the Hart-Otis Car Co. of Montreal Jan. 1907 appointed mech'l engr. of this company, occupying this position to date.

References H. H. Vaughan, C. Warnock, F. Y. Dorrance, F. E. Field, E. B. Tilt, J. A. McCrory.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

BENNET—WILLIAM HERBERT, of Montreal, Que. Born at New Glasgow, Que., August 25th, 1891; Educ., B.Sc. (C.E.), Queen's Univ. 1919, 1915 (summer), special apprtice, C.P.R. Angus shops, 1916 (summer), mechanist on munitions, John Bertram & Sons, Dundas, Ont.; 1917 (summer), instr'man., Gouin dam, St. Maurice River, Fraser Brace Co., 1919-20 (6 mos.), asst. engr., dftsman and instr'man., constrn. new plant, Algoma Steel Corpn., for Fraser Brace & Co.; 1920 (5 mos.), asst. engr., dftsman and instr'man., Atlas Constrn. Co., Montreal, 1920-21, res. engr., J. G. White Engrg. Corpn., dock terminal constrn. and track layout, Port Alfred, Que.; 1921 (6 mos.), res. engr. in charge constrn. hydro-elec. power development, Kenora, Ont., for Backus Brooks Co.; 1921 (5 mos.), dftsman and design track layout, G.T.R., Montreal; June 1923 to date, res. engr., supervising constrn. of three Lake Kenogami dams, for Quebec Streams Commission, Montreal.

References: O. O. Lefebvre, A. Duperron, A. Surveyer, F. S. Keith, C. W. Boast, R. H. Mulock, A. F. Dyer, C. Luscombe.

CHALMERS—GEORGE HADDON, of St. Thomas, Ont. Born at Smiths Falls, Ont., Oct. 21st, 1891; Educ., B.Sc. (Civil), Queen's Univ. 1918; 1911-13, rodman, topog'r., instr'man., C.P.R.; 1914 (May-Aug.), instr'man., Glengarry & Stormont Rlv; Aug. 1914-May 1915 and May 1916-Nov. 1917, 5th field co., Can. Engrs., Canada; 1918-20, with International Nickel Co. of Canada, 3 mos. land surveying and dam constrn., Bisco, Ont., 9 mos. asst. to field engr. at smelter, Copper Cliff, Ont., 8 mos. concrete inspr. on Big Eddy Dam, Turbine, Ont.; 1920 (Jan-July), engr. with Fraser Brace & Co. on plant constrn. for Algoma Steel Corpn.; 1920 (July-Dec.), instr'man., International Nickel Co. of Can., Copper Cliff; 1920-21, res. engr. for city of St. Thomas; 1921 to date, engr. with Jas. A. Bell & Son, St. Thomas.

References: J. H. Brace, C. P. Howrigan, E. L. Pettingill, C. Luscombe, J. A. Bell, W. C. Miller, F. A. Bell, H. B. R. Craig.

COLLINS—LAWRENCE EDWARD, of 904 Lothrop Avenue, Detroit, Mich. Born at Sherbrooke, Que., March 11th, 1893; Educ., all but last term of civil engrg. course, Valparaiso Univ., Valparaiso, Ind. (left 1915); 1915-17, Illinois Steel Co., Gary, Ind., with rank of inspr. Was special asst. to chief civil engr. on $20,000,000. program; 1917 (Mar.-May), in charge of estimating office, and May-Sept. attached to inspn. and editing bureau as inspn. engr. in charge of all orders placed in Western district, Bethleman Steel Co., Sparrow's Point, Md.; 1917-18, inspn. engr., Canadian Steel Corpn., Ojibway, Ont.; May 1918 to date, purchasing dept. of same company. Nov. 1920 appointed asst. purchasing agent (acting purchasing agent) occupying this position to date.

References: F. S. Keith, W. H. Baltzell, E. J. McIntire, N. M. Campbell, F. H. Kester.

ROSS—WILLIAM EWART, of 225 Rubidge Street, Peterborough, Ont. Born at East Ardsley, Yorkshire, England, March 2nd, 1880; Educ., 2 years, Univ. of Sheffield, England. Private study, 1903-07, power house, boiler room, and machine shop, Hemsworth Coal Co., Hemsworth, Eng.; 1908-10, asst. to elec. engr., for same firm; 1910-12, elect'n in charge, Sheepbridge Coal & Iron Co.; 1913 (6 mos.), Standard Lumber Co.; 1913-14, foreman on elect'l constrn., town of Sorel, Que.; 1914-18, overseas, C.E.F., Lieut.; 1918-19, supt. of curative workshops, D.S.C.R.; 1919-20, dftsman., Can. Gen. Elec. Co., Sept. 1920 to date, engr., industrial control, dept., Can. Gen. Elec. Co. Ltd., Peterborough, Ont.

References: P. L. Allison, E. R. Shirley, B. L. Barns, W. M. Cruthers, L. DeW. Magie, G. R. Langley.

SMITH—NEVILLE HERBERT FRANCIS, of 417 Bay Street, Ottawa, Ont. Born at Quyon, Que., Aug. 31st, 1889; Educ., D.L.S. cert. 1914; 1907-09, geodetic survey work; 1910-16, engr. in charge of precise levelling party, geodetic survey; 1917-18 and 1923 (also 6 mos of each intervening year), supervising subdivision of triangulation adjustments in charge of an office; 1919 to date, supervision over party doing precise levelling, reconnaissance of route and party erecting bench mark monuments.

References: J. L. Rannie, W. M. Tobey, N. J. Ogilvie, D. H. Nelles, F. B. Reid, H. F. J. Lambart, J. J. McArthur, H. M. Barton.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

MONTURE—GILBERT CLARENCE, of Kingston, Ont. Born at Hagersville, Ont., Aug. 27th, 1895; Educ., B.Sc. (Mining and Metallurgy), Queen's Univ. 1921; 1913-16 (summers), rodman and instr'man on township and govt. surveys; 1918-19, Lieut. Can. Engrs.; 1920, mining and metallurgical work, Algoma Steel Corpn; At present, office manager, Engineering Society employment service, manager for students' book and supply store, and editor for publications of above departments.

References: A. Jackson, L. T. Rutledge, J. M. Campbell, L. M. Arkley, W. P. Wilgar.

WEIBEL—EMIL EDWIN, of 354 Harvard Avenue, Montreal, Que. Born at Philadelphia, Pa., U.S.A., Nov. 19th, 1896; Educ., B.Sc. McGill Univ. 1918; 1915-17 (summers), struct'l. dfting, Dominion Bridge Co., Lachine; 1918 (summer), estimating on marine engine and steam turbine machinery, for same company; 1918 (four mos.), U.S. Engrs.; 1919 to date, designing and estimating on general mechanical work, in responsible charge under mechanical engineer, Dominion Bridge Company, Lachine.

References: F. Newell, D. C. Tennant, F. P. Shearwood, G. H. Duggan, E. Brown, G. E. Bell, G. E. Newill.

Recent Publications Received

Transactions, Proceedings, Etc.

Presented by the Societies.

The Benevolent Fund of The Institution of Civil Engineers, Report of the Proceedings at the Fifty-Ninth Annual General Meeting, held on Feb. 26th, 1923.

Canadian Institute of Mining and Metallurgy, List of Officers and Members, 1923.

The Franklin Institute of the State of Pennsylvania, Year Book, 1923.

American Society for Testing Materials Tentative Standards, 1923.

Proceedings of The Engineers' Society of Western Pennsylvania, Volume 39, No. 7, October 1923.

Proceedings of the Royal Philosophical Society of Glasgow. 1920-1922. Volume LI.

Minutes of Proceedings of The Institution of Civil Engineers, Volume CCXV. 1922-23, Part 1.

Reports.

Presented by Department of Mines, Province of Ontario.

Thirty-First Annual Report of the Ontario Department of Mines, being Volume XXXI, Part IX, 1922; The Stratigraphy and Paleontology of Toronto and Vicinity; Part III.—Gastropoda, Cephalopoda, and Vermes, by W. A. Parks, Ph.D., assisted by Madeleine Fritz, B.A.

Thirty-First Annual Report of the Ontario Department of Mines, being Volume XXXI, Part X, 1922. Contents: Mining Accidents in Ontario, 1921; Mines of Ontario; Instruction Classes for Prospectors; Notes on Clays of the Missinaibi river.

Presented by Board of Water Supply of the City of New York.

Seventeenth Annual Report of the Board of Water Supply of the City of New York.

Presented by Geological Survey Department of Mines, Canada.

Summary Report, 1922, Part B. and Summary Report, 1922, Part C.

Index to Separate Reports 1906-1910 and Summary Reports 1905-1916. Compiled by F. J. Nicolas.

Presented by The Senate of Canada.

Report of the Special Committee on The Fuel Supply of Canada together with the evidence received by the Committee.

Presented by Governor of the Panama Canal.

Annual Report of the Governor of The Panama Canal, for the fiscal year ended June 30th, 1923.

Presented by E. C. Cuvelette.

The Destruction and The Reconstruction of the Mines of Lens (France).

Technical Books.

Presented by D. Van Nostrand Company.

Electro-Chemistry Related to Engineering, by W. R. Cooper, M.A., B.Sc.

Plane Trigonometry, by Paul R. Rider, Ph.D., and Alfred Davis, M.A.

Projective Geometry with Applications to Engineering, by Peter Field.

Advertising Campaigns, by Harry Tipper and George French.

Presented by Chapman & Hall.

Cargo Handling at Ports, by Brysson Cunningham, D.Sc., B.E., M. Inst. C.E. F.R.S.E.

Presented by John Wiley & Sons, Inc.

Hydro-Electric Power Stations, by David B. Rushmore and Eric A. Lof. 2nd. edition.

Petroleum Resources of The World, by Valentin R. Garfias.

Engineering Drawing, by H. H. Jordan, B.S., and R. P. Hoelscher, B.S.

Presented by E. P. Dutton & Company.

Ventilation, Report of The New York State Commission on Ventilation.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

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A

ABRASIVE WHEELS

DIAMONDS FOR TRUING. Selection and Use of Diamonds for Dressing Grinding Wheels, Ward M. Robinson. Machy. (N. Y.), vol. 30, no. 2, Oct. 1923, pp. 133-136, 3 figs. Discusses general practice in handling this work and presents original information on use of truing diamonds.

PROGRESS IN MANUFACTURE. Progress in Grinding Wheel Manufacture, P. H. Walker. Machy. (N. Y.), vol. 30, no. 2, Oct. 1923, pp. 102-103. Developments; records of performance; new developments in vitrified wheels; improvements in abrasives; advances in polishing grain.

ACCELEROMETERS

IMPACT-MEASURING. Accelerometer for Measuring Impact. Earl B. Wmith. Am. Soc. Testing Matls., advance paper no. 74, for meeting June 25-29, 1923, 7 pp., 4 figs. Describes accelerometer of spring type, so constructed as to have eliminated effect of lag.

AERONAUTICAL INSTRUMENTS

ALTITUDE INSTRUMENTS. Calculating Altitudes for Record Purposes, Charles H. Colvin. Aviation, vol. 15, no. 15, Oct. 8, 1923, p. 440. It is shown that height-measuring instruments, both barographs and altimeters, are quite adequate for purposes for which they are used.

BAROGRAPH. The De Bothezat Barograph. Type "A", W. F. Gerhardt. Air Service Information Circular, vol. 5, no. 439, May 1, 1923, 11 pp., 16 figs. Instrument consists of large silk bellows connected to expansion tank in which presence is automatically brought to atmospheric at limit of expansion by special valve and system of electrical contacts.

AIR COMPRESSORS

CRANKLESS. A Crankless Air Compressor. Power, vol. 58, no. 14, Oct. 2, 1923, p. 530, 2 figs. Crankless engine designed by A. G. M. Michell which is adaptable, with modification in valve gear to use as air compressor, uniflow steam engine, gas engine, etc.; details of compressor.

DIESEL-DRIVEN FOR PUMPING PLANT. Air-Lift Pumping by Diesel Compressor, P. M. Thaver. Power Plant Eng., vol. 27, no. 19, Oct. 1, 1923, pp. 994-996, 3 figs. City of Fond du Lac has reduced cost of pumping by addition of Diesel compressor unit to water plant.

AIR CONDITIONING

HUMIDIFYING PLANTS. Humidifying Plants in Textile Mills, P. Martell Eng. Progress, vol 4, no. 8, Aug. 1923, pp. 176-178, 5 figs. Importance of saturating air with moisture for manufacturing process and for sanitary conditions; types and individual parts of humidifying plants; moisture meters.

AIR PUMPS

RADOJET. Steam Condensing Auxiliaries. Beama, vol. 13, no. 65, Sept. 1923, pp. 191-194, 5 figs. Describes Radojet air pump, principal characteristic of which is use of steam jets for removal of air; types; advantages; operation; Radojets with intercondensers; application in various industries.

AIRCRAFT

ALTITUDE DETERMINATION. The Determination of the Altitude of Aircraft, W. G. Brombacher. Optical Soc. Am.—Jl., vol. 7, no. 9, Sept. 1923, pp. 719-724, 13 figs. Practical method of determining altitude of aircraft above surface of earth, based on relations of altitude to various properties of air.

AIRCRAFT CONSTRUCTION MATERIALS

STEELS. Steel Structural Parts for Aircraft, Horace C. Knerr. Iron Age, vol 112, no 13, Sept. 27, 1923, pp. 816-820, 3 figs. Control in their heat treatment; alloy steels which have been adopted; use of metal in aircraft increasing

AIRPLANE ENGINES

ABSOLUTE CEILING, DETERMINATION OF. Engine Performance and the Determination of Absolute Ceiling, Walter S. Diehl. Nat. Advisory Committee for Aeronautics— Report, no. 171, 1923, 12 pp., 5 figs. Brief study of variation of engine power with temperature and pressures.

CARBURETORS. *See Carburetors.*

AIRPLANE PROPELLERS

DESIGN. Adaption of Propellers to Airplanes (Adaptation des Hélices aux Avions), M. Lamé.Aérophile, vol. 31, nos. 13-14, July 1-15, 1923, pp. 209-211. Relation and proper adjustment between engine, propeller and plane; power of propellers; power available and power used.

MODEL TESTS, ANALYSIS OF. Analysis of Dr. Schaffran's Propeller Model Tests, Max M. Munk. Nat. Advisory Committee for Aeronautics—Tech. Notes. no. 158, Sept. 1923, 13 pp., 8 figs. Extension of author's analysis of Dr. Durand's propeller model tests, adding now the slip curves obtained from tests made with different arrangement of tests and with propellers with more than two blades; series of tests now analyzed is said to be a very complete and systematic one.

AIRPLANES

GLIDERS. Report on Gliders, J. A. Roché. Air Service Information Circular, vol. 5, no. 444, May 1, 1923, 13 pp. 10 figs. Purpose of report is to set forth clear and simple methods for analysis of glider performance on different kinds of winds; value of gliders to aeronautics; effect of topography on soaring; different types of gliders; criteria for selection of soaring site.

METAL. Metal Aeroplane Construction, Hugo Junkers. Roy. Aeronautical Soc—Jl., vol. 27, no. 153, Sept. 1923, pp. 406-449, 53 figs. Outline of author's work in development of metal airplane construction; discusses evolution of his metal plane and method of proceedings and working adopted; advantages of metal construction.

ROLL, DAMPING FACTOR IN. Preliminary Study of the Damping Factor in Roll, James M. Shoemaker and John G. Lee. Nat Advisory Committee for Aeronautics—Tech. Notes, no. 161, Oct. 1923, 23 pp., 6 figs. Theoretical discussion of damping factor in roll, together with results of wind-tunnel tests on continuous rolling of U.S.A.-30 airfoil

SEAPLANES. *See Seaplanes.*

Stability. Dynamic Stability as Affected by the Longitudinal Moment of Inertia, Edwin B. Wilson. Nat. Advisory Committee for Aeronautics—Report, no. 172, 1923, 8 pp. Results of tests with experimental airplane; investigation of period, and damping; note on short oscillations; lateral stability.

STRUCTURAL PARTS. Fittings and Other Structural Parts of Airplanes, P. Eydam. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 160. Oct. 1923, 22 pp., 27 figs. Fitings for wing spar joints and for strut connections; internal bracing; bracing wires; control and landing gear. Translated from Technische Berichte, vol. 3, no. 6.

WINGS. Comparing Aerodynamical Properties of Wings. W. Klemperer and T. Bienen. Aviation, col. 15, no. 13, Sept. 24, 1923, pp. 368-370, 3 figs. With special reference to aspect ratio and parasite drag.

ALLOY STEELS

ELEMENTS IN INFLUENCE OF. Steel Alloys. Automobile Engr., vol. 13, no. 180, Sept. 1923, pp. 273-274. Notes on influence of various elements, including carbon, sulphur, manganese, phosphorus, vanadium, chromium and nickel.

See also Aircraft Construction Materials, Steels.

ALLOYS

ALUMINUM BRONZE. *See Aluminum Bronze.*
BEARING METALS. *See Bearing Metals.*
BRASS. *See Brass.*
COPPER. *See Copper Alloys.*
DURALUMIN. *See Duralumin.*
GUN METAL. *See Gun Metal.*
MAGNESIUM. *See Magnesium Alloys.*
ZINC. *See Zinc Alloys.*

ALUMINUM BRONZE

CAVITIES IN. The Occurrence of Cavities in Aluminum Bronze, J. Gallibourg and A. Brizon. Foundry Trade Jl., vol. 28, no. 371, Sept. 27, 1923, pp. 368-369. Study of casting conditions and results arising from investigation, pouring methods. Translated from paper presented to Paris Foundry Congress.

APPRENTICES, TRAINING OF

FOUNDRY. Training Foundry Apprentices at the Falk Corporation, H. A. Frommelt. Foundry Trade Jl., vol. 28, no. 369, Sept. 13, 1923, pp. 231-233. Program put into effect in plant of Falk Corp., which has a more or less general manufacturing engineering business, specializing in helical gears and railway castings; factors which have made training a success. Paper presented before Am. Foundrymen's Assn.

ARCHES

REACTIONS FOR UNSYMMETRICAL. Reactions for a Particular type of Unsymmetrical Arch, Carl B. Andrews. Am. Soc. Civ. Engrs.—Proc., vol. 49, no. 8, Oct. 1923, pp. 1685-1698, 3 figs. Discusses simple case in which series of parallel projections is reduced to shearing distortion; derivation of formulas referred to.

ASHES

COMBUSTIBLE MATTER IN. Combustible Matter in Boiler Ashes, W. S. Patterson. Chem. & Industry, vol. 42, no. 38, Sept. 21, 1923, pp. 904-906, 1 fig. Causes of "mechanical losses," presents graph showing for different amounts of ash in coal relationship between combustible matter in ashes and actual weight of ashes discharged

AUTOMOBILE ENGINES

COOLING SYSTEMS. New Water-Steam Cooling System Operates Without Pump. C. I. Preston. Automotive Industries, vol. 49, no. 12, Sept. 20, 1923, pp. 581-582, 3 figs. Lowergan system can be used with either conventional forced or thermo-siphon circulation; condenser prevents loss of water; radiator is said to be uninjured by freezing and has device to facilitate thawing.

AUTOMOBILE FUELS

ALCOHOL. Production of Industrial Alcohol (La préparation industrielle de l'alcool). Eug. Grandmougin. Génie Civil, vol. 83, nos. 9, 10 and 11, Sept. 1, 8 and 15, 1923, pp. 198-202, 224-228 and 246-248, 5 figs. Production of alcohol for use as motor fuel; describes fermentation and chemical process.

HEAVY-OIL. Heavy Oil for Motor Cars, A. Heller. Eng. Progress, vol. 4, no. 8, Aug. 1923, pp. 171-173, 6 figs. New service methods of Berlin Gen. Omnibus Co. and German State Post.

See also Benzol: Gasoline.

AUTOMOBILES

AXLE WEIGHTS. Ascertaining Axle Weights, A. Lampert. Motor Transport (Lond.), vol. 37, no. 964, Aug. 20, 1923, pp. 233-234, 4 figs. Simple method of finding out how the gross load of a vehicle is distributed on its axles.

BODIES. Light Weight with Endurance in Body Construction. Motor Transport (N. Y.), vol. 29, no. 4, Sept. 15, 1923, pp. 130-131, 3 figs. Plymetl, a material specially made to withstand unusual strains and weather. Has rust-resisting qualities and reduces chafing.

New Product May Solve Body Finishing Problem, O. H. Briggs. Automotive Mfr., vol. 65, no. 5, Aug. 1923, pp. 12-13. Durability, glass-like hardness, easy manipulation, high-varnish gloss or satin surface as desired, and quick drying are characteristics of Duco finish.

BRAKES. Air Brakes Claimed to Increase Life of Facing and Drum. Motor Transport (N. Y.), vol. 29, no. 4, Sept. 15, 1923, pp. 126-127, 3 figs. Westinghouse device fitted with steel shoes and metal liners; under test shows material improvement in service; installation of air device requires no alterations in original chassis design.

GEAR CHANGE. Gear-Changing Made Easy. Auto car, vol. 51, no. 1455, Sept. 7, 1923, pp. 411-412, 3 figs. Device with which it is impossible to make a bad gear change at any speed; known as Mitchell gear change.

HEADLIGHTING DEVICE PERFORMANCE. Illumination Diagrams for Showing Head-Lighting Device Performance, F. H. Ford. Soc. Automotive Engrs.—Jl., vol. 13, no. 4, Oct. 1923, pp. 333-337, 6 figs. Author recommends arrangement for denoting intensity by varying degrees of tint on surface of chart that is supposed to represent roadway; method of comparing devices by illumination charts that illustrate performance of headlighting devices.

PNEUMATIC LOAD SUSPENSION. Pneumatic Load Suspension. Motor Transport (Lond.), vol. 37, no. 964, Aug. 20, 1923, pp. 230-231, 3 figs. Body and freight converted into live load by simple air cushion system; wide application to all types of vehicles.

AVIATION

AERIAL NAVIGATION. Aerial Navigation, A. P. Rowe, Roy. Aeronautical Soc.—Jl., vol. 27, no. 153, Sept. 1923, pp. 450-458, 7 figs. Discusses art of navigating craft over (1) land unknown to navigator; land which is not capable of being mapped, e.g., desert; (3) large areas of water; (4) land or sea, but above clouds, such that pilot may take advantage of favorable weather conditions, or, in time of war, may proceed to his object of attack without interference.

AIR-LINE REQUIREMENTS. Technical-Commercial Airplane Data (Estudio Técnico-Comercial del Aviòn), Luis Roque Pellizzari. Ingenieria, vol. 27, no. 8, Aug. 1923, pp. 356-362, 2 figs. Describes airplane service between Buenos Aires and Montevideo; types of airplanes suitable; data for calculating airplane details for given carrying capacity.

B

BEAMS

REINFORCED CONCRETE. New Method of Calculating Reinforced Concrete Beams (Nouvelle méthode de calcul de la poutre armée), Léon Legens. Genie Civil, vol. 83, no. 12, Sept, 22, 1923, pp. 278-280, 9 figs. Compares calculation of reinforced-concrete beams with that of a double-hinged arch, and develops new formulas for calculation.

BEARING METALS

BABBITT. The Influence of the Ratio of Length to Diameter in the Compression Testing of Babbitt Metals, John R. Freeman, Jr. and Paul F. Brandt. Am. Soc. Testing Matls.—advance paper, no. 26, for meeting June 25-29, 1923, 7 pp., 3 figs. Investigation to determine influence of ratio of length to diameter in compression tests of babbitt metals.

HIGH LEAD CONTENT. Bearing Metals with High Lead Content (Hochbleihaltige Lagermetalle), G. v. Hanffstengel. Giesserei-Zeitung, vol. 20, no. 18, Aug. 15, 1923, pp. 344-345, 4 figs. Properties and use of such alloys; hardening of lead with light metals; thermit bearing metals; behavior of bearing metals in practice.

BEARINGS, BALL

MANUFACTURE. Ball Bearings and How They Are Made, Robert G. Skerrett. Sci. Am., vol. 129, no. 5, Nov. 1923, pp. 330-331 and 375- 8 figs. Describes equipment and process of manufacture.

BELTING

LEATHER. A New Type of "V" Leather Belt. Power Engr., vol. 18, no. 210, Sept. 1923, pp. 331-332, 2 figs. Salient features and advantages of Brammer belting, constructed on fish-scale principle, comprising separate leather links varying from 3 to 5 in. in length.

Making Leather Belts Endless, Louis W. Arny. Power Plant Engr., vol. 27, no. 19, Oct. 1, 1923, pp. 977-981, 11 figs. Tools required; making laps, classes of belts to be made endless; making new belts endless; waterproofing belting cement; lubrication.

BENDING

THEORY OF. The Theory of Bending, William Hovgaard. Engineering, vol. 116, no. 3015, Oct. 12, 1923, pp. 478-480, 3 figs. Investigation led to what is believed to be new and fundamental proof of essential soundness of theory justifying its extension to beams of non-homogeneous materials.

BENZOL

MOTOR. Comparative Engine Tests with Crude, Acid-Refined, and Silica-Gel Refined Motor Benzol. A. C. Fieldner and G. W. Jones. U. S. Bur. of Mines—Reports of investigations, no. 2517, Aug. 1923, 3 pp. Investigation to determine possibility of using silica-gel as refining agent for motor benzol and especially possibility of removing sulphur compounds and gum-forming constituents by such treatment.

BLAST-FURNACES

FUELS FOR. Tests with Different Fuels in the Blast-Furnace Plant of Böhler Bros. & Co., in Vordernberg (Germany) (Ueber Versuche mit verschiedenen Brennstoffen bei der Hochofenanlage der Gebrüder Böhler & Co., A.-G., in Vordernberg) Stahl u. Eisen, vol. 43, no. 38, Sept. 20, 1923, pp. 1215-1219, 2 figs. Difficulties in production of charcoal pig iron; combustion velocity of different blast-furnace fuels; practical experiences with mixed fuels.

BLOWERS

CONVERTER. Blowers for Large and Small Converters (Gebläse für Gross- und Kleinkonverter), Hubert Hermann. Giesserei-Zeitung, vol. 20, no. 19, Sept. 1, 1923, pp. 371-373, 4 figs. Comparison of burning in shaft furnaces and in iron baths; requirements of converters; drive of small blowers.

BOILER FEEDWATER

CIRCUITS. Boiler Feed Water Circuits, James G. Weir, Power Engr., vol. 18, no. 211, Oct. 1923, pp. 381-384, 12 figs. Discusses three possible sources from which water can absorb impurity, namely, condenser leakage, make-up supply, and absorption of air and other gases in feed reservoir. See also Engineer, vol. 136, no. 3536, Oct. 5, 1923, pp. 372-374, 15 figs.

REGULATORS. Feed Water Regulators. Eng. Rev. & Trader, vol. 37, no. 2, Aug. 1923, pp. 31-32, 3 figs. Describes thermofeed water regulator, consisting of float chamber and automatic regulating valve.

The Mercon Regulator. Power, vol. 58, no. 16, Oct. 16, 1923, p. 602, 3 figs. Excess-pressure regulator for both steam and motor-driven boiler-feed pumps designed to maintain constant differential.

BOILER FURNACES

AIR PREHEATING. Ljungström Air Heater (Le rechauffeur d'air Ljungström). Génie Civil, vol. 83, no. 10, Sept, 8, 1923, pp. 232-234, 7 figs. Preheating of air, using heat of flue gases advantages; describes preheating plant at Holmens Bruks works in Sweden.

FLUE-DUST REMOVAL. Flue-Dust Removal by Suction (Saugluft-Flugaschenförderung), Rich. Baumann. Zeit des Vereines deutscher Ingenieure, vol. 67, no. 39-40, Sept. 29, 1923, pp. 954-955, 7 figs. Describes method according to which red-hot ashes are removed from boilers while in operation, then cooled and, by mixing with water, changed into easily handled sludge; cleanliness and economy of process.

OIL-FIRED. Furnace Setting for Oil-Fired Boilers, George C. Adams Power, vol. 58, no. 14, Oct. 2, 1923, pp. 531-532, 1 fig. Describes furnace composed of two important parts, air spacing and vacuum pit; air spacing is composed of standard arch bricks set on large side.

PULVERIZED-COAL-BURNING. Burning Pulverized Coal. in the Cannon Radiating Furnace, H. B. Cannon. Combustion, vol. 9, no. 4, Oct. 1923, pp. 307-311, 4 figs. New type of boiler furnace designed to operate with pulverized fuel, in which combustion rate many times in excess of rate recommended at present has been maintained.

SMOKELESS:COMBUSTION. Smokeless Combustion in Boiler Furnaces, R. C. Demary. Combustion, vol. 9, no. 4, Oct. 1923, pp. 323-324. Points out importance of analysis of flue gases or proper draft.

BOILER OPERATION

CONTROL. Modern Systems of Boiler Control, John B. C. Kershaw. Combustion, vol. 9, no. 3, Sept. 1923, pp. 232-239, 7 figs. Savings effected by use of testing instruments in boiler houses; bonus systems of control; application of control systems in different plants in Great Britain.

BOILER PLANTS

EFFICIENCY, IMPROVEMENT OF. Building up Efficiency in Small Boiler Plants, R. C. Demary. Power Plant Eng., vol. 27, no. 20, Oct. 15, 1923, pp. 1020-1022, 2 figs. Notes on boiler settings, and boiler-room instruments.

Methods and Equipment Employed in Increasing the Economy of the Light and Power Plant in the Krupp-Gruson Works, Magdeburg (Arbeiten und Einrichtungen zur Hebung der Wirtschaftlichkeit des Licht- und Kraftwerkes im Krupp-Grusonwerk, Magdeburg), H. Zimmermann. Wärme, vol. 46, no. 31, Aug. 3, 1923, pp. 339-341. Fluctuations in load; enlargement of draft; reconstruction of furnaces; no-load losses; turbo-generator as phase displacer; measuring station and control of operation.

HEAT BALANCE. The Calculation of Heat Balances of Boiler Plant, Chas. F. Wade. Elec. Rev., vol. 93, no. 2388. Aug. 31, 1923, pp. 309-310. Laboratory data and further information needed as basis for calculation.

MANAGEMENT. Power Plant Management, Robert June. Blast Furnace and Steel Plant, vol. 11, no. 10, Oct. 1923, pp. 546-550, 4 figs. Efficient combustion practice; combustion losses and how to minimize them.

BOILER TUBES

CLEANING BLOWER. The "Parry" Boiler Tube Cleaning Blower. Engineer, vol. 136, no. 3535, Sept. 28, 1923, p. 350, 5 figs. Combination of De Laval steam nozzle with deflecting nozzle fitted with accurately machined guide vanes, which is mounted in boiler in such manner that it commands all tubes.

BOILERS

LOCOMOTIVE. *See Locomotive Boilers.*

WASTE-HEAT. Boilers with Large Water Space and Waste-Heat Boilers (Grosswasserraum- und Abhitzekessel in der neueren Wärmetechnik), Friedrich Schulte. Wärme, vol. 46, nos. 34 and 35, Aug. 24 and 31, 1923, pp. 373-377 and 387-391, 11 figs. Recent investigations and conclusions and their application to steam boilers; utilization of radiation and contact heat; size of furnace and of radiated heating surfaces in flue and other boilers; application of laws of heat transmission to waste-heat boilers of different types; elimination of air from boiler feedwater.

WATER GAUGES. The Pneumercator Distant-Reading Boiler Water-Gauge. Engineering, vol. 116, no. 3015, Oct, 12, 1923, pp. 460-461, 6 figs. Describes gage which works with cold water, which is distinct advantage over gauges in which glasses are subject to temperature of steam; can be placed in practically any position where it is most convenient for observation.

BOILERS, WATER-TUBE

VERTICAL. Vertical Water-tube Boilers, F. Johnstone-Taylor. Colliery Guardian, vol. 126, no. 3274, Sept. 28, 1923, pp. 773-775, 9 figs. Notes on their construction and advantages.

BORING MACHINES

THRUST TYPE. Improved Type of Thrust Boring Machine. Engineer, vol. 136, no. 3534, Sept 21. 1923, p. 321, 2 figs. Describes improved type of Mangnall Irving thrust borer.

BRAKES

COMPOUND LEVER TO INCREASE POWER. Increased Brake Power for Passenger and Freight Vehicles. Ry. Engr., vol. 44, no. 524, Sept. 1923, pp. 340-341 and 350, 3 figs. By use of compound lever described, increased vacuum brake power is obtained without additional or larger cylinders and incerased hand brake power secured with present brake handles.

KUNZE-KNORR. The Kunze-Knorr Brake for Goods Trains, Kurt Wiedemann. Eng. Progress, vol. 4, no. 7, July 1923, pp. 133-138, 14 figs. Non-automatic single-chamber air brake; double-chamber air brake; change-over freight-train and passenger-train brake; Kunze-Knorr freight-train brake; braking performance; results of experience.

BRAKING

REGENERATIVE. The Compound Characteristic in Regenerative Braking with Direct-Current Traction, M. G. Say and H. G. Frampton. Instn. Elec. Engrs.—Jl., vol. 61, no. 321, Aug. 1923, pp. 863-868, 10 figs. Deals with particulars form of regenerative braking for d.c. trains, effected by application of differential compound field excitation to traction motors.

BRASS

HARDNESS. The Hardness of "Common High" Sheet Brass, Alvan L. Davis. Am. Soc. for Steel Treating, vol. 4, no. 3, Sept, 1923, pp. 348-352. Sets forth average hardness, as determined by various methods, and range in hardness to be expected in annealed and in hard-rolled sheet brass of various tempers.

BRIDGES, CONCRETE

ARCH. Reinforced Concrete Bridge Across the Thames at Reading. Engineering, vol. 616, no. 3013, Sept. 28, 1923, pp. 385-386, 22 figs. partly on p. 400 and supp. plate. Notable for its low rise and for span of main arch which is 180 ft., largest of its type in England; constructed on Hennebique system of reinforced concrete.

DOUBLE-DECK. Solve Complicated River Crossing with Double-Deck Bridge, E. H. Harder. Eng. News-Rec., vol. 9, no. 14, Oct. 4, 1923, pp. 542-545, 7 figs. New reinforced-concrete bridge across Black River, Watertown, N.Y., has upper and lower decks; concrete arch design and construction complicated by this arrangement.

STRENGTH SPECIFICATIONS FOR. Strength Specifications Used for Large Concrete Bridge, J. B. Huntley. Eng. News-Rec., vol. 91, no. 15, Oct. 11, 1923, pp. 586-590, 3 figs. Abrams method of proportioning concrete used on C.C.C. & St. L. Ry. bridge over Great Miami River at Sidney, Ohio; both premixed and separate aggregates used.

BRIDGE DESIGN

STRESSES. Stresses in Bridges, J. S. Wilson and B. P. Haigh. Engineering, vol. 116, nos. 3013, and 3014, Sept. 28, and Oct. 5, 1923, pp. 411-413 and 446-448, 8 figs. Method of design by coefficient; stresses considered in design; graduated stress specifications.

BRIDGE ERECTION

ANCHORAGE CONSTRUCTION. Anchorage Construction Plant, Delaware River Bridge. Eng. News-Rec., vol. 91, no. 12, Sept, 20, 1923, pp. 460-463, 6 figs. Sequence of changing operations handled by mobile units on overhead track system; transport by scows solved problem of limited land area for storage.

RENEWAL WITHOUT DIVERTING TRAFFIC. An Interesting Example of Bridge Erection. Ry. Rev., vol. 73, no. 9, Sept. 1, 1923, pp. 293-299, 12 figs. Renewal of bridge over South Channel of Mississippi River at Rock Island without diverting traffic.

BRIDGES, HIGHWAY

STEEL. Vaudreuil-Ile Perrot Highway Bridge, F. B. Painchaud. Can. Engr., vol. 45, no. 13, Sept. 25, 1923, pp. 341-342, 6 figs. Details of bridge which links up Montreal-Toronto highway; steel structure 1,395 ft. long resting on 16 concrete piers; concreting done in winter; details of steel construction.

BRIDGES, RAILWAY

DEAD-LOAD STRESSES. Determination of Dead Load Stresses, L. H. Swain. Ry. Engr., vol. 44, no. 524, Sept. 1923, pp. 328-329, 3 figs. Application of theory of sound to determine dead-load stresses in defective tens on bars of lattice girder bridges.

IMPACT TESTS. Effects of Impact on Steel Railroad Bridges (Stosswirkungen bei eisernen Eisenbahnbrücken), F. Brunner. Bauingenieur, vol. 4, no. 14, July 31, 1923, pp. 413-418, 8 figs. Develops formulas and makes practical calculations to establish approximate effect.

BRIDGES, STEEL

NICKEL-STEEL CONSTRUCTION. Nickel Steel in Modern Bridge Construction, Paul D. Merica. Iron & Steel of Can., vol. 6, no. 9, Sept. 1923, pp. 189-191. Comparison of weight and cost of carbon and nickel steel; long spans are made economically possible by superior physical characteristics of nickel steel.

BRONZES

DEFECTIVE CASTINGS. Defective Bronze Castings, Walters F. Buckley. Metal Industry (N. Y.), vol. 21, no. 9, Sept. 1923, p. 359. Explanation of various reasons responsible for their production in foundry and what should be done to minimize and prevent this condition.

BUILDINGS

EARTHQUAKE-RESISTANT, JAPAN. Design of Earthquake-Resistant Buildings in Japan. Eng. News-Rec., vol. 91, no. 12, Sept. 20, 1923, p. 478, 5 figs. Details provide unusual strength at column joints; heavy sway bracing used; struts between foundation piers.

BUSHINGS

BRONZE, MOLDING. Bronze Bushings, R. E. Search. Metal Industry (N. Y.), vol. 21, no. 9, Sept. 1923, pp. 356-357, 5 figs. Various methods of molding these castings. Translated and abstracted from Fonderie Moderne, Apr. 1923.

C

CABLES, ELECTRIC

OVERHEAD TRACK SYSTEM, FOR. A Modern System of Overhead Railway Track Construction. Ry. Engr., vol. 44, no. 521, June 1923, pp. 1923, pp. 227-229 and 236, 5 figs. Steel-cored aluminum cables on Lake Erie and Northern Railway, Canada.

SUBMARINE. Submarine Cables and Ocean Floors. Tel and Tel. Jl., vol. 9, nos. 101 and 102, Aug. and Sept. 1923, pp. 191-193 and 218-220, 1 fig. Discoveries concerning ocean floor in connection with laying of different cables; effects upon weights of submarine cables.

CAR COUPLERS

AUTOMATIC. The Automatic Scharfenberg Coupling for Railway Cars, Gustav Laubenheimer. Eng. Progress, vol 4, no. 7, July 1923, pp 155-156, 11 figs. Rigid-type coupling without any locking device; coupling process; locking and disengaging of coupling advantages of Scharfenberg coupling.

CARBURETORS

AIRCRAFT. Thermal Atomizing Carburetors (Les carburateurs à pulvérisation thermique). Aérophile, vol 31, nos. 13-14, July 1-15, 1923, pp 212-213, 2 figs. Describes Le Grain carburetor adapted to aeronautical engines, designed to eliminate all dangers from back-fire of flame, and assuring complete atomizing of fuel.

CARS, FREIGHT

CAST-STEEL UNDERFRAME. One-Piece Cast Steel Freight Car Underframe. Ry. Rev., vol. 73, no. 13, Sept. 29, 1923, pp. 447-449, 6 figs. Southern Pacific standard double-sheathed box cars, equipped with cast-steel underframe, weight 13.8 lb. per cu-ft. capacity.

REINFORCED-CONCRETE. Freight Cars Made of Reinforced Concrete, H. Kleinlogel. Eng. Progress, vol. 4, no. 8, Aug. 1923, p. 164, 3 figs. Experiments and designs; reinforced-concrete cars heavier but cheaper than steel cars.

TRUCK-FRAME TESTS. Tests on Different Shaped Arch Bar Side Frames, Louis E. Ensley. Ry. Mech. Engr., vol. 97, no. 9, Sept. 1923, pp. 632-634, 8 figs. Slight changes in design reduce unit stresses from over 40,000 lb. to about 20.000 lb. See also Ry. Rev., vol. 73, no. 9, Sept. 1, 1923, pp. 303-306, 8 figs.

CASE-HARDENING

PROTECTION FROM CARBURIZATION. Protective Coatings for Selective Carburization. J. S. Vanick and H. K. Herschman. Am. Soc. for Steel Treating—Trans., vol. 4, no. 3, Sept. 1923, pp. 305-328, 8 figs. Results of experiments with coatings of copper plate and mineral base pastes, such as kaolin, fireclay and enamel mixtures in order to find effective protection of steel surfaces from carburization.

CAST IRON

MASS EFFECT. Studies Mass Effect on Iron, O. Smalley. Foundry, vol. 51, no. 20, Oct. 15, 1923, pp. 822-825, 4 figs. Tests made to determine chemical and physical phenomena occurring in cast iron as affected by rate of cooling; pouring temperature and rate of filling mold shown to be factors. (Abstract.) Paper read at Int. Foundrymen's Congress. See also Foundry Trade Jl., vol. 28, no. 370, Sept. 20, 1923, pp. 246-250, 9 figs.

PEARLITIC. The Production, Strength Properties and Useful Possibilities of Pearlitic Cast Iron (Das Perlitgusseisen, seine Herstellung, Festigkeitseigenschaften und Anwendungsmöglichkeiten), O. Bauer. Giesserei-Zeitung, vol. 20, no. 17, Aug. 1, 1923, pp. 317-324, 10 figs. Conditions for production of pearlitic castings; tests to determine properties of pearlitic cast iton; its superiority over other kinds of cast iron; uses.

SPECIFICATIONS. Topical Discussion: Is it Desirable to Include Chemical Requirements in Specifications for Cast Iron? Am. Soc. Testing Matls.—advance paper, no. 23, for meeting June 25-29, 1923, 6 pp. Argument for affirmative, by Robert Job; argument for negative, by Richard Moldenke.

TESTING. Testing Cast-Iron, Richard Moldenke. Foundry Trade Jl., vol. 28, no. 369, Sept. 13, 1923, pp. 224-226. Present position; Fremont test; early methods; separately cast test bars; advent of arbitration bar; necessity for universal bar; ring test; flat and round test bars; criticism of arbitration bar; diameter and machining of test bars; position of casting; etc. Report to Int. Foundrymen's Convention at Paris, France.

The Mechanical Testing of Cast Iron, H. H. Shepherd. Metal Industry (Lond.), vol. 23, nos. 9, 11, 12 and 13, Aug. 31, Aept. 14, 21 and 28, 1923, pp. 171-172, 223-225, 251-253 and 275-277, 7 figs. Reviews and criticizes various methods used for mechanical testing.

CASTING

TEMPERATURE INFLUENCE ON METALS. The Influence of Casting Temperature on the Working Properties of Metals, T. B. L. Cain. Metal Industry (Lond.), vol. 23, no. 9, Aug. 31, 1923, pp. 165-166, 7 figs. Gives instances of profound influence excited by casting temperature.

CASTINGS

CLEANING. Machines and Methods for Cleaning Castings (Maschinen und Verfahren der Gussputzerei), W. Kaempfer. Zeit. des Vereines deutscher Ingenieure, vol. 67, nos. 35 and 36, Sept. 1 and 8, 1923, pp. 850-853 and 979-881, 31 figs. Comparison of sand blast and manual operations; free jet blasts; sand blasts with revolving tables; cleaning drums; handling of mass articles; dust absorption.

CEMENT

QUICK-SETTING Results of Tests with Rapidly Setting Cement (Resultats d'expériences sur les ciments à durcissement rapide), Henry Lossier. Génie Civil, vol. 83, no. 9, Sept. 1, 1923, pp. 204-207. Details of tests of few cements; Lafarge and Holderbank Swiss cement supplied by Lambert Frères, including resistance to compression, resistance of seams, exposure to air, adhesive strength, shrinkage, and co-efficient of elasticity.

CEMENT, PORTLAND

FINER GRINDING, EFFECT OF. Late Data on the Effect of Finer Grinding and a Higher SO3 Content upon the Physical Properties of Portland Cement. P. H. Bates. Am. Soc. Testing Matls., advance paper, no. 38, for meeting June 25-29, 1923, 8 pp. Data obtained from testing specimens of all pages, including those tested at five years.

CENTRAL STATIONS

BY-PRODUCT POWER FROM WORKS FOR. Central-Station Utilization of By-product Power from Steel Plants, L. B. Breedlove. Elec. World, vol. 82, no. 15, Oct. 13, 1923, pp. 761-762, 1 fig. Opportunity for economical interchange of electrical energy and conservation of waste heat developed in steel industry; what data from fully electrified plant show.

CHROME-NICKEL STEEL

CORROSION, RESISTANCE TO. Resistance to Corrosion of a Nickel-Chrome Steel (La résistance à la corrosion d'un acier au nickel-chrome), Robert Stumper Revue de Métallurgie, vol. 20, no. 9, Sept, 1923, pp. 620-621. Results of tests with a steel of following composition: 0.54 Si, 0.012 P. 0.65 Mn, 0.6 C. 15.68 Cr, 7.04 Ni, exposed to action of hydrochloric acid, sulphuric acid, NaCl, steam, air, etc., showing excellent results.

CITY PLANNING

REGIONAL AND METROPOLITAN. Regional and Metropolitan Planning, George B. Ford. Eng. and Contracting (Roads and Streets), vol 60, no. 3, Sept. 5, 1923, pp. 499-506. Principles and methods are discussed.

COAL

CLASSIFICATION AND ANALYSES. What Management Should Know of Coal, Robert June. Blast Furnace and Steel Plant, vol 11, no 9, Sept. 1923, pp. 495-499 and 503, 3 figs. Analytical summary of many elements entering into power production reduced to common basis for busy executive.

CARBONIZATION. Low Temperature Carbonization in Vertical Retorts. Gas World, vol. 79, no. 2040, Aug. 25, 1923, pp 139-141, 1 fig. Experiments by Fuel Research Board. Coal mixtures and temperatures and resultant coke; conditions for obtaining suitable coke; tests with variations in steaming, test results.

COAL INDUSTRY

ENGINEERING AND MANAGEMENT. Thickness of Coal, Size of Mine and Use of Machinery the Three Factors in Efficient Production. Coal Age, vol 24, no 14, Oct. 4, 1923, pp. 505-508. Study of production records for 20 years of all soft-coal mines in United States. Coal Commission report on engineering and management

DIRECT CONVERSION TO ELECTRICITY. Transforming Fuel Energy Directly Into Electric Energy (Problemet att direkt omvandla bransleenergi till elektrisk energi). Gosta Angel. Teknisk Tidskrift, vol. 53, nos. 10 and 15, Mar. 10 and Apr. 14, 1923, pp. (Kemi) 13-16 and 17-20, 4 figs. By using coal as anode in Lalande battery, which is described in detail, describes gas battery with both electrodes consisting of gas, battery with both electrodes consisting of gas, cathode connected with air, and anode with CO or other gas, concludes that at present direct transformation is impracticable.

PURCHASING BY ANALYSIS. Propose Coal Buying by Analysis. Iron Trade Rev., vol. 73, no. 13, Sept. 27, 1923, p. 889. Southern Ohio Iron & Coke Assn. sponsors marketing plan in fuel similar to that in iron ore.

COAL HANDLING

BELT-CONVEYOR SYSTEM. Coal Sorted, Stored and Transported by Belt-Conveyor System. Power, vol. 58, no. 16, 1923, pp. 598-602, 7 figs. Fifty-ft. depth of coal storage is made possible by conveyor system, which may screen incoming coal, sending fine to power-house bunkers and coarser lumps to storage area; distributing crane performs number of functions in selecting and handling fuel; atomized water spray arrests coal dust.

FLOATING PLANTS. Floating Coal-Handling Plants at Continental Seaports. E. Krahnen. Iron & Coal Traders Rev., vol. 107, no. 2895, Aug. 24, 1923, p. 261. Floating steam slewing cranes for discharging and coaling steamers at Rotterdam; coal hoist for coaling steamers at Hamburg; coal hoist designed as colliers for coaling steamers.

PIERS. The Electrically-Operated Coal Pier of the Western Maryland Railway Company. R. W. McNeill. Elec. Jl., vol. 20, no. 9, Sept. 1923, pp. 329-333, 8 figs. Equipment consists of stationary car dumper of lift and turnover type, with mechanical trimming apparatus for loading boats directly from dumper pan, and auxiliary conveying system to permit loading of boats on side of pier opposite that on which dumper pan is located.

COKE OVENS

DESIGN. The Development of Coke Furnace Construction. Rob. Gau. Eng. Progress vol. 4, no. 8, Aug. 1923, pp. 165-168, 6 figs. Historical development attainment of excess of gas during carbonization; novel arrangements of heat accumulators; compound coke oven; employment of silica bricks; recent experience; continuously operated vertical oven.

COMBUSTION

CO. AT HIGH PRESSURES. Gaseous Combustion at High Pressures. William A. Bone, Dudley M. Newitt, and Donald T. A. Townend, Roy. Soc.—Proc., vol. 103, no. A721, May 3, 1923, pp. 205-232, 12 figs. Energy-absorbing function and activation of nitrogen in combustion of carbon monoxide.

The Relative Influences of Water Vapor and Hydrogen upon the Explosion of Carbon Monoxide—Air Mixtures at High Pressures. William A. Bone, Dudley M. Newitt and Donald T. A. Townend. Chem. Soc—Jl., vol. 123-124, no. 730, Aug. 1923, pp. 2008-2021, 2 figs. Describes experiments which have led to belief that water vapor has smaller influence than hydrogen upon rates of pressure development in carbon monoxide-air experiments.

COMPRESSED AIR

FOUNDRIES. Possibilities of Saving by Use of Compressed Air in Foundries (Ersparnismöglichkeiten im Pressluftbetrieb in Giessereien). H. Kupper. Giesserei-Zeitung, vol. 20, no. 19, Sept. 1, 1923, pp. 374-377, 3 figs. Conditions for economic working of compressors; use of compressors for low and high pressure in foundries; arguments for introduction of unit air pressure; proper design of compressed-air containers; arrangement.

CONCRETE

AGGREGATES. Report of Committee C-9 on Concrete and Concrete Aggregates. Am. Soc. Testing Matls., advance paper, no. 34, for meeting June 25-29, 1923, 13 pp., 2 figs. Report of cooperative series of tests on accelerators; proposed revised tentative specifications for concrete aggregate.

REQUIREMENTS. Symposium: What Properties of and Methods of Making Concrete Require Further Investigation? Am. Soc. Testing Matls., advance paper, no. 37, for meeting June 25-29, 1923, 52 pp., 4 figs. Discusses requirements of concrete to meet many varieties of service conditions; what can be learned from behaviour of actual structures.

WATERPROOFING. Waterproofing a Reinforced Concrete Standpipe. Eng. & Contracting (water works), vol. 60, no. 3, Sept. 12, 1923, pp. 523-525, 3 figs. Method of preventing leakage in 16-yr.-old structure.

WORKABILITY OF MIXTURES. A Penetration Test for the Workability of Concrete Mixtures with Particular Reference to the Effects of Certain Powdered Admixtures. J. C. Pearson and F. A. Hitchcock. Am. Soc. for Testing Matls., advance paper no. 47, for meeting June 25-29, 1923, 20 pp., 6 figs. Describes simple penetration test for measuring workability of concrete mixtures, as distinguished from consistency of flow.

CONDENSERS, STEAM

AIR PUMPS FOR. Air Pumps for Surface Condensers (Beurteilung von Luftpumpen für Oberflüchenkondensatoren), Paul H. Müller. Schiffbau, vol. 24, no. 46, Aug. 15, 1923, pp. 717-718, 1 fig. It is shown that water-jet apparatus as air pumps for surface-condensing plants are more saving of heat and more practical than steam-jet apparatus.

TUBES, TESTING. Testing Marine Condenser Tubes. Machy. (Lond.), vol. 22, no. 571, Sept. 6, 1923, pp. 728-729, 5 figs. Methods adopted in engine shops of William Beardmore & Co., Dalmuir.

VACUUM, ESTIMATION OF. Effect of Changing Conditions on Vacuum in Surface Condensers. Mech. World, vol. 74, no. 1923, Aug. 31, 1923, pp. 129-130. Method of calculation; includes table of vacuum, with corresponding temperatures.

CONNECTING RODS

FORKED, STRENGTH OF. The Strength of Forked Connecting Rods. William J. Kerton. Engineering, vol. 116, no. 3014, Oct. 5, 1923, pp. 442-444, 7 figs. Author seeks to derive more accurate method of calculating stresses in forked end of connecting rod, and to prove validity of his method by experimental evidence. Paper read before Brit. Assn.

HIGH-SPEED ENGINES. The Design of Connecting-Rods for High-Speed Engines. M. Platt. Automobile Engr., vol. 13, no. 180, Sept. 1923, pp. 279-285, 15 figs., and (appendices), 285-287, 6 figs. Presents numerous formulas for design of connecting rods of various cross sections.

CONVEYORS

MAIL HANDLING. Van Buren Station, Chicago Post Office. Am. Architect, vol. 124, no. 2426, Aug. 15, 1923, pp. 171-175, 10 figs. Mechanical conveyor system installed to handle large tonnage of mail.

PNEUMATIC. Compressed-Air and Fan Pneumatic Conveyor (Ueber Luft und Lufterforderer), B. Buhle. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 36, Sept. 8, 1923, pp. 873-878, 35 figs. Fan blast conveyor, in contrast to the usual suction and compressed-air conveyor, is described as an arrangement in which the air current is generated by a fan, describes types built by Seek Bros., Dresden, and Siemens-Schuckert Works, Berlin and results of tests.

COPPER ALLOYS

COPPER-NICKEL-LEAD. Copper-Nickel-Lead Alloys (Kupfer-Nickel-Bleilegierungen). W. Guertler and F. Menzel. Zeit. für Metallkunde, vol. 15, no. 8, Aug. 1923, pp. 223-224, 2 figs. Whereas copper and lead as well as nickel and lead do not mix in every condition, by mixing of all three metals, technically useful alloys of uniform structure are obtained.

COPPER-TIN. Solidification and Transformation Curves of Copper-Tin Alloys (Das Erstarrungs- und Umwandlungsschaubild der Kupfer-Zinnlegierungen). O. Bauer and O. Vollenbruck. Zeitl für Metallkunde, vol. 15, nos. 5 and 7, May and July 1923, pp. 149-125 and 191-195, 6 figs. Composition and properties of mixed crystals, changes in Cu_3Sn compound, eutectic points, etc.

CORONA

A. C. DISCHARGE. Two Photographic Methods of Studying High-Voltage Discharges. Karl B. McEachron. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1045-1050, 10 figs. Results of two methods of drawing out a.c. corona discharge along time axis.

CORROSION

ALLOYS RESISTANT TO. Alloys Resistant to Corrosion. Faraday Soc.—Trans., vol. 19, part 1, no. 55, July 1923. Contains following papers: General discussion, by Robert Robertson and C. H. Desch, pp. 159-158; The Corrosion of Industrial Metals, W. H. Hatfield, pp. 159-168, 1 fig.; The Resistance to Corrosion of Stainless Steel and Iron, J. H. G. Monypenny, pp. 190-183, 4 figs. Heat and Acid Resisting Alloys (Ni—Cr—Fe), J. Ferdinand Kayser, pp. 184-195, 6 figs.; Monel Metal, John Arnott, pp. 196-198. Corrosion Tests on Certain Nickel Alloys, F. Orme, pp. 199-200; Mechanism of So-Called "Dry Corrosion" of Metals, Ulick R. Evans, pp. 201-212; general discussion, pp. 213-230, 1 fig.

IRON AND STEEL. Report of Committee A-5 on Corrosion of Iron and Steel. Am. Soc. for Testing Matls.—advance paper, no. 11, for meeting June 25-29, 1923, 35 pp., 28 figs. Reports on inspection of Fort Sheridan, Pittsburgh and Annapolis tests; on total immersion tests; and on methods of sampling and analysis of metallic coated products.

MECHANISM OF. The Mechanism of Corrosion. John Johnston. Indus. & Eng. Chem., vol. 15, no. 9, Sept. 1923, pp. 904-905. Points out that more attention should be directed to what may be expected to happen at surface of separation, and, formation and behavior of film or layer at metal surface under various conditions.

CULVERTS

MONOLITHIC CONCRETE. Construction of Monolithic Concrete Culverts. I. H. Boggs and C. L. Tindall. Eng. & Contracting (Roads and Streets), vol. 60, no. 4, Oct. 3, 1923, pp. 704-705. Methods employed by maintenance division of N. Carolina Dept. of State Roads and Highways.

D

DAMS

CONSTRUCTION METHODS. Construction Methods at Laurel Road Dam, Stamford, Conn., David Bonner, Jr. Eng. & Contracting (Water Works), vol. 60, no. 4, Oct. 10, 1923, pp. 745-750, 6 figs. Ingenious use of belt conveyors for handling aggregate and concrete in dam construction.

DEFLECTION MEASUREMENTS. Deflection Measurements on Arch Dam in Switzerland. F. A. Noetzli. Eng. & Contracting (Water Works), vol. 60, no. 3, Sept. 12, 1923, pp. 530-533, 4 figs. Swiss tests on 75-ft. high variable radius-type diversion dam on River Reuss.

EMERGENCY. The Emergency Dam at St. Marys Falls. E. A. Markham. Military Engr., vol. 15, no. 62, July-Aug., 1923, pp. 342-344, 4 figs. Four locks on St. Marys Falls Canal and emergency dam to stop flow of water in case of breach of gates.

DIESEL ENGINES

DESIGN. Modern Diesel Engines (Die Dieselmaschine der Gegenwart). H. Nägel. Zeit. des Vereines deutscher Ingenieure, vol. 67, nos. 28, 29, 30, 32 and 33, July 14, 21, 28, Aug. 11 and 18, 1923, pp. 677-685, 711-713, 725-735, 778-782 and 808-812, 128 figs. Review of development during past decade, constructional features of latest types by M. A. N., Deutz, Krupp, Sulzer, Deutsche Werke and Michel Motor companies; methods of eliminating air compressor, and latest experience in regard to use of heavy oils (of high ignition point); development of 2-stroke engines, with special reference to valve and port methods of admitting air for scavenging; solid injection without use of compressor, an economic necessity in small Diesel engines, and trend is towards elimination of compressors in large engines as well; use of residual oils of high boiling point said to offer economic advantages; Krupp "mushroom" piston, an important development; use of Diesel engines on locomotives, with special reference to use of Lentz hydraulic gear.

EUROPEAN TYPES. Europe Developing New Types of Diesel Engines. Mar. Eng. & Shipg. Age, vol. 28, no. 10, Oct. 1923, pp. 598-601, 9 figs. Manufacturers carrying out experimental work on double-acting high-speed and compressorless types of engines.

TEMPERATURE DISTRIBUTION AND HEAT STRESSES. The Most Recent Investigations of Temperature and Heat Stresses in Internal-Combustion Engines. Die neuesten Forschungen uber den Temperaturverlauf und die Warmespannungen in Verbrennungsmotoren). H. Schmolke. Warme, vol. 46, no. 30, July 27, 1923, pp. 327-330, 1 fig. Describes determination of periodical temperature oscillations in walls of Diesel engines, and method of calculation leading to determination of stationary temperature distribution and resulting heat stresses.

DRILLING MACHINES

SCIENTIFIC INVESTIGATION. Drilling Machines (Bohrmaschinen). G. Schlesinger. Werkstattstechnik, vol. 17, nos. 14 and 15, July 15 and Aug. 1, 1923, pp. 417-447 and 449-480, 248 figs. Comparison of scientific calculation, measurement and practical design based on study of drawings submitted by 17 German firms, all well-known makers of drilling machines. Deals with stresses occurring in drilling and their measurement; main drive of machine and its parts; screw-cutting arrangements; weight of machine in relation to power consumption and drilling pressure; shape and stress of supports or stands. Description of various types and makes.

DRILLS

TWIST, MAGNETIC ANALYSIS. Report of Committee A-8 on Magnetic Analysis. Am. Soc. Testing Matls.—advance paper, no. 13, for meeting June 25-29, 1923, 3 pp. Abstract of report on testing of twist drills.

DRYDOCKS

ST. JOHN, NEW BRUNSWICK. The St. John Drydock. E. G. Cameron. Eng. Jl., vol. 6, no. 10, Oct. 1923, pp. 424-439, 20 figs. Details of construction and equipment of drydock designed for largest vessels afloat.

DURALUMIN

RESISTANCE TO ALTERNATING STRESSES. Resistance of Manganese Bronze, Duralumin, and Electron Metal to Alternating Stresses. R. R. Moore. Am. Soc. Testing Matls., advance paper, no. 24, for meeting June 25-29, 1923, 17 pp., 8 figs. Results of investigation made by Engineering Division of Air Service at McCook Field, to determine endurance limit of duralumin bar stock as rolled, annealed and tempered, similar investigations on manganese bronze and electron metal are included.

DYNAMICS

STROUD SYSTEM OF TEACHING. The Stroud System of Teaching Dynamics, James B. Henderson. Engineering, vol. 116, no. 3013, Sept. 28, 1923, pp. 409-410. Describes results obtained with Stroud system; author seeks to show that system is more logical than any other in that all other systems become special cases, and also that Stroud's artifices are valuable aids to accuracy in laboratory and in engineering workshop. Paper read before Brit. Assn.

E

EARTHQUAKES

MECHANICS OF. Earthquakes and Volcanoes, Edgar W. Woolard. Sci. Am. vol. 129, no. 5, Nov. 1923, pp. 304-305 and 370, 5 figs. Mechanics of titanic subterranean forces and their destructive careers; general structure of earth; volcanic and seismic phenomena; Japanese and other great earthquakes.

ECONOMIZERS

CAST-IRON. Feed Heaters or Fuel Economizers, Chas, F. Wade. Power Engr., vol. 18, no. 210, Sept, 1923, pp. 342-343, 1 fig. Outstanding facts relating to design, erection and operation of ordinary cast-iron type of economizer.

EDUCATION, ENGINEERING

AMERICAN INDUSTRY AND. Engineering Education and American Industry. Nat. Indus. Conference Board—Special Report, no. 25, Aug. 1923, 25 pp., 4 figs. Need for trained leadership in industry; educational problem; responsibility of industry.

EDUCATION INDUSTRIAL

SCHOOL COURSES. The Educational Courses of the German Committee for Technical Instruction (Die Lehrgänge des Deutschen Ausschusses für Technisches Schulwesen), C. Matschoss. Zeit. des Vereines deutscher Ingenieure, vol. 67 no. 35, Sept. 1, 1923, pp. 845-849, 18 figs. Gives examples of instruction sheets for machine builders, locksmiths, patternmakers, molders, forgers, etc.; how courses originated further developments and possibilities of application.

ELECTRIC ARCS

HIGH-FREQUENCY GENERATOR, AS. Frequency Conversion by Third Class Conductor and Mechanism of the Arching Ground and Other Cumulative Surges, and Voltages Induced by Arcing Grounds. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1078-1082, 5 figs. Discussion of papers by Charles P. Steinmetz published in Mar. issue and of paper by J. Slepian and J. F. Peters published in Aug. issue of Jl.

ELECTRIC CIRCUITS

MINIATURE. The Solution of Electric Power Transmission Ploblems in the Laboratory by Miniature Circuits, O. R. Schurig. Gen. Elec. Rev., vol. 26, no. 9, Sept. 1923, pp. 611-618, 5 figs. Shows how miniature circuits are employed to solve transmission problems.

ELECTRIC CIRCUITS, A.C.

FLOATING NEUTRAL SYSTEMS. Floating Neutral n-Phase Systems, Leonard A. Doggett. Am. Inst. Elec. Engrs.,—Jl., vol. 42, no. 10, Oct. 1923, pp. 1029-1032, 4 figs Author seeks to find very simples method of solving 3-phase unbalanced star circuits; described direct method, based on straight forward application of Kirchoff's laws, with which all results apply as well to single-phase and to any polyphase star system.

ELECTRIC CURRENTS

SHORT-CIRCUIT PROBLEMS. A Simplified Method of Analyzing Short-Circuit Problems Am. Inst. Elec. Engrs. — Jl., vol. 42, no. 10, Oct. 1923, pp. 1021-1028, 12 figs. Presents theoretical basis for theorem by which practical analysis and visualization of short-circuit phenomena can be greatly simplified.

ELECTRIC DISTRIBUTION

UNDERFLOOR DUCT SYSTEM. Underfloor Duct System. Elec. World, vol. 83, no. 12, Sept. 22, 1923, pp. 595-598, 12 figs. Installed in 22 buildings, costing more than $62,000,000 to provide electric service with least expense and maximum flexibility of distribution; optinions of architects, engineers and contractors.

ELECTRIC DRIVE

POWER-PLANT AUXILIARIES. The Drive of Power Station Auxiliaries, L. Breach and H. Midgley. Instn. Elec. Engrs.—Jl., vol. 61, no. 321, Aug 1923, pp. 829-845 and (discussion) 845-862, 9 figs. Deals only with supply of power for auxiliaries of modern power station; consideration of different types of auxiliaries used in station; different types of supplies available; suitable of different auxiliaries and supplies for various conditions of station working.

ELECTRIC FURNACES

BRASS MELTING. Applying the Induction Furnace to an Industrial Brass Foundry, J. G. Crawford Elec. World, vol 82, no. 12, Sept. 22, 1923, pp. 586-588, 3 figs. Advantages of electric melting include economies in production, improved quality of poured metal closer control of product and more favorable operating conditions; results of test run.

CURRENT-CONSUMPTION CALCULATION. Calculation of Current Consumption in Electric Furnaces (Note sur le calcul des prises de courant dans les fours électriques), Alphonse Pasquier. Revue de Métallurgie, vol 20, no. 9, Sept 1923, pp 591-596, 2 figs Describes simple practical method of calculation applicable to metallic or carbon electrodes.

FIAT. New Design of Electric Furnaces. Eng. Progress, vol. 4, no. 8, Aug. 1923, pp. 169-170, 2 figs Improvements; arrangements of electrodes; 3-phase transformer; advantages of Fiat furnace.

INDUCTION. Theory of High-Tension Induction Furnaces (Théorie du four à induction à haute fréquences), G. Ribaud. Journal de Physique et le Radium, vol. 4, no. 6, June 1923, pp. 185-197, 2 figs Calculation of what efficiency of this type of furnace should be, i.e., ratio between calorific energy taken from high-frequency source, and factors influencing this efficiency.

METAL INDUSTRY. Electric Furnaces in the Metal Industry (Der Ofen mit elektrischer Beheizung in der Metallindustrie), Wintermeyer Elektro-Journal, vol 3, no 2, Feb 1923, pp 22-25, 7 figs Reviews construction and operation of various types of arc and resistance furnaces, annealing and heating furnaces.

NON-FERROUS. Use of the Electric Furnace in Non-Ferrous Foundries and in Heat Treatment (L'emploi du four électrique en fonderies d'alliages et dans les traitements thermiques), M. Fourment Société des Ingénieurs Civils de France Mémoires et Compte Rendu des Travaux, vol 76, nos 4-5, Apr.-May 1923, pp. 446-467, 15 figs partly on supp plate. Principles of resistance, induction and arc furnaces, and their advantages in non-ferrous foundry work, comparison of various types of furnaces, construction of electric furnaces for heat treatment.

STEEL. Giving Flexibility to Electric Furnace Design, Frank Hodson Can Machy, vol 30, no 10 Sept 6, 1923, pp 37-38, 3 figs Steelmaking furnaces built for Ford Motor Co plant, of 60 to 80-ton capacity, provided with 8 electrodes.

Progress in Manufacture of Steel in the Electric Furnace (Les progrès de la fabrication de l'acire au four électrique), Clausel de Coussergues. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 76, nos. 4-5, Apr.-May 1923, pp. 423-445, 6 figs. on supp. plate. Describes different types of resistance or induction, arc radiation, and arc conduction furnaces, single-, two-, and three-phase; efficiency, heat losses, current consumption, etc.

ELECTRIC GENERATORS, A.C.

HIGH-SPEED. Some Problems in High-Speed Alternators, and Their Solution, Instn. Elec. Engrs.—Jl., vol. 61, no. 321, Aug. 1923, pp. 869-889, 3 figs. Discussion of paper by J. Rosen published in presious issue of Jl.

VOLTAGE WAVE SHAPE, IMPROVING. A Method of Improving the Voltage Wave Shape of an Alternator by External Circuits, E. W. Marchant and T. H. Turney. Engineering, vol. 116, no. 3014, Oct. 5, 1923, pp. 444-446, 16 figs. Principle involved in method described is to short-circuit each phase of alternator for frequency of ripple which it is desired to eliminate by-introducing shunt in resonance with frequency of ripple, and to cut down short-circuit current by introducing additional inductance.

ELECTRIC GENERATORS, D.C.

HIGH-VOLTAGE. A Continuous-Current Generator for High Voltage, S. R. Bergman. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1041-1045, 8 figs. Machine in which voltage between bars runs up to about 100 volts, or nearly four times conventional value; describes novel type of commutator.

ELECTRIC LOCOMOTIVES

GASOLINE-ELECTRIC SWITCHING. New Gasoline-Electric Switching Locomotive. Ry. Rev., vol. 73, no. 14, Oct. 6, 1923, pp. 488-489; 2 figs. Describes 40-ton unit constructed by Gen. Elec. Co., embodying improvements in design and construction over previous types.

INTERURBAN FREIGHT SERVICE. Electric Locomotive for Interurban Freight Service. Elec. Ry. Jl., vol. 62, no. 10, Sept. 8, 1923, pp. 368-369, 2 figs. Field-control motors with forced ventilation give high continuous rating; locomotive will haul 1180 tons on level tangen truck.

SINGLE-PHASE. Single-Phase Express Locomotives, Type 1C1, With Individual Axle Drive, Built by Ateliers Sécheron for Swiss Federal Railways (Locomotives monophasées pour express type 1C1, à commande individualle des essieux, construites par les Ateliers de Sécheron pour les Chemins de fer fédéraux suisses), J. Werz. Génie Civil, vol. 83, no. 11, Spet. 15, 1923, pp. 241-245, 14 figs. partly on supp. plate. Describes design, electric equipment, and gives dimensions; results of trials; maximum speed 90 km. p. h.

ELECTRIC RAILWAYS

LENGTH OF TRAINS. Length of Trains for Electric Rapid Transit Service (Die Zuglänge elektrischer Stadtschnellbahnen, Renfrert. Zentralblatt der Bauverwaltung, vol. 43, nos. 65-66, Aug. 15, 1923, pp. 386-388, 8 figs. Data on length of trains in various capitals; discusses most economic length of trains for distance between two states, making calculations for distance of 600 m. with a starting acceleration of 0.7 m. per sec. per sec. and a braking deceleration of 1.0 m. per sec. per sec.

ELECTRIC MOTORS, A.C.

INDUCTION. The Operation of Induction Motors at Different Frequencies, H. Cotton. Elec. Rev., vol. 93, no. 2388, Aug. 31, 1923, pp. 308-309, 1 fig. Brief statement of properties of circle diagram of induction motor, followed by discussion of new conditions of operation.

SQUIRREL-CAGE. Squirrel-Cage Induction Motor with High-Starting Torque and Low-Starting Current in the Line, T. F. Wall. Engineering, vol. 116, no. 3013, Sept. 28, 1923, pp. 394-395, 12 figs. Principle of new type of squirrel-cage motor; and advantages which may be expected therefrom. Paper read before Bris. Assn.

STARTERS. Automatic Starters for Synchronous Motors. Power, vol. 58, no. 16, Oct. 16, 1923, pp. 605-608, 8 figs. Describes two types, one for starting on full voltage and other for part voltage; frequency relay is used to close field switch at proper time.

ELECTRIC TRANSMISSION LINES

CHARGING. Charging Transmission Lines, A. W. Copley. Elec. World, vol. 82, no. 9, Sept. 1, 1923, pp. 426-427, 1 fig. Desirable excitation features of generators used on long transmission lines; analyses of armature reaction and excitation characteristics; effect of transformers and synchronous condensers.

REGULATION OF HIGH-VOLTAGE. Regulation of High-Voltage Lines, E. F. Gehrkens. Elec. World, vol. 82, no. 15, Oct. 13, 1923, pp. 759-760. Typical cases involving action of different types of regulators are discussed to indicate factors in handling problem of voltage, power factor and load regulation.

CHANGING VOLTAGE WHILE HOT. Changing lines to 220,000 While Hot, H. A. McIntosh. Elec. World, vol. 82, no. 14, Oct. 6, 1923, pp. 695-697, 4 figs. Additional section is placed under steel towers on Big Creek transmission system of Southern California Edison Co. with lines in operation; new insulator units and shield rings are installed.

ELECTRIC WELDING

DEVELOPMENT AND PROSPECTS. Electric Welder Vs. Riveter. Sci. Am. vol. 129, no. 4, Oct. 1923, pp. 236 and 295, 6 figs. Past successes and future promises of electric welding

TANKS The Application of Electric Welding to Large Tank Construction, E. J. Rigby. Am. Welding Soc Jl., vol. 2, no 8, Aug 1923, pp. 14-24, 5 figs. Methods adopted in repairing and constructing gas holders by Melbourne and Metropolitan Gas Co.

ELECTRIC WELDING, ARC

CORROSION, EFFECT ON. The Metallorgraphic Aspect of Arc Welded Joints, E. J. Rigby Indus Australian & Min Standard, vol 70, no 1813, Aug 30, 1923, pp 328-330, 9 figs Discusses effects of corrosion on welding, in connection with use of Quasi-Arc process of welding used in construction of gas holder in Melbourne.

ELEMENTS

HAFNIUM. On the Chemistry of Hafnium, G. von Hevtsy Chem & Industry, vol. 42, no 30, Sept 28, 1923, pp 929-930 Methods of separating hafnium from zirconium, chemical properties of hafnium

EMPLOYEES

EDUCATING IN FUNDAMENTAL ECONOMICS. Educating Workers in Fundamental Economics, Carl E Dietz Ry Age vol 75, no 14, Oct 6, 1923, pp 617-620, 1 fig How to tell story clearly and in such a way that they can readily grasp it. (Abstract.) Address delivered before Chamber of Commerce

EMPLOYMENT MANAGEMENT

WHITE MOTOR CO. White Company Revises Shop Management I. I. Prentiss Iron Age, vol 112, no 15, Oct 11, 1923, pp 953-955 Ratios wage plan and other mechanisms adopted by truck manufacturer, personnel research department, provision for close touch with employees.

ENGINEERS

CHEMICAL. The Aim and Function of the Chemical Engineer, W. H. Coleman. Chem. Age (Lond.), vol. 9, no. 219, Aug. 25, 1923, pp. 197-198. Points out essential function of chemical engineer, emphasizing importance of simplification of processes and insisting on factor of costs as well as of efficiency being taken into account.

F

FANS

ELECTRICALLY DRIVEN. Electric Drive for Centrifugal Fans. Blowers and Propeller Fans, Gordon Fox. Blast Furnace & Steel Plant, vol. 11, nos. 9 and 10, Sept. and Oct. 1923, pp. 469-471 and 530-532, 3 figs. Characteristics of fans operated at various percentages of rating with curves showing pressures, velocity heads, horsepower, etc.

MINE. High-Pressure Ventilating Fans, M. Mallécot Colliery Guardian, vol. 126, no. 3270, Aug. 31, 1923 p. 522, 2 figs. Examination of relative merits of two methods of ventilation.

OPERATION. Ventilation Problems, Walter S. Weeks. Eng. & Min. Jl.-Press, vol. 116, no. 10, Sept. 8, 1923, pp. 413-414, 4 figs. Discusses factors in operation of fans.

FATIGUE

INDUSTRIAL. Industrial Fatigue and Its Factors, C. E. A. Winslow. Forging—Stamping—Heat Treating, vol. 9, no. 9, Sept. 1923, pp. 380-381. Regulation of working day not only proves beneficial to employer but directly increases production; overheating of workroom affects efficiency.

FILES

STEEL, FAILURE OF. Some Causes for File Steel Failures, Arthur W. F. Green. Iron Age, vol. 112, no. 13, Sept. 27, 1923, pp. 811-815, 30 figs. Suggested means for prevention; conditions prevailing in rolling, forging and heat treatment of steel.

FIRE EXTINGUISHERS

CARBON TETRACHLORIDE. Tests with Tetrachloride Extinguishers on Electric Fires, S. H. Katz, E. J. Gleim and J. J. Bloomfield. Fire & Water Eng., vol. 74, no. 10, Sept. 5, 1923, pp. 441-442 and 448-449, 2 figs. Effects produced under varying conditions; experiments on electric arcs; effects on human beings.

FIRE PROTECTION

WELL-WATER SYSTEM. A Novel Well Water Fire Protection System, H. C. Wetmore. Fire & Water Eng., vol. 74, no. 11, Sept. 12, 1923, pp. 505-506, 6 figs. How Key West, Fla., met puzzling situation; shallow salt wells supply water for fire pumpers; how wells are constructed.

FIREBRICK

TESTING INSULATING VALUE OF. Testing the Comparative Insulating Value of Fire Brick, T. M. Caven. Combustion, vol. 9, no. 3, Sept. 1923, pp. 243-244. Description of simple method of making tests for thermal conductivity.

FLOOD CONTROL

METHODS. Comparison of Flood Control Measures, Harry Taylor. Eng. & Contracting (Water Works), vol. 60, no. 3, Sept. 12, 1923, pp. 563-567. Causes of floods and methods for their control.

FLOORS

CONCRETE. How Should Concrete Floors be built? Contract Rec. & Eng. Rev., vol. 37, no. 38, Sept. 19, 1923, pp. 907-909. Specifications of Am. Concrete Inst., which are recognized as standard.

FLOTATION

ORES, OXIDIZED. Flotation of Oxidized Ores, Albert W. Hahn. Min. & Metallurgy, vol. 4, no. 201, Sept. 1923, pp. 465-466. Mill tests for investigating process invented by R. V. Smith, for concentrating oxidized lead ores; describes patented process and also patented reagent developed by C. M. Nokes, which was found to be particularly suitable for oxidized copper ores, refractory manganese silver ores, and oxidized gold ores.

FOUNDATIONS

UNDERPINNING. Underpinning New York Public Library Without Shores, C. S. Rindsfoos. Eng. News-Rec., vol. 91, no. 13, Sept. 27, 1923, pp. 510-511, 3 figs. Used method known as "stealing"; rammed mortar transfers load to new footing; unusual rock conditions.

FLOW OF WATER

PIPES. An Experiment on the Flow of Water through a Circular Bend of Rectangular section, Kazuo Kumabe. Soc. Mech., Engrs. Tolyo, Japan—Jl., vol. 26, no. 78, June 1923, pp. 49-67, 22 figs. on supp. plates. Distribution of pressure and velocity in circular bend of rectangular section of pipe. Value of experiment in regard to theory of water turbines having radial guide vanes.

FORGE SHOPS

CHARGER MANIPULATOR. Forge Shop with Charger-Manipulator. Iron Age, vol. 112, no. 16, Oct. 18, 1923, pp. 1034-1036, 4 figs. Machine operators on turntable, with heating furnaces grouped radially about it; flexible heat-treating furnace a feature.

FOUNDRIES

AMERICAN PRACTICE. American Foundry Practice, Richard Moldenke. Foundry Trade Jl., vol. 28, no. 372, Oct. 4, 1923, pp. 283-284 and (discussion) 284-285. Notes on recruiting labor; Pittsburgh casting; nomenclature of semi-steel; cost systems, research work; sulphur in cast iron; pig iron by fracture and analyses; foundry coke; question of sand; safety-first considerations; co-operative reaserch; testing cast iron. Paper before Inst. Brit. Foundrymen.

BRASS VS. IRON. Brass vs. Iron Foundries, Charles F. Hopkins. Metal Industry (N. Y.), vol. 21, no. 9, Sept. 1923, pp. 351-355, 3 figs. Difference between ferrous and non-ferrous metals, care of crucibles and brass-foundry practice. (Abstract.) Address bedress before Phila. Foundrymen's Assn.

COMPRESSED-AIR ECONOMIES. Compressed Air Economies in Foundries, H. Kupper. Metal Industry (Lond.), vol. 23, no. 14, Oct. 5, 1923, pp. 289-291, 3 figs. In author's opinion question of uniform pressure for foundries is becoming of progressively increasing importance, reasons for which are enumerated. Translated from Giesserei-Zeitung.

MODERN PRACTICE. Traces Trend in Steel Foundries, Edgar A. Custer. Iron Trade Rev., vol. 73, no. 15, Oct. 11, 1923, pp. 1028-1030. Green sand molds, rammed hard, becoming more widely used; rigid and accurately machined flasks and equipment; field pointed out for making castings in dry sand cores.

PROTECTION OF WORKMEN. The Protection of Foundry Workmen (Arbeiterschutz in Giessereien), A. Holverscheid. Stahl u. Eisen, vol 43, nos. 30 and 36, July 26 and Sept. 6, 1923, pp. 968-975 and 1157-1162. Accidents liable to occur in sand dressing, molding, and with drying oven, in smelting and casting, cleaning of castings, etc.; treatment of injured.

FOUNDRY EQUIPMENT

SAND-AND-OIL-MIXING MACHINE. Sand and Oil Mixing Machine. Machy. (Lond.), vol. 22, no. 574, Sept. 27, 1923, pp. 826-827, 3 figs. New type of machine for mixing sand and oil as used in foundry core making.

FUELS

ANTHRACITE SUBSTITUTES. Anthracite Substitutes, O. P. Hood. U. S. Bur. of Mines—Reports of Investigations, no. 2516, Aug. 1923, 4 pp. Discusses use of coke, bituminous coal, briquets, oil, and gas as substitutes. See also report on Fuels Available for Domestic Use as Substitutes for Anthracite Coal, Rudolf Kudlich in Report of Investigations, no. 2520, Aug. 1923, 7 pp.

COAL VS. OIL. Will It Pay to Burn Oil Instead of Coal? W. F. Schaphorst. Ry. Mech. Engr., vol. 97, no. 9, Sept. 1923, p. 624, 1 fig. Presents chart determining relative value of coal and fuel oil.

TECHNOLOGY. Notes on Recent Developments in Fuel Technology, R. Wigginton. Fuel in Sci. & Practice vol. 2, no. 8, Sept. 1923, pp. 247-248. New oil meter; examination of oils; coal gas; coal productions; combustion of nitrogen; peat and dopplerite; fuel from ashes; industrial oxygen; new flame safety lamp.

USE AND ABUSE. Fuel—Its Use and Abuse, R. H. Fernald. Engrs. & Eng., vol. 40, no. 9, Sept. 1923, pp. 227-235 and (discussion) 235-239, 7 figs. Deals with resources and consumption in United States of solid liquid and gaseous fuels; summary of suggestions for conservation of fuel.

See also Coal; Lignite; Oil Fuel; Pulverized Coal.

G

GAGES

STANDARDIZATION. The Question of Gages in Germany and Abroad (Der Stand der Passungsfrage in Deutschland und im Auslande), K. Gramenz. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 25, June 23, 1923, pp. 605-612, 11 figs. Definition, classification, and standardization of gages in Germany, Austria, Holland, Sweden, England, United States and Russia.

GAS MANUFACTURE

VERTICAL RETORTS. Vertical Retort Results from Small Plant in Victoria, F. H. Hewlings. Gas Age-Rec., vol. 52, nos. 9 and 10, Sept. 1 and 8, 1923, pp. 247-249 and 289-290, 1 fig. Description of plant and discussion of operation results, by superintendent.

GAS PRODUCERS

ASH-FUSION. Ash-Fusion Gas Producers (Il gasogeno a fusione delle ceneri), M. Servais. Metallurgia Italiana, vol. 15, no. 1, Jan. 1923, pp. 7-10. Experiments with gas producers with capacity for gasifying 200 tons in 24 hrs.; tables of data referred to 1 kg. of coke; heat balance, etc.

GASES

MIXTURES, PRESSURES OF. The Pressures of Gaseous Mixtures, Irvine Masson and L. G. F. Dolley. Roy. Soc.—Proc., vol. 103, no. A722, June 1, 1923, pp. 524-538, 2 figs. Results of investigations show that volume of mixture of argon and ethylene is usually markedly greater than sum of separate volumes, all being measured at one and same pressure (termed mixture pressure); at fixed molecular ratio (mass ratio), there is particular value of mixture pressure at which increase is greatest.

SPECIFIC HEATS. Varying Specific Heats and Gas Engine Mixtures, Telford Petrie. Engineer, vol. 136, no. 3536, Oct. 5, 1923, pp. 361-362, 2 figs. Presents charts of specific heats at constant volume.

GASOLINE

POWER-PRODUCING QUALITIES. Preliminary Report of Power Producing Qualities of Certain Gasolines, Hugh M. Milton, Jr. Agricultural & Mech. College of Texas—Bul., vol. 8, no. 8, Aug. 1, 1922, 39 pp., 17 figs. Investigation of efficiency variations of four-cycle internal-combustion engine with different grades of petroleum products.

GEARS

TOOTH THICKNESS, MEASURING. Measuring Tooth Thickness of Involute Gears, Ernest Wildhaber. Am. Mach., vol. 59, no. 15, Oct. 11, 1923, pp. 551-552. New method which is not affected by errors in outside diameter; ordinary vernier caliper used; formula for standard measurement. See article by same author entitled. Measuring the Tooth Thickness of Helical Involute Gears, in same journal, no. 16, Oct. 18, 1923, pp. 587-588, 2 figs.

VARIABLE-SPEED. Shifting Speeds With An Oil Pump, P. J. Risdon. Sci. Am. vol. 129, no. 5, Nov. 1923, pp. 334 and 376, 4 figs. Details of British variable-speed gear without gear wheels.

GOVERNORS

CLOSE REGULATION. Close Regulation, H. W. Phillips. Power, vol. 58, no. 13, Sept. 25, 1923, pp. 495-498, 2 figs. Points out that close regulation may involve mechanical disadvantages in prime mover, a geared electric motor or a boiler-draft regulating device.

GRINDING MACHINES

FACE-GRINDING. Face-Grinding Machines. Machy. (Lond.), vol. 22, no. 573, Sept. 20, 1923, pp. 789-792, 8 figs. Heavy-duty machines of double- and single-ended types.

GEAR. Pratt & Whitney Gear Tooth Grinding Machine, Ellsworth Sheldon. Am. Mach., vol. 59, no. 15, Oct. 11, 1923, pp. 535-540, 10 figs. Faces of grinding wheels represent tooth profiles of rack; ingenious adaption of mechanical movement; true generating machine.

GUN METAL

CASTING TEST SPECIMENTS. Methods of Casting Test Speciments of Gun Metal, E. H. Dix, Jr. Am. Soc. Testing Matls., advance paper, no. 25, for meeting June 25-29, 1923, 12 pp., 6 figs. Experience of McCook Field foundry in connection with casting test bars of gun metal.

GYPSUM

VOLUMETRIC CHANGES. Volumetric Changes of Gypsum, J. Miller Porter. Am. Soc. Testing Matls., advance paper no. 36s, for meeting June 26-29, 1923, 10 pp., 12 figs. Study of nature and magnitude of volumetric changes which gypsum undergoes when setting and under certain conditions after set, such as humidity, temperature, etc.; and study of causes in some cases of lack of adhesion of gypsum-sand mix on concrete base,

H

HACK-SAWING MACHINES

POWER. Power Hacksaws and their Efficiency, H. J. Swanson. Machy. (N. Y.), vol. 30, no. 2, Oct. 1923, pp. 121-124, 1 fig. Types of saw blades, cutting speeds; saw blades for different kinds of service; feeds or pressure on blade; determining time required for sawing.

HANDLING MATERIALS

CHEMICAL PLANTS. Transport Facilities in Chemical Works, Herbert Blyth. Chem. Age. (Lond.), vol. 9, no. 219, Aug. 25, 1923, pp. 192-194, 5 figs. Describes facilities at works of United Alkali Co. at Widnes.

Problems. What Is Your Material Handling Problems, E. T. Spidy. Can. Ry. Club—Official Proc., vol. 22, no. 6, Sept. 1923, pp. 20-30 and (discussion) 30-40. Discusses factors entering into movement of material namely, management and labor, trucking system, material to be moved, conveyance, distance material has to be moved, and roadbed on which movement is made.

HARDNESS

Magnetic Testing. Magnetic Indications of Hardness and Brittleneness, A. V de Forest, Am. Soc. for Steel Treating—Trans., vol. 4, no. 3, Sept. 1923, pp. 342-347, 1 fig. Describes recent developments.

HEAT TRANSMISSION

Thermal Conductivity. The Measurement of Thermal Conductivity, Ezer Griffiths and G. W. C. Kaye. Roy. Soc.—Proc., vol. 104, no. A724, Aug. 1, 1923, pp. 71-98, 12 figs. Describes three types of apparatus of "plate" type for rapid precision determination of thermal conductivities of materials of low conductivity.

HEATING, STEAM

Systems. Steam and Hot-Water Heating Systems (Dampfwasserheizungen), Karl Brabbee. Gesundheits-Ingenieur, vol. 46, no. 32, Aug. 11, 1923, pp. 305-311, 13 figs. Critical review of the systems developed by the Zählerheizungs Company in Vienna; steam-water system with low-pressure boilers; known as DaWa heating system.

HYDRAULIC ACCUMULATORS

Design. Design and Calculation of Hydraulic Accumulators (Entwerfen und Berechnen hydraulischer Akkumulatoren), A. Lambrette. Praktische Maschinen-Konstrukteur, vol. 56, no. 27, July, 5, 1923, 4 pp., 6 figs. Calculation of cylinders, pistons, etc., for various pressures; control and safety devices; pumps; etc.

HYDRAULIC TURBINES

American and European. American and European Hydraulic Turbines (Amerikanische und europäische Wasserturbine), V. Graf. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 37, Sept. 15, 1923, pp. 908-909. Reply to article by H. Birchard Taylor in Power, no. 12, June 1923, in which he compares progress in America and Europe in construction of hydroelectric plants.

Conical. High-Speed Conical Turbines (Uever schnellaufende Konusturbinen), W. Zuppinger. Schweizerische Bauzeitung, vol. 82, no. 8, Aug. 25, 1923, pp. 97-101, 10 figs. Describes conical turbines constructed by Ateliers des Charmilles, Geneva, and explains principle upon which construction is based.

Kaplan. Development of Kaplan Turbine (Die Entwicklung der Kaplanturbine), Paul Walther. Elektro-Journal, vol. 3, no. 1, Jan. 1923, pp. 4-7, 12 figs. Results of braking tests carried out at technical laboratories in Germany, and of turbines constructed under license, showing increased efficiency (up to 92 per cent) and improvements made.

Pelton. New 26,000 Hp. Pelton Turbines at the Vanaus Central [Les nouvelles turbines Pelton de 26,000 C. V. de la centrale de Venaus (Mont-Cenis)], J. Boudet. Houille Blanche, vol. 22, no. 183, July-Aug. 1923, pp. 121-125, 7 figs. These turbines are built by Riva Co., Milan, for heat of 1100m.; horizontal axis; details of design and operation.

Single-Runner Overhung Pelton Turbines. Engineering, vol. 116, no. 3015, Oct. 12, 1923, p. 461- 4 figs. partly on p. 464. Reaction turbines installed in power plant on Fagundes River, Brazil.

The Modern Pelton Wheel, F. Johnstone Taylor, Power Engr., vol. 18, nos. 209, 210 and 211, Aug., Sept. and Oct., 1923, pp. 298-300, 325-327 and 365-367, 20 figs. Its development and present-day construction. Describes some recent successful Pelton wheel plants.

HYDRO-ELECTRIC DEVELOPMENTS

New York State. Beaver River Hydro-electric System, R. T. Livingston. Power Plant Eng., vol. 27, no. 20, Oct. 15, 1923, pp. 1015-1019, 11 figs. System composed of five small plants forms public service corportation called Northern New York Utilities, Inc., supplying electric light and power to majority of towns and cities in district and also to large number of paper mills.

HYDRO-ELECTRIC PLANTS

Economical Operation. Operating Hydro-Electric Plants To Obtain Most Economical Output, Ralph Brown. Power, vol. 58, no. 16, Oct. 16, 1923, pp. 614-616, 1 fig. Method of keeping record of plant performance to obtain best economy of available water; operating in parallel with steam plants; obtaining maximum output from hydro-electric units.

Sherman Island, Hudson River. Paper Company Completes Power Plant on the Hudson. Eng. News-Rec., vol. 91, no. 12, Sept. 20, 1923, pp. 470-476, 12 figs. Unusual geological condition of site; self-loading multiple-arch dam; 864-ft. spillway; large concrete-lined canal; reinforced-concrete penstocks, scroll cases, and draft tubes.

HYDROCARBONS

Genesis of. Notes on the Genesis of Hydrocarbons and Their Localization in Certain Zones of the Earth's Crust, R. d'Andrimont. Instn. Petroleum Technologists—Jl., vol. 9, no. 38, Aug. 1923, pp. 287-291. Qualities of hydrocarbons; tectonics of deposits.

HYDROPLANES

Design. Hydroplanes (Note sur les hydroglisseurs), P. Boutiron. Bul. Technique du Bureau Veritas, vol. 5, no. 7, July 1923, pp. 142-147, 9 figs. A river or marine boat propelled by purely aerial means, which latter also sustain it in water; details of design and propulsion; discusses phenomenon of gliding and its practical application.

I

ICE PLANTS

Montgomery Ala. Montgomery, Ala., Ice and Cold Storage Plant. Southern Engr., vol. 40, no. 1, Sept. 1923, pp. 61-64, 7 figs. Description of plant of Atlantic Ice & Coal Corp., which consists of three units, two 100-ton and one 40-ton capacity units; combined ice and cold storage plant.

Oil-Engine Drive. Ice-Making with Oil Engines. Refrigeration, vol. 32, no. 6, July 1923, pp. 30-34, 5 figs. Plant in Jersey City which has normal daily capacity of 200 tons. Experimental work showed that oil engine drive was most economical.

Oil-vs Corliss-Engine-Driven. Comparative Costs of Operating a 20-Ton Ice Plant. Southern Engr., vol. 40, no. 1, Sept. 1923, pp. 50-52, 2 figs. Comparison of operating costs of a Diesel- oil-engine and a Corliss-engine driven 20-ton plant.

INDICATORS

Micro, for High-Speed Engines. A New Type of High-Speed Engine Indicator. Power Engr., vol. 18, no. 210, Sept. 1923, pp. 351-352, 5 figs. Main features and advantages of Collins' patent micro-indicator, made by Cambridge & Paul Instrument Co.

INDUCTANCE COILS

High-Frequency Circuits. The Design of Inductances for High-Frequency Circuits, C. L. Fortescue. Instn. Elec. Engrs.—Jl., vol. 61, no. 321, Aug. 1923, pp. 933-939 and (discussion) 939-943, 6 figs. Investigation of proportions and arrangement of winding of high-frequency inductances in order to obtain minimum ratio of R/L; deals with both stranded and solid wire-coils, and unavoidable limitations arising from space factor; includes tables which enable simple comparisons to be made between stranded and solid wire coils having single- or multiple-layer windings.

INDUSTRIAL MANAGEMENT

Absence Records. Absence Records That Aid in Production Planning. Factory, vol. 31, no. 4, Oct. 1923, pp. 460-461, 500 and 502, 4 figs. Records of absenteeism collected from four large Philadelphia textile firms during over three years and dependable facts brought out by them.

INDUSTRIAL RELATIONS

Employers' Organizations. Employers' Associations in the United States. Int. Labour Rev., vol. 8, no. 3, Sept. 1923, pp. 367-379. Activities of employers' associations; U. S. Chamber of Commerce; Nat. Assn. of Mfrs.

Industrial Disputes, Settlement of. How Germany Settles Industrial Disputes, Frankel. Monthly Labor Rev., vol. 17, no. 3, Sept. 1923, pp. 8-17. Legal concililation agencies: jurisdiction, organization and procedure of conciliation boards; voluntary adjustment agencies; effectiveness of conciliation system; proposed measures for adjustment of disputes.

INTERNAL-COMBUSTION ENGINES

Crankless. Crankless Engines, Autocar, vol. 51, no. 1455, Sept. 7, 1923, p. 419, 3 figs. 8-cylinder design likely to be developed for aircraft use, and may also be applicable to automobile.

Fuel-Injection Pump. The Time Lag and Interval of Discharge with a Spring Actuated Fuel Injection Pump, Robertson Matthews and A. W. Gardiner. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 159, Sept. 1923, 17 figs., 1 fig. Deals with research on spring-actuated fuel pump for solid or airless-injection with small, high-speed internal-combustion engines.

Fuels for. Fuels for Internal Combustion Engines, with Special Reference to Alcohol Production, Frederick Nathan. Fuel in Sci. & Practice, vol. 2, no. 8, Sept. 1923, pp. 249-254. Survey of possible substitutes for gasoline for use in internal-combustion engines.

Heat Transmission in. Heat Transmission in Internal-Combustion Engines (Der Wärmeübergang in der Verbrennungskraftmaschine), Wilhelm Nusselt. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 28, July 14, 1923, pp. 692-695, 5 figs. Based on explosion tests in ball-shaped bombs, study is made of cooling of hot combustion gases; formulas for heat-transmission coefficients are derived; and equation is developed for calculation of heat exchange between gas and wall in internal-combustion engine.

High-Power. High-Power Explosion Engines (Moteurs à explosion à haut rendement), Maurice Dumas. Technique Moderne, vol. 15, no. 17, Sept. 1, 1923, pp. 530-534, 8 figs. Inadequacy of Rochas cycle; gives variation and dimensions; instead of cutting to dead point, stops short of it; gives illustrative examples.

Losses in. Losses in Heat Engines and Means of Reducing Them, W. P. Sillince. Diesel Engine Users Assn., Reprint Paper for meeting June 8, 1923, 37 pp., including discussion, 8 figs. Reducing waste and improving efficiency of heat engines of internal-combustion, particularly Diesel type; principal losses of heat; typical Diesel-engine heat balance; losses to jacket water and exhaust; Still engines.

Research and Testing Plant. The Works and Laboratory of Messrs. Ricardo & Co., Ltd. Automobile Engr., vol. 13, no. 180, Sept. 1923, pp. 275-278, 10 figs. Résumé of activities at Bridge Works, Sussex; methods and equipment.

See also Airplane Engines; Automobile engines; Carburetors; Diesel Engines; Oil Engines.

IRON CASTINGS

Chilled Rolls. Application of Scientific Principles to the Manufacture of Chilled Rolls, Emil Schutz. Foundry Trade Jl., vol. 28, no. 367, Aug. 30, 1923, pp. 176-179, 8 figs. Results of investigation of number of problems relating to manufacture of chilled rolls recently carried out in Germany; factors studies include cooling of rolls, heating of chills, contraction, chill, casting strains and temperature, hardness, and chemical and metallurgical properties of castings. Translated from Stahl u. Eisen.

IRON, PIG

Electrolytic Production. Production of Pig Iron by the Electric Furnace (La fabrication de la fonte au four électrique), Clausel de Coussergues. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 76, nos. 4-5, Apr.-May 1923, pp. 543-564. Describes different types of furnaces; reactions in electric blast furnaces, and reagents used; comparison of open and closed furnaces; future of pig iron production by electric furnace.

IRRIGATION

Economical Use of Water. The Economical Use of Irrigation Water Based on Tests Harry S. Clyde, Willard Gardener and Orson W. Isaraelsen. Eng. News-Rec., vol. 91, no. 14, Oct. 4, 1923, pp. 548-552, 6 figs. Solution of problem considered when water is available at given price, land plentiful, water limited and land semi-irrigated.

INSULATING MATERIALS, ELECTRIC

Porcelain. The Production of Porcelain for Eletcrical Insulation. Frank H. Riddle. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1097-1102, 13 figs. Ceramic tests on finished product; combined mechenical and electrical test; use of microscope as aid in study of quality and structure of porcelain.

Testing. Report of Committee D-9 on Electrical Insulating Materials. Am. Soc. Testing Matls., advance paper, no. 61, for meeting June 25-29, 1923, 42 pp., 13 figs. Test for non-volatile matter; proposed method for determining sludging properties of transformer oils; measuring power factor and dielectric constant of insulating materials at commercial frequencies; testing electrical insulating materials for voltage effects at radio frequencies; testing cable splicing and pothead compounds.

INSULATORS, ELECTRIC

Testing Apparatus, Gases Liberated by. Gases Liberated by High-Voltage Insulation Testing Apparatus, G. W. Jones and W. P. Yant. U. S. Bur. of Mines—Reports of Investigations, no. 2497, July 1923, 4 pp. It was found that gases liberated during testing of insulators, using 90,000-volt flashover 60-cycle testing apparatus, are mainly ozone.

INTEGRATORS

Root-Mean-Square Value, Calculation of. Mechanical Computation of Root Mean Square Values, L. A. Umansky. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1093-1095, 5 figs. Points out that root-mean-square value can be quickly calculated mechanically by device called Amsler's mechanical integrator, invented 65 years ago and widely used for other purposes.

L

LABOR

INDIVIDUAL AND COLLECTIVE BARGAINING. Individual and Collective Bargaining Under Mexican State Labor Laws, Martha Dobbin. Monthly Labour Rev., vol. 17, nos. 2 and 3, Aug. and Sept. 1923, pp. 189-240 and 146-158. Study of contract provisions, employers' and workers' organizations and labor disputes, and conciliation and arbitration.

LEGISLATION. Labor Legislation of 1922. U. S. Bur. Labor Statistics, Bul. no. 330, May 1923, 102 pp. Includes information on wages, hours of labor, hygiene and safety, pensions, retirement provisions, insurance, labor organizations and disputes, etc.

LABORATORIES

AERODYNAMIC. The Melbourne University Aerodynamic Laboratory, W. E. Bassett. Commonwealth Engr., vol. 10, no. 11, June 1, 1923, pp. 410-412, 3 figs. Designed to carry our research work on aircraft machine, engines, and construction material, for affording instruction to engineering students; testing accurate models of airplanes or airships; testing actual engines used as to horsepower developed, fuel consumption, faults, etc; and to advance technical knowledge of science of aeronautics.

METALLURGICAL. Assembling a Metallurgical Laboratory, Richard Rimbach. Foundry Trade Jl., vol. 28, no. 368, Sept. 1923, pp. 201-202, 3 figs. Installation and space necessary; machine shop and testing laboratory; analytical laboratory; balance room and office; storeroom.

LATHES

LOCOMOTIVE WHEEL BOSS. Lathes for Locomotive Wheel Bosses (Lokomotivradsatz-Drehbank), Y. Krupski. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 35, Sept. 1. 1923, pp. 858-861, 11 figs. Influence of attempts to increase efficiency on design of machine; principal parts, drive and feed; advantages of new lathe.

LIFTING MAGNETS

RAW-MATERIAL HANDLING. The Industrial Advantages of Electric Lifting Magnets, F. N. Reville. Australasian Elec. Times, vol. 2, no. 7, July 27 1923, pp. 468 and 471-473, 2 figs. Description of magnets designed for handling raw material.

LIGHTNING ARRESTERS

TESTING. Some Fundamentals in Protecting Against Lightning, E. E. Burger. Gen. Elec. Rev., vol. 26, no. 9, Sept. 1923, pp. 608-611, 8 figs. Discusses fundamentals which should be considered in commercial testings of lightning arresters, based on experiments made in General Engineering Laboratory.

LIGNITE

U. S. DEPOSITS. Neglected Sources of Home Supply of Liquid Fuel. Oil Eng. & Finance, vol. 4, no. 83, Aug. 11, 1923, pp. 141-142. Oil obtainable from valuable lignite deposits in the United States; industrial importance of deposits.

LIQUIDS

VISCOSITY. On a Relation Between the Viscosity of a Liquid and Its Coefficient of Expansion, D. B. Macleod. Faraday Soc.—Trans., vol. 19, part 1, no. 55, July 1923, pp. 6-16 and (discussion) 34-37, Expression is given for viscosity of liquids at different temperature and pressures. See also article by same author entitled. On the Viscosity of Liquid Mixtures Showing Maxima, pp. 17-34, 10 figs.

LOCOMOTIVE BOILERS

REPAIRING. Repairing Locomotives in a Contract Shop. Boiler Maker, vol. 23, no. 9, Sept. 1923. pp. 245-249, 7 figs. Description of contract locomotive repair shop that was built up around a war-time ordnance plant; types of boiler repairs handled and methods employed.

LOCOMOTIVES

AVERAGE LIFE. A Mortality Table for the Steam Locomotive, F. H. Adams. Ry. Rev., vol. 73, no. 12, Sept. 22, 1923, pp. 423-424. Interstate Commerce Commission bureau of valuation finds that average expected life for 8165 locomotives is about 31 years.

CARBON-VANADIUM STEEL FOR REDUCING WEIGHT. A Practical Example of Carbon-Vanadium Steel Use, R. J. Finch. Ry. Rev., vol. 73, no. 15, Oct. 13, 1923, pp. 532-534, 2 figs. Dynamic augment and weight of new Chicago & Northwestern Ry. Pacific type locomotive reduced.

DESIGN. Modern Locomotive Engine Design and Construction. Ry. Eng., vol. 44, nos. 522, and 524, July and Sept. 1923, pp. 269-275, and 334-339 and 350, 21 figs. July: Positive location of plates and buckle for laminated-type spring; determination stresses in plate springs and buckles; application of load ot laminated-type springs; adjustment of weight on springs; load-compensating arrangements. Sept.: Laminated springs; spring-compensating gear; design of coiled springs.

HEAT ECONOMY IN. Heat Economy in Steam Locomotives, L. Schneider. Eng. Progress, vol. 4, no. 7, July 1923, pp. 139-144, 10 figs. Economy in design of furnace, boiler, preheaters, superheaters, engine and valve gear.

INTERNAL-COMBUSTION. High Power Internal Combustion Locomotives, J. S. Tritton Ry. Rev., vol. 73, no. 14, Oct. 6, 1923, pp. 497-499, 4 figs. Also Ry. Engr., vol. 44, no. 524, Sept. 1923, pp. 325-327 and (discussion) 327-328, 4 figs. Transmission presents principal problem of adopting internal-combustion engines to locomotive service.

MIKADO. Mikado Type Locomotives for Duluth & Iron Range. Ry. Jl., vol. 29, no. 9, Sept. 1923, p. 16, 1 fig. Equipped with feedwater heater and booster; with aid of latter tractive force is increased to 70,000 lb.; booster is piped to use superheated steam.

MIXED-SERVICE. Locomotive for Mixed Service, G. Reder. Eng. Progress, vol. 4, no. 7, July 1923, pp. 151-154, 4 figs. Describes recent types of locomotives which may be used for greatest possible number of different types of trains.

THERMIC SIPHONS. A Dynamometer Car Test on the N. C. & St. L. Ry. Ry. Rev., vol. 73, no. 15, Oct. 13, 1923, pp. 521-526, 7 figs. Value of thermic siphon determined in test of same locomotive with or without this device. See also Ry. Mech. Engr., vol. 97, no. 9, Sept. 1923, pp. 521-526, 7 figs.

TURBO-ELECTRIC CONDENSING. Ramsay Turbo-Electric Condensing Locomotive. Ry. Age. vol. 75, no. 15, Oct. 13, 1923, pp. 667-668, 3 figs. Experimental locomotive under development in England; results of tests.

The Ramsay Turbo-Electric Condensing Locomotive. Ry. Gaz., vol. 39, no. 12, Sept. 21, 1923, pp. 362-366, 6 figs. Further details of this locomotive and results of trials.

LUBRICATING OILS

PROPERTIES. Lubricating Oils (Les huiles industrielles de graissage), J. Lévy. Technique Moderne. vol. 15, no. 17, Sept. 1, 1923, pp. 522-530, 6 figs. Properties desired in liquid lubricants; animal and vegetable oils and fats; distillation; cracking; fractionation in refining of oil.

RE-REFINING. A New Lubrication Development, David W. Dickie. Pac. Mar. Rev., vol. 20, no. 9, Sept. 1923, pp. 451-452. Describes process of refining discarded lubricating oil and recovering good lubricant contained therein.

STEAM-ENGINE CYLINDERS. What Oil for Steam Engines? Forrest A. Hoff. Oil News, vol. 11, no. 16, Aug. 20, 1923, pp. 28-29. Suggestions for compounding right oils for steam cylinders; type of feed, steam temperature and dryness important; formulas for cylinder oil.

TURBINE. Deterioration of Turbine Oils in Use, Alexander Duckham and Stanley I. Bowrey. Engineering, vol. 116, no. 3012, Sept. 21, 1923, p. 353. 1 fig. Discusses deterioration due to atmospheric action on warm oils as principal cause of emulsification, and other circumstances contributing ill effects.

LUBRICATION

BOUNDARY. The Nature of Lubrication in Engineering Practice. T. E. Stanton. Instn. Petroleum Technologists—Jl., vol. 9, no. 38, Aug. 1923, pp. 260-273, 4 figs. Results of pendulum experiments show that by means of comparatively simple apparatus characteristics of lubricants and bearing metals under conditions of boundary lubrication can be investigated rapidly and conveniently.

M

MACHINE TOOLS

PAPER MACHINERY. Special Tools for Making Paper-Mill Machinery, E. T. Spidy. Am. Mach., vol. 59, no. 16, Oct. 18, 1923, pp. 575-578, 11 figs. Machines and methods used by Dominion Engineering Works, turning, boring and grinding large cylinders and rolls of various materials.

RAILWAY-WHEEL PRODUCTION. Machine Tools for Railway Wheel Production. Machy. (Lond.), vol. 22, no. 570, Aug. 30, 1923, pp. 685-691, 12 figs. Duplex boring mills by Webster & Bennett, Ltd., Coventry.

MACHINING METHODS

CURVES, LARGE RADIUS. The Machining of Curves of Large Radius, E. W. Eager. Mech. World, vol. 74, nos. 1910 and 1912, Aug. 10 and 24, 1923, pp. 78 and 110-111, 5 figs. Methods and instruments for producing work, gages, or templets which have arcs or curves in their form.

MAGNESIUM ALLOYS

PROPERTIES. Magnesium and Extra-Light Alloys (Le magnésium et les alliages ultra-légers), Albert Portevin. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 76, nos. 4-5, Apr.-May 1923, pp. 486-507, 9 figs. partly on supp. plates. Mechanical properties of magnesium and effect of addition of other metals; effect of extrusion on mechanical properties; producers of magnesium alloys and analyses of their products; advantages and uses of extra-light alloys.

MALLEABLE CASTINGS

STRUCTURE. Malleable Castings and Their Changes at High Temperature (Sur la constitution des Fontes Malléables et les modifications qu'elles subissent instantanément aux hautes températures). Fonderie Moderne, vol. 17, Aug. 1923, pp. 274-276, 5 figs. Compares American and European malleable castings and their micro-structure (Revue de la Soudure autogéne.)

MATERIALS

COHESIVE FORCE. Cohesion from the Engineering Standpoint A. A. Griffith. Engineering, vol. 116, no. 3012, Sept. 21, 1923, p. 377. Explains author's theory of plastic strain, in which conclusion is reached that it is simply external manifestation of phase changes occurring within material. Paper before Brit. Assn.

STRENGTH TESTING. Further Researches on the Strength of Materials, W. E. Dalby. Roy. Soc.—Proc., vol. 103, no. A720, Apr. 3, 1923, pp. 8-25, 7 figs. Describes recent researches with author's modified testing machine and elastic recorder, and his new instrument for getting records of torque and twist positive and negative limits, called elastic torque twists recorder.

The Testing of Materials and Its Effects on Engineering, G. B. Upton. Soc. Automotive Engrs.—Jl., vol. 13, no. 4, Oct. 1923, pp. 296-299 and (discussion) 299-300 and 312. Properties of materials; endurance curves; factor of safety. Discusses the four bases of design, namely strength, fatigue, stiffness, and shock.

MATTER

ELECTRICAL STRUCTURE OF. Electrical Structure of Matter, Ernest Rutherford. Engineer, vol. 136, no. 3533, Sept. 14, 1923, pp. 28-29. Discusses Bohr's theory on outer structure of atom; nucleus of atom, and its structure. Author points out that there is not same certainty today as a decade ago that atoms of an elements contain hidden stores of energy. See also Elec. Rev., vol. 93, no. 2390, Sept. 14, 1923, pp. 384-386, and Chem. News, vol. 125, nos. 3309, 3310, and 3311, Sept. 14, 21 and 28, 1923, pp. 161-165, 177-182 and 193-197. Paper read before Brit. Assn.

METALLOGRAPHY

A.S.T.M. REPORT. Report of Committee E-4 on Metallography. Am. Soc. Testing Matls.—advance paper, no. 18, for meeting June 25-29, 1923, 15 pp. Proposed tentative definitions of terms relating to metallography; photography as applied to metallography; and metallographic testing of non-ferrous metals and alloys.

STRUCTURE, THEORY OF. Development and Possible Achievements of Metallographic Research (Entwicklung und mögliche Ziele der metallkundlichen Forschung), F. Sauerwald. Zeit. für Metallkunde. vol. 15, no. 7, July 1923, pp. 184-190. With special consideration of kinetic theory of structure.

METALS

FATIGUE OF. The Fatigue Failure of Metals, C. F. Jenkin. Roy. Soc.—Proc., vol. 103, no. A720, Apr. 3, 1923, pp. 121-138, 13 figs. Describes theory which appears to offer reasonable explanation of most of principal phenomena observed when wrought iron, steel, nickel, copper, and some other metals are tested.

GASES IN. Gases in Metals, Louis Jordan. Am. Soc. Testing Matls.—Advance paper, no. 20, for meeting June 25-29, 1923, 16 pp. Methods for determining gases in metals; effects of gases in practical metallurgy; application of methods of analysis for gases.

RUSTPROOF. Acid and Rust Proff Materials for Chemical Works, Rex Furness. Chem. Age. (Lond.) vol. 9, no. 219, Aug. 25, 1923, pp. 198-200. Describes more important acid-resisting and rustproof metals and alloys and discusses chemical properties which are demanded.

MINERALS

NON-METALLIC, CANADA. Prepared Non-Metallics in Canada, S. J. Cook. Can. Chem. & Metallurgy, vol. 7, no. 9, Sept. 1923, pp. 226-231. Their consumption by the principal Canadian industries during 1922; possibilities for development.

MINES

VENTILATION. Economy and Efficiency in Ventilation, Joseph Parker. Colliery Guardian, vol. 126, nos. 3268 and 3269, Aug. 17 and 24, 1923, pp. 397-399 and 465-466, 6 figs. Determining characteristics of a fan, regulators; Sirocco fans; experiments with evasée; power-saving arrangements; etc. Problems arising from excessive resistance of some splits; position of regulator and booster fan; fan drives.

MOLDING MACHINES

FLASK EQUIPMENT. Suitable Flask Equipment for Molding Machine, Arnold Lenz. Can. Foundryman, vol. 14, no. 9, Sept. 1923, pp. 13-16 and 32, 19 figs. Laying out of flasks; materials for flasks; equipment should be inter changeable; no gaggers need be used, if properly fitted to pattern; sand strip, which is really a permanent continuous gagger, recommended.

MOLDING METHODS

PLANER TABLES. How to Mold a Planner, Table, R. H. Palmer. Foundry, vol. 51, no. 19, Oct. 1, 1923, pp. 767-769, 8 figs. Method of preparing and venting sand bed to prevent scabbing on face; faults of omission and commission in patternmaking practice.

MOLDS

DESIGN. Design of Cast-Iron Molds for Casting under Pressure (Le Dessin des Coquilles pour le Moulage sous pression). Fonderie Moderne, vol. 17, Aug. 1923, pp. 256-258, 1 fig. Difficulties in casting, elimination of air, complete filling of mold, life of mold of various compositions. (Abstract from La Machine Moderne).

GATING. The Importance of Proper Gating, F. G. Edwards. Metal Industry (Lond.), vol. 23, no. 10, Sept. 7, 1923, pp. 195-196, 3 figs. Discusses factors which should be considered.

MORTAR

FATIGUE. Fatigue of Mortar, R. B. Creppe. Am. Soc. Testing Matls., advance paper, no. 41, for meeting June 25-29, 1923, 9 pp., 6 figs. Results of investigation of fatigue element with respect to cement mortar carried on in Testing Matls. Laboratory of Purdue University.

N

NOMENCLATURE

A. S. T. M. COMMITTEE REPORT. Report of Committee E-8 on Nomenclature and Definitions. Am. Soc. for Testing Matls.—Advance paper, no. 5, for meeting June 25-29, 1923, 16 pp.

NON-FERROUS METALS

A. S. T. M. REPORT. Report of Committee B-2 on Non-Ferrous Metals and Alloys. Am. Soc. Testing Matls.—advance paper, no. 15, for meeting June 25-29, 16 pp., 1 fig. Proposed revised tentative specifications for seamless admiralty condenser tubes and ferrule stock; and for determination of zinc in pig lead.

ELECTROLYTIC PRODUCTION. Metallurgy of Electrolytic Non-Ferrous Metals (Métallurgie des métaux non ferreux par l'électrolyse), M. Altmayer. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 76, nos. 4-5. Apr.-May 1923, pp. 508-542, 7 figs. partly on sup. plate. Discusses copper, lead tin, zinc, cadmium, nickel and precious metals, and describes principally American practice of elcetrolytic production.

RESEARCH PROBLEMS. The Trend of Research in the Non-ferrous Industry, Paul D. Merica. Indus. & Eng. Chem., vol. 15, no. 9, Sept. 1923, pp. 895-897. Corrosion problem; what is to be done with scrap; chemistry of metals at high temperature; new industrial uses for non-ferrous metals and alloys; fabrication of metals and alloys.

O

OILS

ROAD. Use of Air Bath in Determination of Solid Residue of Road Oils at 100 Penetration, H. F. Clemmer and H. C. Helmle. Am. Soc. Testing Matls., advance paper, no. 58, for meeting June 25-29, 1923, 5 pp., 1 fig. With new hot air bath it is possible to check samples of oil to 1 per cent.

OIL ENGINES

CONTINENTAL PRACTICE. Continental Oil Engine Practice, J. L. Chaloner. Gas & Oil Power, vol. 19, no. 217, Oct. 4, 1923, pp. 1-3. Professor Nagel's researches; port scavenging; M. A. N. and Sulzer systems; cooling; preheating of starting air; Professor Neumann's tests; machanical injection; heat transmission.

PISTON AND CYLINDER LUBRICATION. Operation of Marine Oil Engines, John Lamb. Inst. Mar. Engrs.—Trans., session 1923-1924, Aug. 1923, pp. 172-192 and (discussion) 192-205, 4 figs. Discusses lubrication of cylinders and pistons.

OIL FUEL

BURNERS. The Scarab-Coen Oil Burning System, Oil Eng. & Finance, vol. 4, no. 85, Aug. 25, 1923, pp. 242-244, 3 figs. System of mechanical oil burning which operates under low pressure; details of design; oil heater; duplex strainer.

COMBUSTION IN DIESEL ENGINES. Liquid Fuels and Their Combustion in Diesel Engines (Flüssige Brennstoffe und ihre Verbrennung in der Deisel-maschine), Otto Alt. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 28, July 14, 1923, pp. 686-691, 13 figs. Review of knowledge on chemical and physical properties of fuels and of combustion process in Diesel engine; gives tables showing ignition temperature required in engine for various fuels; apparently no gasification and no appreciable evaporation precede ignition; ignition point depends upon chemical constitution; all liquid fuels, including benzol, burn when the required ignition temperatures are reached.

EFFICIENT BURNING. Burning Liquid Fuel Efficiency, H. A. Anderson. Iron Trade Rev., vol. 73, no. 16, Oct. 18, 1923, pp. 1097-1098 and 1105. Type of burner and design of furnace principal factors in economical use of fuel oil; refractories, use of insulating brick, and condition of fuel also influence efficiency.

INDUSTRIAL POWER PLANTS. Oil as Fuel in Industrial Power Plant, Douglas Henderson. Power Plant Eng., vol. 27, no. 19, Oct. 1, 1923, pp. 974-976, 2 figs. How practical and economic considerations affect use and selection of fuel.

OPEN-HEARTH FURNACES

COMPRESSED-GAS FIRING. Compressed-Gas Firing of Open-Hearth Furnaces, Gerhard Donner. Iron & Coal Trades Rev., vol. 107, no. 2897, Sept. 7, 1923, p. 353, 3 figs. Also Foundry Trade Jl., vol. 28, no. 371, Sept. 27, 1923, p. 273, 3 figs. Describes carried out, and results obtained, on experimental 3-ton open-hearth furnace heated by compressed gas. Translated from Stahl u. Eisen.

LIME VS LIMESTONE PRACTICE. Lime vs Limestone in Basic Open-Hearth Practice as Affecting Time Costs, Lewis M. Fulton. Iron & Steel of Can., vol. 6, no. 9, Sept. 1923, pp. 180-181. Comparison of material costs.

OIL SHALE

WORLD'S RESOURCES. Oil Shale—A Comprehensive Survey, Victor C. Alderson. Min. Congress Jl., vol. 9, no. 10, Oct. 1923, pp. 383-385. Notes on oil shale in Scotland, England, Germany, Sweden, Spain and Newfoundland, Africa's oil shale, importance in Esthonia, deposits in United States, especially western resources, extent of world's resources. Bibliography.

ORES

TONNAGE AND GRADE CALCULATION. How to Calculate Tonnage and Grade of an Ore body. James E. Harding. Eng. & Min. Jl.—Press, vol. 116, no. 10, Sept. 8, 1923, pp. 445-448, 7 figs. Usual practice ignores important factors; formulas suggested have wide application and eliminate personal taste and judgment.

OXY-ACETYLENE WELDING

OVERHEAD. Welding Overhead with the Oxy-Acetylene Flame, C. J. Nyquist. Am. Welding Soc.—Jl., vol. 2, no. 8, Aug. 1923, pp. 13-14. Discussion of one most difficult applications of oxy-acetylene welding.

SHEET ALUMINUM. The Autogenous Welding of Sheet Aluminium by the Oxy-Acetylene Process, A. Eyles. Machy. (Lond.), vol. 22, no. 574, Sept. 27, 1923, pp. 822-825, 19 figs. Aluminum welding fluxes; welding material; preparing metal for welding; power of blowpipes; execution of sheet-aluminum welding; treatment after welding.

TANKS. Welding Small Tanks by the Oxy-Acetylene Process. Acetylene Jl., vol. 25, no. 3, Sept. 1923, pp. 117-124, 20 figs. Welding practices; examples of tank welding; comparison of costs.

P

PAINTS

TESTING FILMS. Further Studies of the Physical Properties of Drying-Oil, Paint and Varnish Films, Harley A. Nelson and George W. Rundle. Am. Soc. Testing Matls., advance paper, no. 50, for meeting June 25-29, 1923, 13 pp., 6 figs. Discusses three aspects of testing of paint films.

PAPER MANUFACTURE

BLEACHING OF LIGNOCELLULOSE. Bleaching of Ligno-Cellulose, Carl Schwalbe and Herman Wenzyl. Paper, vol. 32, no. 23, Sept. 26, 1923, pp. 3-6 and 23. Discusses effect of addition of mineral acids on bleaching of wood pulp; relative advantages of alkaline and acid bleaching.

CYLINDER MACHINES. Cylinder Papermaking Machine. Paper Trade Jl., vol. 77, no. 11, Sept. 13, 1923, pp. 50-54, 7 figs. Describes cylinder machine patented by George L. Bidwell, with improved means for feeding cylinder vats with solution of water and fiber and for controlling suction; other improvements.

PROBLEMS AND DEVELOPMENTS. The Paper Industry; Problems and Recent Development, Bjarne Johnsen. Indus. & Eng. Chem., vol. 15, no. 9, Sept. 1923, pp. 891-893. Improvements in sulphite process; recovery of by-products; wood substitutes; improvements in bleaching; sizing; importance of scientific control.

PULP MANUFACTURE. The Decker Process for Sulphite Pulp, C. S. V. Harkings. Paper Trade Jl., vol. 77, no. 13, Sept. 27, 1923, pp. 51-52, 1 fig. Improvement in sulphite cooking method.

PAPER MILLS

DRYING MACHINES. Report, Discussion and Cost Figures on the Efficiency of Electric Paper Drying Machine, John E. Alexander. Paper Trade Jl., vol. 77, no. 12, Sept. 20, 1923, pp. 43-44. Figures, data and discussion regarding efficiency of drying paper by steam and by electricity.

VENTILATION. Heat Recovery Atom Machine Room Vapor, J. O. Ross. Paper Trade Jl., vol. 77, no. 14, Oct. 4, 1923, pp. 47-49. Principle of ventilating machine room in paper manufacturing plant; sources of waste heat; Briner economizers.

PATTERNS

LARGE CASTINGS. Large Pattern and Core Work on the Pacific Coast. Am. Mach., vol. 59, no. 15, Oct. 11, 1923, pp. 553-555, 7 figs. Method, used in making large pipe connections for turbine work, of building both patterns and cores with sand over skeleton wooden frames to cheapen cost where but few castings are required.

NICKEL-PLATED PLATES. Nickel Plated Production Pattern Plates, William H. Parry. Metal Industry (N. Y.), vol. 21, no. 9, Sept. 1923, p. 358. Method of overcoming difficulty of sand adherence.

STANDARDIZATION. Pattern Standardization, E. S. Carman. Metal Industry (N. Y.) vol. 21, no. 10, Oct. 1923, pp. 400-401. Need for this work and possibilities of eliminating some of unseen wastes of foundry. (Abstract.) Bul. Am. Foundrymen's Assn.

PIGMENTS

WHITE PAINT, OPTICAL PROPERTIES. Some Optical Properties of White Paint Pigments in the Ultra-Violet Spectrum, A. H. Pfund. Am. Soc. Testing Matls., advance paper, no. 51, for meeting June 25-29, 1923, 11 pp., 6 figs. Treats of certain properties of paint pigments in ultra-violte region of spectrum.

PIPE

FRICTION LOSSES. New Logarithmic Equation for Friction Losses in Pipes, F. W. Greve. Eng. News-Rec., vol. 91, no. 15, Oct. 11, 1923, p. 605. Formula devide with aid of reducing number of variables to minimum.

REINFORCED, STRESSES IN. The Stresses in Pipes Reinforced by Steel Rings, Gilbert Cook. Engineering, vol. 116, no. 3015, Oct. 12, 1923, pp. 447-478, 2 figs. Investigation of conditions under which reinforced pipe may be made lighter than plain pipe even when no difficulties of welding would be encountered, conclusions regarding relation between spacing of rings and their effectiveness. Paper read before Brit. Assn.

PLANERS

HERRINGBONE-GEAR. A New Herringbone Gear Planer, N. Leerberg. Am. Mach., vol. 59, no. 15, Oct. 11, 1923, pp. 561-563, 3 figs. Features of design proposed to overcome difficulties usually encountered; two tools cut simultaneously and move in helical path; work held stationary during cutting to give stability.

PLATES

RECTANGULAR, STRESSES IN. Stress Distribution in a Rectangular Plate having two Opposing Edges Sheared in Opposite Directions, C. E. Inglis. Roy. Soc.—Proc., vol. 103, no. A723, July 2, 1923, pp. 598-610, 11 figs. Distributions obtained are apparently in close agreement with those experimentally determined by Prof. Coker.

PRECIPITATION

COTTRELL PROCESS. Electrical Precipitation Process, P. F. Landolt and N. W. Sultzer. Paper, vol. 32, no. 23, Sept. 26, 1923, pp. 7-8. Advantages claimed for practical application of Cottrell processes to paper industry; improvements in operation and reduction of certain wastes.

PRESSES

HYDRAULIC. Hydraulic Plants. A Few General Considerations, H. S. Catterniole. Mech. World, vol. 74, no. 1914, Sept. 6, 1923, pp. 145-146. Hydraulic plants for forging, riveting, shearing, baling, and other pressing operations are grouped in four types each of which is discussed.

PULVERIZED COAL

PLATE-HEATING FURNACES. Powdered Fuel For Furnace Work. Engineering, vol. 116, no. 3014, Oct. 5, 1923, pp. 423-426, 5 figs. partly on p. 424. Details of pulverized coal installation for plate-heating furnace.

PUMPS

DEEP-WELL. A New Type of Deep Well Pump. Refrigeration, vol. 32, no. 6, July 1923, pp. 42-43, 5 figs. Water elevated by means of propeller similar to that employed for propelling ships. Advantages of Axiflo pump.

PYROMETERS

THERMOELECTRIC. Notes on Thermoelectric Pyrometers and Instructions for Their Use on Heat Treating Steel. Am. Soc. for Steel Treating. Trans., vol. 4, no. 3, Sept. 1923, pp. 410-430, 8 figs. Thermocouple or "fire-end"; leads from thermocouple to indicator or recorder; indicators and recorders; cold-junction compensation, installing pyrometers. Report of Sub-Committee — IV, on Pyrometry.

Q

QUANTUM THEORY

PRINCIPLES OF. The Underlying Principles of the Quantum Theory and Its Experimental Investigation (Die Grundlagen der Quantentheorie und ihre experimentelle Prüfung), Rudolf Ladenburg. Zeit. für technische Physik, vol. 4, nos. 6 and 7, 1923, pp. 225-232 and 249-258, 5 figs. Notes on continuous spectrum of hollow-space radiation; theory of specific heats; Einstein quantum equation; Bohr atom theory; series lines of hydrogen; Bohr's correspondence principle; periodic system of elements. Bibliography.

R

RADIO COMMUNICATION

NEON TUBES. Experiments With the Neon Tube, S. O. Pearson. Wireless World, vol. 12, nos. 190 and 191, Apr. 7 and 14, 1923, pp. 2-5 and 34-37, 11 figs. How a neon lamp can be made to produce oscillating currents; application to relays and recorders.

RECEIVERS, SUPER-REGENERATIVE. The Armstrong Super-Regenerative Receiver. Wireless World, vol. 12, no. 193, Apr. 28, 1923, pp. 111-115, 6 figs. Two papers read before Radio Soc. of Great Britain, viz.; Single-Valve Super-Regenerative Receiver, by A. D. Cowper, and Two-Valve Super-Regenerative Receiver, by G. P. Mair.

RADIOTELEGRAPHY

WAVEMETERS. Building a Wavemeter. Wireless World, vol. 12, no. 196, May 19, 1923, pp. 198-200, 4 figs. Describes instrument similar to Townsend type in principle, but having several novel points in its construction.

RADIOTELEPHONY

DUPLEX. Some Modern Developments in Duplex Telephony, P. P. Eckersley. Wireless World, vol. 11, no. 177, Jan. 6, 1923, pp. 455-461, 5 figs. Definition of duplex telephony; uses the inherent problem and principles of solution; aerial system; protected receiver systems, including two wave-lengths, two aerials and two wave-lengths, single aerial; best wave-length method; side tons; description of typical installation; group communication.

RAILS

CORROSION, PREVENTION OF. Oiling Prevents Corrosion of Rail and Fixtures. Ry. Rev., vol. 73, no. 19, Sept. 15, 1923, pp. 377-378, 2 figs. Delaware Lackawanna & Western R. R. develops cheap and satisfactory way to prevent corrosion from salt drippings and other causes.

MANUFACTURE. The Production of Iron and Steel for Railway Purposes, Cecil J. Allen. Ry. Engr., vol. 44, nos. 521, 523, and 524, June, Aug. and Sept., 1923, pp. 222-226, 309-313 and 344-349, 26 figs. Methods employed in manufacturing iron and steel constituents of railway track, structures and rolling stock. June: Rolling of steel rails and heavy sections. Aug.: Finishing, testing and inspection of steel rails. Sept.: Recent tests on basic open-hearth rails and method and results of Sandberg sorbitic treatment.

RAILWAY ELECTRIFICATION

ILLINOIS CENTRAL, CHICAGO. Termina IImprovement and Electrification of the Illinois Central Railroad at Chicago, Daniel J. Brumley. Ry. Rev., vol. 73, no. 9, Sept. 1, 1923, pp. 299-303. Work now in progress involves extensive re-arrangement of facilities in addition to change of motive power.

RAILWAY MOTOR CARS

ELECTRIC. Motor Car and Trailer of the Stockholm Railway Company (Aktiebolaget Stockholms sparvagars nya motor-och släpvagnar), Gusta Lindman. Teknisk Tidskrift, vol. 53, no. 9, Mar. 3, 1923, pp. (Elektroteknik) 31-35, 9 figs. Details of design and construction of new rolling stock for overhead electric lines.

GAS-ELECTRIC-BATTERY. A Gas-Electric-Battery Car for Railway Service, R. J. Needham. Ry. Rev., vol. 73, no. 15, Oct. 13, 1923, pp. 535-539, 2 figs. Reserve capacity and provision against breakdowns combined with double-end control, regenerative braking and other special features.

GASOLINE. Gasoline Motorized Coach for the C. & N. W. Ry. Age. vol. 75, no. 13, Sept. 29, 1923, pp. 585-587, 3 figs. Trial run shows practicability of synchronized double motor drive and double-end control.

PNEUMATICALLY SYNCHRONIZED ENGINES. Two Pneumatically Synchronized Engines Used in New Railcar. Automotive Industries, vol. 49, no. 15, Oct. 11, 1923, pp. 749-751, 4 figs. Standard railway coach, adopted in preference to lighter automotive construction, requires more power than single stock unit will develop; clutches, gears and throttle controlled by air; brake compressor electrically driven.

TYPES. Railroad Motor Cars. Eng. Progress, vol. 4, no. 7, July 1923, pp. 125-128, 6 figs. Types; drive; power transmission; engine equipment.

RAILWAY OPERATION

CAR INTERCHANGE. Interchange of Rolling Stock. Int. Ry. Congress—Bul., vol. 5, no. 8-9, Aug. Sept. 1923, pp. 747-770. Discussion on interchange of freight cars and penalty charges in case of delay in return of that stock; rules to be adopted in relations between railways themselves; rules to be adopted in relations between railways and consignors and consignees.

TRAIN CONTROL. Automatic Train Control, W. J. Thorrowgood. Ry. Eng., vol. 44, no. 521, June 1923, pp. 128-220. Cost; comparative figures; need for automatic train control.

Automatic Train Control on Chicago & Alton R. R. Ry. Rev., vol. 73, no. 11, Sept. 15, 1923, pp. 379-384, 14 figs. Test section 14 mi. in length recently put in service between Normal and Lexington, Ill.

I. C. C. Report on Sprague Train-Control Tests on N. Y. C. Ry. Signaling, vol. 16, no. 9, Sept. 1923, pp. 367-369. Analysis of tests; it has been demonstrated that magnetic impulse can be transmitted in electrified territory from permanent track magnets to locomotive regardless of speed, oscillation, or weather conditions, and that such impulse will actuate locomotive apparatus to provide automatic brake application in practical manner. (Abstract.)

RAILWAY REPAIR SHOPS

ELECTRICAL APPLICATIONS. Electrical Applications at the Transcona Shops, Alfred C. Turtle. Ry. Elec. Engr., vol. 18, no. 9, Sept. 1923, pp. 261-267, 17 figs. Canadian National Railway make extensive use of electric energy; heat treatment with electric furnace.

LOCOMOTIVE. A Straight Line Method for Locomotive Shops. Lawrence Richardson. Ry. Rev., vol. 73, no. 10, Sept. 8, 1923, pp. 339-345, 4 figs. Progressive system for classified repairs patterned after best industrial production practice.

RAILWAY SIGNALING

AUTOMATIC. The Automatic Signalling Between Marylebone and Wembley, Great Central Section, London & North Eastern Railway, Ry. Gaz., vol. 39, no. 10, Sept. 7, 1923, pp. 302-309, 16 figs. Describes new features and departures from precedent; how steam worked railway has all those safeguards and facilities hitherto only to be found on rapid-transit electrically operated lines.

FOG REPEATER SIGNALS. Signalling Apparatus on the Metropolitan Railway for Use in Foggy Weather and Snow, W. Challis. Ry. Engr., vol. 44, no. 522, July 1923, pp. 245-247, 7 figs. Describes fog repeater signals, which enable trains to run to time even in very dense fogs. (Abstract.)

INTERLOCKING. Dynamic Indication for A. C. Power Interlockings. Ry. Engr., vol. 44, no. 521, June 1923, pp. 205-206 and 211, 3 figs. Describes how dynamic indication may be obtained for points and signals operated by alternating currents.

RAILWAY TRACK

CROSSINGS. An Analysis of the Various Methods Used for Calculating Dimensions for Points and Crossings, R. D. Walker. Ry. Engr., vol. 44, no. 523, Aug. 1923, pp. 314-315, 5 figs. Discusses four general methods, namely, (1) turnout curve tangential to main line and to crossing at theoretical point of crossing; (2) turnout curve tangential to switch at its heel and to crossing at theoretical point of crossing; (3) turnout curve tangential to main line and to wing rail of crossing at its toe; and (4) turnout curve tangential to switch at its heel and to wing rail of crossing at its toe.

REDUCTION GEARS

CALCULATION. Calculation of High-Speed High-Powed Gears (Calcul des engrenages à grande vitesse et pour grande puissance), Alb. Schlag. Revue Universelle des Mines, vol. 18, no. 5, Sept. 1, 1923, pp. 321-344, 10 figs. Gears for speed reduction, their calculation and construction, including dimensions of pinions; profile, types and angle of teeth; recommends 30-deg. angle.

REFRIGERANTS

NATURAL-GAS GASOLINE AS. The Use of Highly Volatile Natural Gas Gasoline as a Refrigerant, L. D. Wyant. U. S. Bur. of Mines—Reports of Investigations, no. 2510, Aug. 1923, 10 pp. Experiments indicate that volatile gasoline can be used to advantage in many refrigerating plants.

REFRIGERATION

PACKING-HOUSE. Refrigeration in The Packing House, H. J. Macintire. Southern Engr., vol. 30, no. 1, Sept. 1923, pp. 39-41, 2 figs. Refrigeration required and temperatures used with various products.

RESEARCH

IRON INDUSTRY. Scientific Research in the Iron Industry. (Wissenschaftliche Forschung in der Eisenindustrie), P. Goerens. Stahl u. Eisen, vol. 43, no. 37, Sept. 13, 1923, pp. 1191-1199, 10 figs. The relation of research to development of iron industry; its purpose, costs and benefits; the necessity of comprehensive industrial research, and co-ordination between industrial research bureaus, investigating committees, iron-research institutes and colleges. Editorial comment.

ROADS, CONCRETE

CALCIUM CHLORIDE, USE OF. An Investigation in the Use of Calcium Chloride as a Curing Agent and accelerator of Concrete, H. F. Clement and Fred Burggraf. Am. Soc. Testing Matls., advance paper, no. 42, for meting June 25-29, 1923, 19, pp., 12 figs. Review of investigations conducted by Illinois Division of Highways, results of which have led to adoption of both external and internal usage of calcium chloride in concrete-highway construction.

ROADS, MACADAM

BITUMINOUS. The Construction and Maintenance of Bituminous Macadam Roads, Raymond W. Coburn. Boston Soc. Civ. Engrs.—Jl., vol. 10, no. 7, Sept. 1923, pp. 298-313. History and types; construction of Massachusetts standard type; statistical data obtained from experimental bituminous macadam construction built by State in 1913.

BRICK ON WATERBOUND. Brick on Waterbound Macadam with Penetration Curb, C. H. Henning. Eng. News-Rec., vol. 91, no. 12, Sept. 20, 1923, pp. 468-469, 4 figs. Construction methods on 25-mi. Texas road; curb work unique; 10-months' traffic develops no defects.

ROAD MATERIALS

SPECIFICATIONS. Report of Committee D-4 on Road and Paving Materials. Am. Soc. Testing Matls., advance paper, no. 55, for meeting June 25-29, 1923, 31 pp. Specifications recommended for adoption as standard; proposed revisions of existing standard methods and specifications, and of tentative specifications and methods of tests; proposed method of testing for determination of bitumen; proposed tentative specifications for asphalt cement, sand-clay mixtures, broken slag, etc.

ROLLING MILLS

DRIVES. Adjustable Speed Main Roll Drives, A. K. Bushman. Gen. Elec. Rev., vol. 26, no. 10, Oct. 1923, pp. 681-687, 7 figs. Discusses advantages and disadvantages of various methods of obtaining adjustable speed control of main rolls used in manufacture of steel; compares relative merits of a.c. and d.c. systems.

DRIVES, FLYWHEELS FOR. Flywheels for Steel Mill Drives, L. A. Umansky. Gen. Elec. Rev., vol. 26, no. 10, Oct. 1923, pp. 688-707, 21 figs. Considers character of rolling-mill load; energy of flywheels characteristics of induction motors; effect on motor size; cost of operating flywheels; etc. Flywheel calculations.

ELECTRICALLY DRIVEN. Electric Drive of Reversing Mill C. B. Huston. Elec. World, vol. 82, no. 12, Sept. 22, 1923, pp. 577-580, 7 figs. Third in same plant to be converted from steam drive; rolling requirements; special features embodied in main mill motor; provisions for starting reversing and regulating load.

S

SAND MOLDING

COHESIVENESS TESTING. Sand Conservation and Reclamation Tests Using the Doty Cohesiveness Testing Machine, R. F. Harrington, W. I. MacComb and M. A. Hosmer. Foundry Trade Jl., vol. 28, no. 366, Aug. 23, 1923, pp. 153-156, 3 figs. Enumeration of inconsistencies which authors' investigations have indicated. Summary of results of tests. (Abstract.) Paper presented before Am. Foundrymen's Assn.

PERMEABILITY. Moulding Sand Permeability. Metal Industry (Lond.), vol. 23, no. 13, Sept. 28, 1923, pp. 268-269, 1 fig. Apparatus and method for testing permeability of moulding sands due to joint committee of Am. Foundrymen's Assn. and Nat. Research Council on moulding sand investigation.

SCREW-THREADS

STANDARDIZATION, GERMANY. Introduction of Thread Standardization in Germany (Die Durchführung der Gewindenormung in Deutschland), G. Schlesinger. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 25, June 23, 1923, pp. 749-754, 19 figs. Development of standards; Whitworth and metric unit thread standards; tolerances; templets.

SEWAGE DISPOSAL

ACTIVATED SLUDGE PROCESS. Sewage Treatment Plant at Cochrane, Ont. Can. Engr., vol. 45, no. 12, Sept. 18, 1923, pp. 321-323, 3 figs. Describes activated sludge plant designed for daily volume of 500,000 gal. sewage; principal features of plant and method of operation; method of dealing with sludge and distributing compressed air.

DEWATERING ACTIVE SLUDGE. A Practical Solution of the Problem of Dewatering Active Sludge, J. A. Wilson, W. R. Copeland, and H. M. Heisig. Indus. & Eng. Chem., vol. 15, no. 9, Sept. 1923, pp. 956-969, 4 figs. Chemical investigations carried out at Milwaukee station have led to successful problem of dewatering winter sludge.

SHAFT SINKING

WET SAND. Concrete Caisson Used to Sink Shaft Through Wet Sand, R. Franklin Mundorff. Eng. & Min. Jl.,—Press, vol. 116, no. 3, Sept. 29, 1923, pp. 535-538, 8 figs. Work in connection with shaft sinking to open up coal seam underlying property near Terre Haute, Ind., of Grasselli Chemical Co.

SHEARS

ROTARY PLATE. Self-contained Hydralulic Tools. Machy. (Lond.), vol. 22, no. 574, Sept. 27, 1923, pp. 813-816, 7 figs. Rotary shearing machine for ⅞-in plates.

SLATE

CHARACTERISTICS. The Characteristics of Slate, Oliver Bowles. Am. Soc. Testing Matls., advance paper, no. 68, for meeting June 25-29, 1923, 12 pp. Definition and brief description; properties on which use depends; desirable standards and tests.

SOLDERING

MATERIALS, TECHNOLOGY OF. The Technology of Soldering Materials. Chem. Trade Jl. & Chem. Engr., vol. 73, no. 1891, Aug. 17, 1923, pp. 185-186. Review of modern progress.

SNOW REMOVAL

TRACKS, FROM. Snow and Ice Removal from Tracks. Elec. Ry. Jl., vol. 62, no. 10, Sept. 8, 1923, Contains following articles: Fixed Snow Sweeper Routes are Desirable, pp. 357-359, 3 figs. Fighting 145 Inches of Snow, pp. 359, 3 figs.; Revolving Teeth Cut Ice Between Rails, p. 360, 3 figs.; Keeping Track of Snow Removal Costs, R. B. Genest, pp. 361-362, 4 figs.

STANDARDIZATION

NEEDS AND LIMITATIONS. Standardization Is the Salvation of American Industry, Frank B. Gilbreth. Chem. Age. (N. Y.), vol. 31, no. 9, Sept. 1923, pp. 385-386. Need of standardization; superstandardization; standardization in Europe; significance of standardization, See also article by Albert M. Whitney on Limitations on Standardization, pp. 387-388.

SOC. AUTOMOTIVE ENGRS. Tentative Standardization Work. Soc. Automotive Engrs.—Jl., vol. 13, no. 4, Oct. 1923, pp. 339-343, 4 figs. Use of both bilateral and unilateral systems of expressing tolerances proposed; recommends adoption of standard brake test; revised molding standards proposed.

TREND OF. The Trend of Standardization, George K. Burgess. Am. Soc. Testing Matls.—advance paper, no. 1, for meeting June 25-29, 1923, 10 pp. Discusses agencies at work in field of standardization, their inter-relations and what they are trying to accomplish; relation of research to standardization.

UNITED STATES. Progress of Standardization in the United Ststes, Warren R. Roberts. Min. Congress Jl., vol. 9, nos. 9 and 10, Sept. and Oct. 1923, pp. 322-325 and 362. List of organizations which are now and have been carrying on work along standardization lines; reports on standardization received by author from technical societies.

STEAM

STEAM-AIR MIXTURES. A New Diagram for Steam-Air Mixtures (Ein neues Diagram für Dampfluftgemische), R. Mollier. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 36, Sept. 8, 1923, pp. 869-872, 5 figs. Points out that in practical applications of steam-air mixtures the water vapor can always be treated as a complete gas; principle of calculation is then very simple; new diagram and its application to processes of drying and water recooling.

STEAM ACCUMULATORS

PRINCIPLES AND TYPES. The Importance of Different Types of Steam Accumulators in the Conservation of Power (Die Bedeutung verschiedener Speicherformen für die Energiewirtschaft), H. Pauer. Wärme, vol. 46, nos. 31, 32 and 33, Aug. 3, 10 and 17, 1923, pp. 341-345, 355-358 and 367-369, 12 figs. Causes of fluctuations between power supply and demand; losses occurring with seasonal short fluctuations; thermal principles of different storage systems; comparison between Ruths and feed-space accumulators.

STEAM-ELECTRIC PLANTS

BARBADOS ISLAND, PA. Barbados Island Plant Illustrates Modern Central Station Design. Power Plant Eng., vol. 27, no. 19, Oct. 1, 1923, pp. 965-973, 12 figs. Electrified auxiliaries, double-effect evaporators, motor-operated valves, starting bus for motors, and loop system of boiler feed are features of design.

STEAM GENERATORS

ELECTRIC. Using Excess Power to Save Coal, E. H. Horskotte. Indus. & Eng. Chem. vol. 15, no. 9, Sept. 1923, pp. 913-914, 1 fig. Electric generation of steam for heating and process work.

STEAM PIPE

HIGH-TEMPERATURE STEAM. Piping for High-Temperature Steam (Conduites de vapeur à haute température), Luc Denis. Société d'Encouragement pour l'Industrie Nationale Bul., vol. 135, no. 5, May, 1923, pp. 328-338, 4 figs. Conduction of super-heated steam, piping and joints for purpose, arrangement of systems of pipe lines, examples.

STEAM POWER PLANTS

AUXILIARIES. Steam Plant Auxiliaries, C. D. Gray and M. M. Samuels. Elec. World, vol. 82, no. 15, Oct. 13, 1923, pp. 749-753, 6 figs. Discusses methods of switching and grouping auxiliaries, arrangements for insuring continuity of service; typical installations; choice of voltage and house-service supply.

OIL-BURNING. Power Plant Equipped to Burn Oil, Ry. Mech. Engr., vol. 97, no. 9, Sept. 1923, pp. 621-622, 3 figs. Flexible boiler operation and labor saving secured by burning oil in enginehouse power plant.

STEAM-TRAPS

INSTALLATION AND OPERATION. Steam-Trap Insatllation and Operation, R. N. Robertson. Power, vol. 58, no. 15, Oct. 9, 1923, pp. 573-576, 7 figs. Gives logical reasons for erratic behavior of steam traps and clarifies misunderstandings and rule-of-thumb methods employed.

STEAM TURBINES

DISCS, DESIGN OF. The Design of Rotating Discs, G. Arrowsmith. Engineering, vol. 116, no. 3014, Oct. 5, 1923, pp. 417-419, 4 figs. In method outlined mathematical accuracy of original solution of Stodola has been maintained, but equations have been so transposed that discs of any reasonable contour can be treated.

LEAVING LOSSES, REDUCTION OF. Devices to Reduce Leaving Losses in Steam Turbines, Ivor R. Cox. Beama, vol. 13, no. 65, Sept. 1923, pp. 175-181, 6 figs. Points out that in order to increase leaving area without increasing blade stress it is necessary to depart from parallel blade and adopt blade the section of which is larger at root than at tip.

VIBRATION IN, CORRECTION OF. Correcting Vibration in Reaction Type Turbines, L. Long. Power, vol. 58, no. 16, Oct. 1923, pp. 609-612, 2 figs. Checking a sprung motor; checking trueness of coupling flanges; determining whether vibration is in turbine or generator; other recommendations.

STEEL

ALLOY. *See Alloy Steels.*

CHROME-NICKEL. *See Chrome-Nickel Steel.*

ELASTIC LIMIT. The True and apparent Elastic Limit of Steel, M. L. Fraichet. Iron & Coal Trades Rev., vol. 107, no. 2896, Aug. 31, 1923. p. 302. Results of tests carried out on wide variety of steels. Translated from Revue de Métallurgie.

ENDURANCE TESTS. Endurance Properties of Steel: Their Relation to Other Physical Properties and to Chemical Composition, D. J. McAdam, Jr. Am. Soc. Testing Matls.—advance paper, no. 19, for meeting June 25-29, 1923, 46 pp. 25 figs. Results of endurance tests at U. S. Nav. Eng., Experiment Station on carbon and alloy steels; repeated impact tests were made on machine which is described, as result of which, relationship of repeated impact to single impact and to endurance properties is indicated by graphs.

FRACTURE. Oblique Fracture and Flake Formation (Schieferbruch und Flockenbildung), Franz Rapatz. Stahl. u. Eisen, vol. 43, no. 37, Sept. 13, 1923, pp. 1190-1202, 3 figs. Review of data contained in literature up to end of 1921, from which it is shown that no satisfactory explanation exists as to causes of flakes, and there is diversity of opinions regarding preventive measures.

Noteworthy Fractures (Bemerkenswerte Brucherscheinungen), Richard Baumann. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 39-40, Sept. 29, 1923, pp. 945-947, 24 figs. It is shown that elongation of structure is observable even after breaking at red heat, when followed quickly by cooling; results of tensile tests on highly heated steel wires; observations on dented water pipes; fractures caused by excessive stress and by rapid change of temperature; influence of rapid increase in pressure in fracture of hollow cylinders.

HIGH-SPEED. *See Steel High-Speed.*

INTERNAL STRAINS. Internal Strains in Cold Worked, Cold Pressed or Cold Bent Carbon Steel. W. J. Merten. West. Machy. World, Sept. 1923, vol. 14, no. 9, pp. 285-286 and 289, 7 figs. Points out that timely and judicious application of annealing for relieving of internal strains, accompanied by proper design of drawing dies and proper clearance, are all important to cold, deep drawing practice.

SPECIFICATIONS. Report of Committee A-1 on Steel. Am. Soc. for Testing Matls.—advance paper, no. 7, for meeting June 25-29, 1923, 39 pp., 29 figs. Recommendations affecting standards and tentative standards; recommendations for steel rails and accessories, structural steel, steel castings, steel tubing and pipe, boiler steel; methods of chemical analysis and physical tests; commercial bar steels, plate tolerances, steel for welding. Proposed revisions in standards. Report on ladle tests ingot investigation; proposed specifications for steel castings and steel plate.

SULPHUR IN. Summarizes Work on Sulphur in Steel. Iron Trade Rev., vol. 73, no. 15, Oct. 11, 1923, pp. 1023-1024. Abstract of committee report outlining progress made and summarizing investigations planned by joint committee.

TEMPERATURE, EFFECT ON PROPERTIES. The Effect of Temperature on Some of the Properties of Steel, H. R. A. Mallock. Roy. Soc.—Proc., vol. 103, no. A720, Apr. 3, 1923, pp. 1-7, 9 figs. Results of experiments now in progress at Davy-Faraday laboratory, on effect of temperature on elastic coefficient of solids.

TENSILE STRENGTH. Effect of Temperature on the Tensile Strength of Steel. Ry. & Locomotive Eng., vol. 36, no. 10, Oct. 1923, pp. 307-308, 1 fig. Presents table showing results of series of investigations on ten steels of different carbon and manganese content.

TESTS, MAGNETIC. Magnetic Testing of Steel (Essai magnetique des aciers à la traction. Limites élastiques), L. Fraichet. Revue de Métallurgie, vol. 20, no. 8, Aug. 1923, pp. 549-559, 13 figs. Results of tests made; apparatus used; elastic limits; etc.

STEEL CASTINGS

HEAT TREATMENT. Steel Castings Viewed Through the Microscope, M. G. Dumas. Ry. Rev., vol. 73, no. 13, Sept. 29, 1923, pp. 456-462, 17 figs. Fundamentals underlying scientific heat treatment of plain carbon steel castings.

MODERN TREND. Outline Steel Casting Trend, Edgar A. Custer. Foundry, vol. 51, no. 19, Oct. 1, 1923, pp. 789-791. Green sand moulds rammed hard, becoming more widely used; rigid and accurately machined flasks and equipment and; field pointed out for making castings in dry sand cores.

STEEL, HEAT TREATMENT OF

HARDENING. The Hardening of Steel, Zay Jeffries and R. S. Archer. Am. Soc. for Steel Treating—Trans., vol. 4, no. 3, 1923, pp. 263-304, 7 figs. Gives general definition of hardness, general theory of hardening of metals, and detailed conception of nature of hardened steel and of causes for its hardness.

INGOT STRUCTURE. Ingot Structure and Heat Treatments, B. D. Sakalatwalla. Iron Age, vol. 112, no. 13, Sept. 27, 1923, pp. 815-816. Importance of controlling former as aid to latter, possible effect of electromagnetic treatment during solidification.

MAGNETIC INSPECTION. A New Method of Magnetic Inspection, A. V. de Forest. Am. Soc. Testing Matls.—advance paper no. 22, for meeting June 25-29, 1923, 12 pp., 6 figs. Rapid method of non-destructive test and inspection has been developed, by suitable combination of two independent magnetic readings, it is possible to determine different effects of two different factors entering into treatment of steel, method has been applied to study of different magnetic effects of quenching and drawing processes on 1 per cent tool steel and 18 per cent tungsten high speed steel.

QUENCHING, EFFECT OF. The Effect of Quenching from above the Carbide Transition Temperature upon the Magnetism of Steel, A. A. Doe. Roy. Soc.—Proc., vol. 104, no. A725, Sept. 1, 1923, pp. 316-321, 4 figs. Results of experiments indicate that quenching does not suppress transformation.

Variations in Volume Undergone by Hollow Steel Objects when Quenched (Variations de capacite accompagnant les traitements thermiques des corps creux en acier). Albert Portevin. Comptes Rendus des Séances de l'Académie des Sciences, vol. 176, no. 13, Mar. 26, 1923, pp. 897-902. Changes in volume of cavity in 75 mm. steel shell caused by quenching is given in table, which shows that method of quenching is of great importance; repetition of treatment causes continued growth, which appears to be due to tendency to assume spherical form.

TOOL STEEL. Activity of Sub-Committee I, on Recommended Practice for Treatment of Tool Steel during 1922-23. Am. Soc. for Steel Treating, vol. 4, no. 3, Sept. 1923, pp. 397-406. Recommended practice in heat treatment of plain carbon tool steel and in heat treatment of 18-per cent tungsten high-speed steel.

STEEL, HIGH-SPEED

EFFECT OF HEAT TREATMENT ON PROPERTIES. The Effect of Heat Treatment on Lathe Tool-Performance and Some Other Properties of High-Speed Steels, H. J. French, Jerome Strauss and T. G. Diggs. Am. Soc. for Steel Treating, vol. 4, no. 3, Sept. 1923, pp. 353-396, 10 figs. Deals with time-temperature relation in hardening and tempering of high-speed steels and their effects upon lathe-tool performance, constitution and dimensional changes. Comparisons of "Taylor" and "breakdown" tests for lathe tools; consideration of prevention and elimination of so-called "flaky fractures" in heat treatment of high-speed steels.

HARDNESS AFTER QUENCHING. Secondary Hardness of High-Speed Heated After Quenching (Sur la "dureté secondaire" de l'acier rapide chauffé après la Trempe) G. Z. Nesselstraus. Revue de Métallurgie, vol, 20, no. 4, Apr. 1923, pp. 174-180, 13 figs. Series of chromium steels containing tungsten or cobalt, tungsten steel, and two carbon steels were studied by means of thermal analysis, hardness measurement, and microscopic examination; results.

STEEL WORKS

D. C. POWER GENERATION. Direct-current Power Generation for Steel Plant Loads, Ernest Pragst. Gen. Elec. Rev., vol. 26, no. 10, Oct. 1923, pp. 672-677, 6 figs. Analyzes pros and cons of various methods of obtaining adequate amount of a.c. power for operating auxiliary drives, and makes recommendations to suit different needs.

STREET RAILWAYS

CARS, WORM-DRIVE. New Worm Drive Tramcar, Aera, vol. 12, no. 2, Sept. 1923, pp. 175-179, 2 figs. Hull Corporation Tramways has built a double-deck car incorporating automobile type of drive, with split axles, suspended motors, and other novel features.

STRUCTURES

RECIPROCAL LOAD DEFLECTION RELATIONSHIPS. Reciprocal Load Deflection Relationships for Structures, C. E. Larad. Engineering, vol. 116, nos. 3010 and 3011, Sept. 7 and 14, 1923, pp. 287-288 and 321-322, 12 figs. Writer proposes to extend Lord Rayleigh's theorems and relationships in a form which, though less mathematical, is more in accord with engineering usage, and to give selected examples for purpose of making clear the fundamental principles involved and use to which theorems can be applied.

SUPERHEATERS

MULTI-FLOW. Multi-Flow Steam Superheaters, Engineer, vol. 136, no. 3536, Oct. 5, 1923, pp. 376-377, 6 figs. Improved form of double-flow superheater, specially designed for use in downtake at rear of Lancashire and Galloway boilers.

SURGE TANKS

MATHEMATICAL ANALYSIS. An Analysis of the Surge Tank of Constant Area and Unlimited Height, H. W. Coultas. Beama, vol. 13, no. 66, Oct. 1923, pp. 233-240, 5 figs. Mathematical analysis based on curves showing flow in tunnel, friction head, acceleration head and level in surge tank against time.

SUBSTATIONS

D. C. FOR STEEL WORKS. The Direct-Current Automatic Substation, C. P. Wilson. Elec. Jl., vol. 20, no. 9, Sept. 1923, pp. 337-339, 2 figs. As labor-saving device for steel mills.

T

TARS

STRAIGHT DISTILLED RESIDUES. Some Relations Between the Characteristics of Straight Distilled Tar Residues, J. W. Kennedy. Am. Soc. Testing Matls., advance paper, no. 57, for meeting June 25-29, 1923, 11 pp., 8 figs. Investigation of inter-relationship of important physical properties of different types of tars, with view toward obtaining information valuable in application of tars as road materials.

TELEPHONY

LONG-DISTANCE. Telephone Transmission Over Long Distances, H. S. Osborne. Am. Inst. Elec. Engrs.—Jl., vol. 42, no. 10, Oct. 1923, pp. 1051-1062, 21 figs. Points our similarities and contrasts of power transmission and telephone transmission over long distances; recent important developments in telephone transmission through cables over long distances, results obtained in commercial application of carrier telephone and telegraph systems.

TEMPERATURE CONTROL

APPARATUS. Temperature Control Apparatus (Note sur un contrôleur de température), Alfred Guy. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 135, no. 5, May 1923, pp. 341-345, 3 figs. New patent device in which heat is automatically cut off on reaching a different temperature; gives various examples of application, such as electric irons gas heaters, metal furnaces.

TEMPERATURE MEASUREMENT

HEATED WALLS. The Course of Temperature in Heated Walls of any Given Form (Temperaturverlauf in geheizten Wandungen von beliebiger Form), J. Geiger. Zeit. des Vereines deutscher Ingenieure, vol. 67, no. 37, Sept. 18, 1923, pp. 905-908, 11 figs. Describes simple and practical method of determining temperature in heated walls of any form, thickness or shape.

TESTING MACHINES

HARDNESS. Testing of Steel for Hardness, H. M. German. Am. Soc. for Steel Treating. Trans., vol. 4, no. 3, Sept. 1923, pp. 329-341, 5 figs. Deals with most important factors and elements that introduce errors in operation of Brinell, and Rockwell machines and scleroscope.

TESTS AND TESTING

METHODS. Report of Committee E-1 on Methods of Testing. Am. Soc. for Testing Matls., advance paper, no. 4, for meeting June 25-29, 1923, 26 pp., 14 figs. Classification of testing methods, tentative methods, revision of standard methods of mechanical testing of metallic materials; suggested methods of tension testing of metallic materials; proposed tentative testing of metallic materials, proposed tentative definitions of terms relating to methods of testing; and for verification of testing machines.

THERMOMETERS

REMOTE-READING. Distance Thermometers for Temperatures Below 700 Degrees (Rationella distanstermometrar for temperaturer under 700°), C. H. Marell. Teknisk Tidskrift, vol. 53, no. 10, Mar. 10, 1923, pp. 73-74, 5 figs. Describes expansion thermometers, solid, liquid and gas, also thermoelectric, and resistance types.

SPECIFICATIONS. Report of Committee D-15 on Thermometers. Am. Soc. Testing Matls., advance paper, no. 71, for meeting June 25-29, 1923, 12 pp. Proposed specifications for A. S. T. M. partial immersion thermometers and for A. S. T. M. thermometers for use with Saybolt viscosimeter.

TILE

DRAIN. Report of Committee C-6 on Drain Tile. Am. Soc. Testing Matls., advance paper, no. 31, for meeting June 25-29, 1923, 10 pp., 1 fig. Abstract of reports of four investigations on development of chemical tests and test requirements to determine resistance of drain tile to action of alkalis and acids in soil.

HOLLOW BUILDING. Report of Committee C-10 on Hollow Building Tile. Am. Soc. Testing Matls., advance paper, no. 35, for meeting June 25-29, 1923, 3 pp. Proposed revised tentative definitions of terms relating to hollow tile.

TOOL MAKING

MASTER-PLATE METHOD. The Master Plate in Press Tool Making, W. Richards. Machy. (Lond.), vol. 22, no. 571, Sept. 6, 1923, pp. 717-720, 11 figs. Examples of master plates and their application.

TRANSFORMERS

EXPLOSIONS. Causes and Prevention of Explosions in Power Transformers, O. H. Eschholz. Elec. World, vol. 82, no. 9, Sept. 1, 1923, pp. 423-425, 4 figs. Chief hazard from hydrogen liberated from oil by arc; must prevent liberation or avoid mixture with oxygen to prevent explosion; inert gas over oil serves purpose.

TRANSPORTATION

HIGHWAY. Road Transport, A. E. Berriman. Engineering, vol. 116, no. 3012, Sept. 21, 1923, pp. 380-381. Deals with freight transport by road and by rail; types of commercial vehicles and their suitability for different purposes; passenger vehicles; road improvement and traffic control. Paper read before Brit. Assn.

V

VALVES

PRESSURE-REDUCING. An Original Type of Reducing Valve. Power Engr., vol. 18, no. 211, Oct. 1923, pp. 385-386, 2 figs. Describes principle and characteristics of Clark's reducing valve, made under Eyre's patent.

PUMP. Ismailia Valves for Pumps and Mains. Engineering, vol. 116, no. 3013, Sept. 28, 1923, pp. 392-393, 13 figs. Valve in which ordinary hinge arrangement has been eliminated from design was introduced for use at Ismailia pumping station at Cairo; application is being extended to general field of service where liquids contain sand, grift, refuse and other solid matter.

VENTILATION

OFFICE BUILDINGS. The Ventilation of Office Buildings, Charles L. Hubbard. Bldg. Age., vol. 45, no. 9, Sept. 1923, pp. 66-68, 6 figs. Suggestions for improving ventilating conditions in building already in process of preparation or in use.

SMOKE TUBES FOR DETERMINING AIR CURRENTS. Sulphur Trioxide Smoke Tubes for Determining Air Currents, S. H. Katz and J. J. Bloomfield. U. S. Bur of Mines—Reports of Investigations, no. 2505, July 1923, 2 pp., 1 fig. Describes instrument for generating streams of SO_3 smoke, which is also useful in places where fire for generating smokes is not permissible.

VISCOSIMETERS

COMBINED PLASTOMETER AND. A New Combined Viscometer and Plastometer, E. C. Bingham and H. A. Murray, Jr. Am. Soc. Testing Matls., advance paper, no. 76, for meeting June 25-29, 1923, 9 pp., 2 figs. Proposes new principle in viscometry where shearing stress is varied by allowing material to enter capillary under constant pressure head; advantages of method.

VOLTAGE REGULATIONS

GENERATOR REGULATORS. Generator Voltage Regulators—Alternating-Current Type, J. H. Ashbaugh. Power, vol. 58, no. 13, Sept. 25, 1923, pp. 488-491, 8 figs. Why d.c. generator voltage regulators cannot be used to control voltage of a.c. generator; operation of two types of voltage regulators for alternators.

W

WALLS

HOLLOW-TILE. Some Compressive Tests of Hollow-Tile Walls, Herbert, L. Whittemore and Bernard D. Hathcock. U. S. Bur. of Standards, Technologic Papers no. 238, July 21, 1923, pp. 513-527, 6 figs. Description of materials and walls; details of tests; results and discussion.

WATERPROOFING

MATERIALS. Waterproofing Materials. Am. Soc. Testing Matls., advance paper, no. 56, for meeting June 25-29, 1923, 24 pp. Proposed specifications for asphalt mastic for use in waterproofing; for bituminous grout for use in waterproofing above and below ground level; felted fabrics, woven cotton fabrics, and burlap.

WATER POWER

OPTIMUM POWER OF HEADS. Determining the Optimum Power of which Heads of Water are Capable (Sur la détermination de la puissance optimum d'aménagement des chutes d'eau), E. Baticle. Houille Blanche, vol. 22, no. 183, July-Aug. 1923, pp. 132-134, 4 figs. Variability of quantity of water available; curves of actual water supply; their use in determining optimum, examples and calculations.

WELDING

ELECTRIC. *See Electric Welding. Electric Welding, Arc*

OXY-ACETYLENE. *See Oxy-Acetylene Welding*

SPEED IN. Speed Versus Good Welding, R. G. Mason. Am. Welding Soc.—Jl., vol. 2, no. 8, Aug. 1923, pp. 10-12, 1 fig. Troubles resulting from speedy welding.

WOOD PRESERVATION

CREOSOTE OIL. Report of Committee D-7 on Timber. Am. Soc. Testing Matls., advance paper, no. 60, for meeting June 25-29, 1913, 7 pp. Proposed method of test for coke residue of creosote-oil; report of sub-committee on testing methods.

Z

ZINC ALLOYS

MACHINE-TOOL BEARINGS, FOR. Cooper Poor Zinc Alloys for Machine-Tool Bearings, the Influence of Casting and Lubrication (Kupferarme Zinklegierungen für die Lagerungen der Werkzeugmaschinen, Einfluss des Giessens und der Schmierung), G. Schlesinger and M. Kurrein. Werkstattstechnik, vol. 17, nos. 16 and 17, Aug. 15, and Sept. 1, 1923, pp. 481-487 and 522-526, 24 figs. Account and results of tests for purpose of substituting for bronze bearings, bearings of zinc alloys with little or no copper content. Report of experimental department for machine tools of Charlottenburg Technical Academy.

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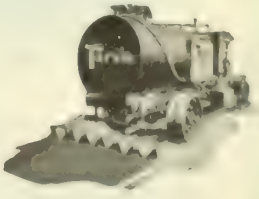

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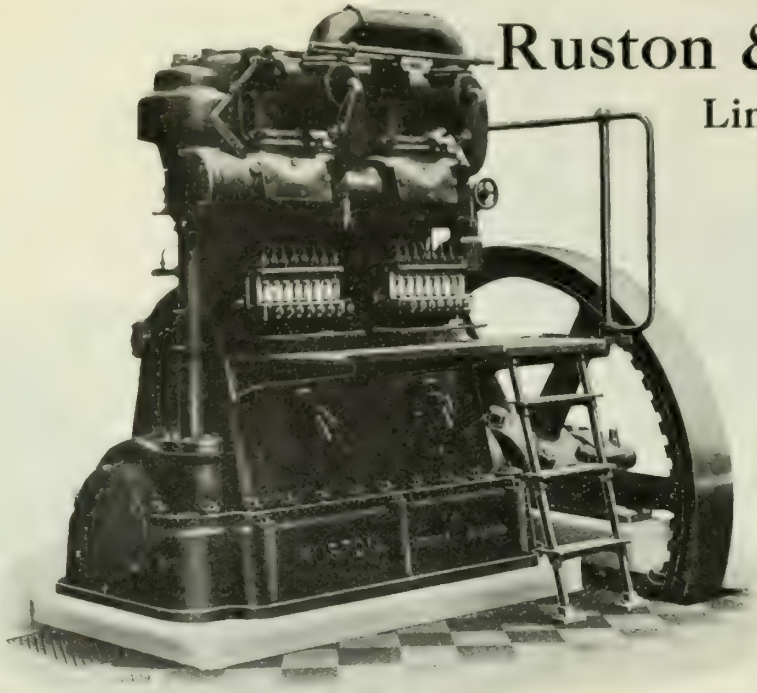

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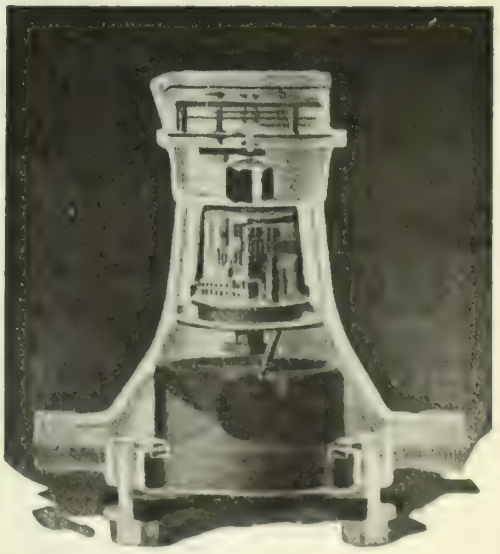

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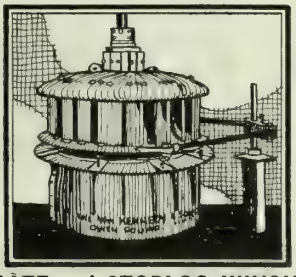

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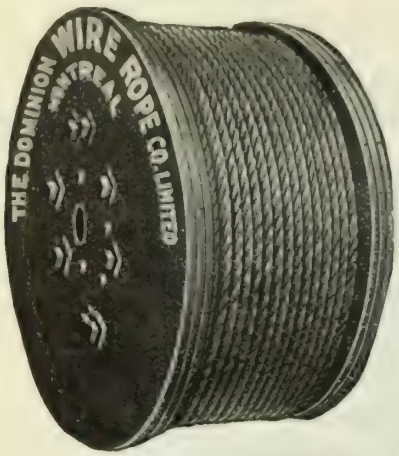

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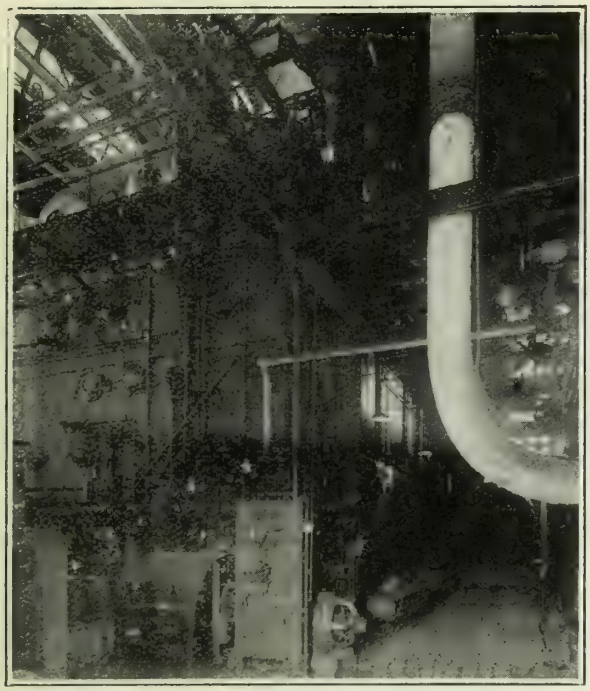

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ELESCO SUPERHEATERS

Help build the famous HUDSON SUPER-SIX

The Hudson Motor Car Company of Detroit, have operated Elesco Superheaters for years in their Stirling Boilers without spending one cent for repairs.

Performance in actual practice where nearly even superheat is being maintained under severe conditions, is the best proof that these modern superheaters will make good in your boilers.

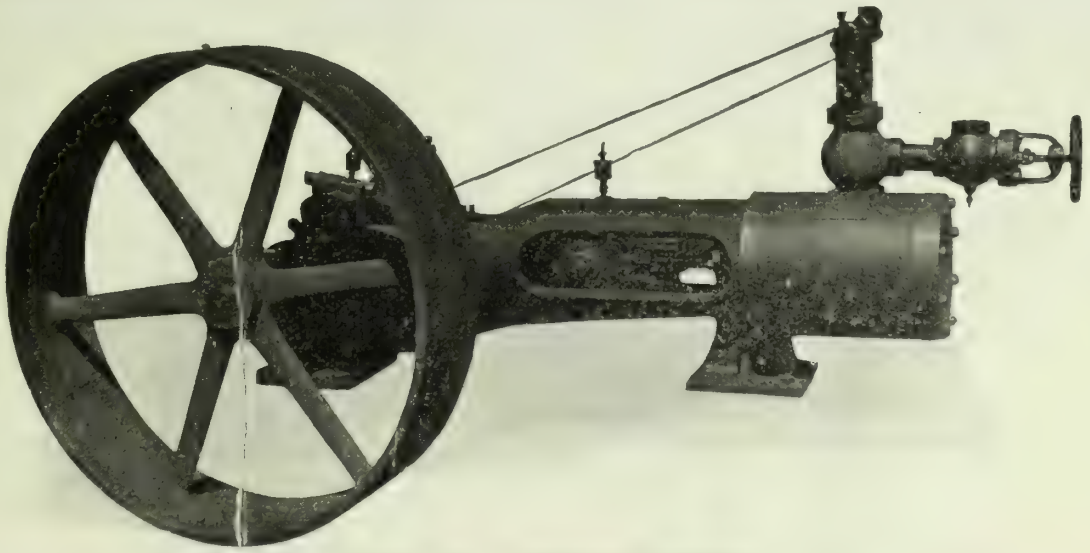
Let our engineering department show you the statistics—how superheated Steam will increase the operating economy of your plant—no obligations.

Write for O-T series of Bulletin.

The Superheater Company, Limited

Transportation Building, Montreal.

Works: Sherbrooke, Quebec.



LEONARD CLIPPER ENGINE

IS designed to fill a widespread and growing demand for an engine capable of doing heavy, continuous work with the least amount of care and attention.

E. LEONARD & SONS, LTD.

Head Office and Works: London, Canada, — Branches and Agents from Coast to Coast.

ESTABLISHED 1834.

LEONARD

Valuable suggestions appear in the advertising pages.

STEEL & FERRO-ALLOY CASTINGS

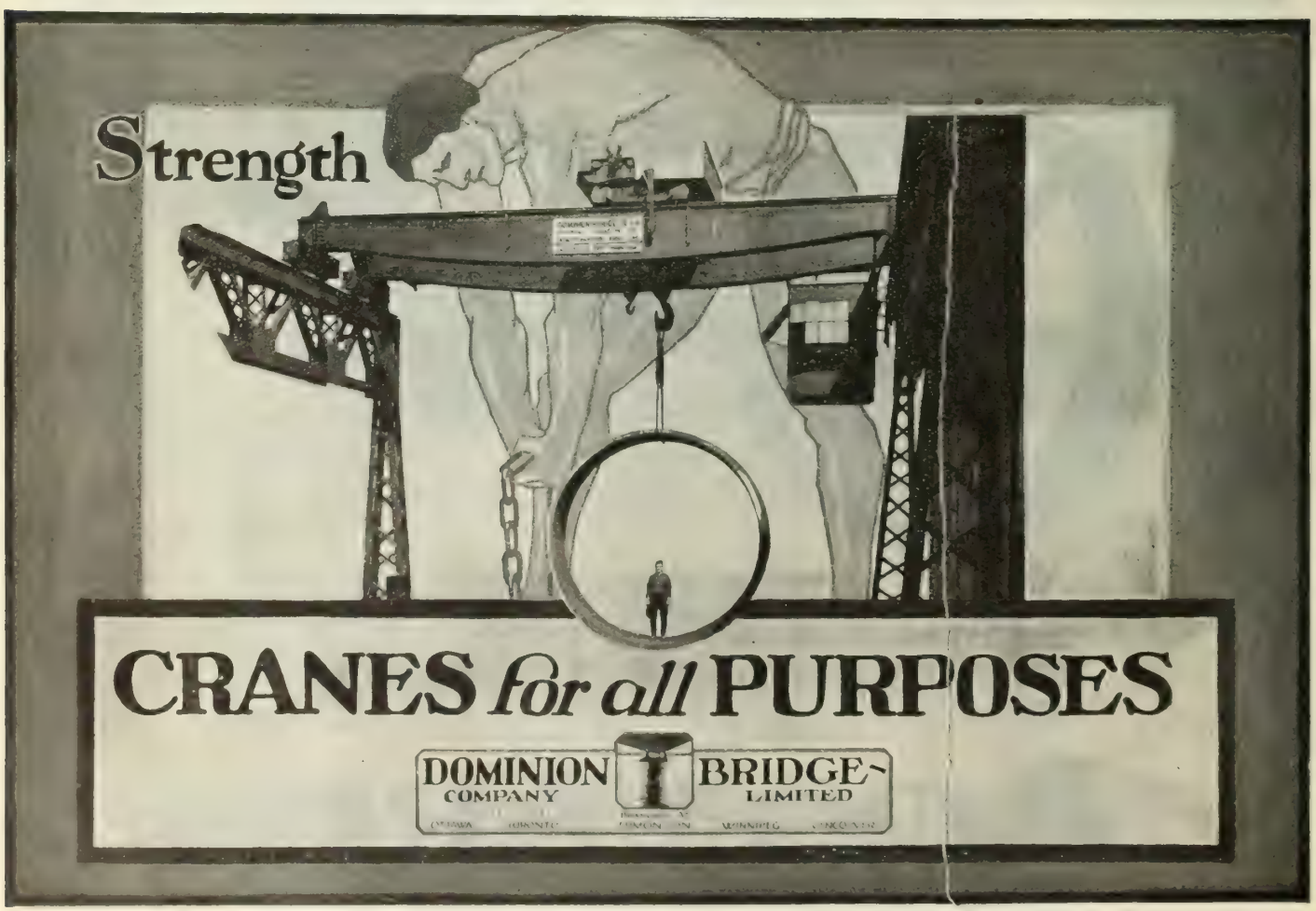
FOR ALL PURPOSES

1 lb. to 50 tons.

ELECTRICAL, HYDRAULIC,
LOCOMOTIVE, MARINE,
MECHANICAL, MINING,
ETC.

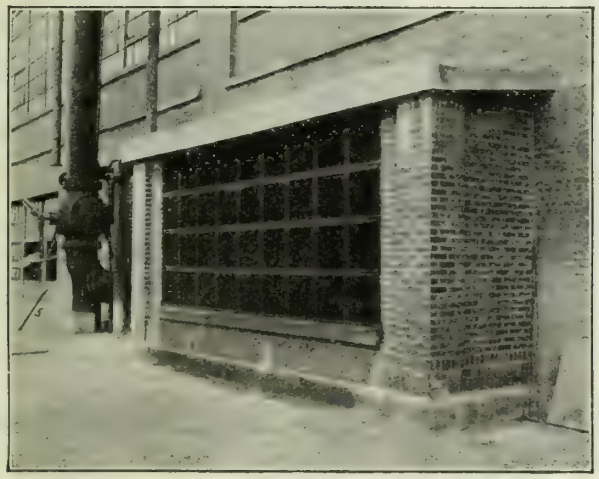
CANADIAN STEEL FOUNDRIES LIMITED

MONTREAL



The advertiser is ready to give full information.

You Need CLEAN AIR For Your Turbo-Generators



Midwest Air Filters Eliminating Dust Troubles on Steel Plant Turbo-Generators

The Trumbull-Cliffs Furnace Company of Warren, Ohio, pay no tribute to dust. Their turbo-generators are protected by this 25,000 cu. ft. per minute Midwest Air Filter installation.

DUST and dirt from your cooling air will otherwise settle in the fine air passages and on windings. Short circuit or burn out may not inevitably result, but when it does .... the cost is far in excess of the cost of insuring yourself against damage by

MIDWEST AIR FILTERS

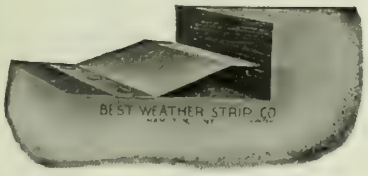
REMEMBER-they have no moving parts, sprays, pumps nor anything to get out of order. And they are the only devices that do catch all dust and dirt.

Ask Dept. F-16 to send you our new handbook

MIDWEST CANADA LIMITED

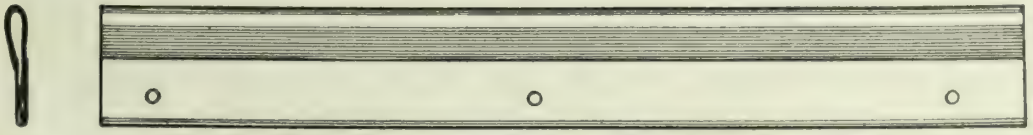
83 Craig Street West, - - - MONTREAL, Can.

You can save enormously on your Heating Costs



Spring Bronze and Brass Weather Strip for doors and casements comes in four widths—¾ inch—1 inch—1¼ inch and 1½ inch.

By the use of Best's Interlocking Weather Stripping around your doors and windows, you can save from fifteen to forty per cent of your heating costs.



Wear Ever Window Weather Strip of rubber and zinc is ideal for windows.

FOR FURTHER INFORMATION WRITE TO

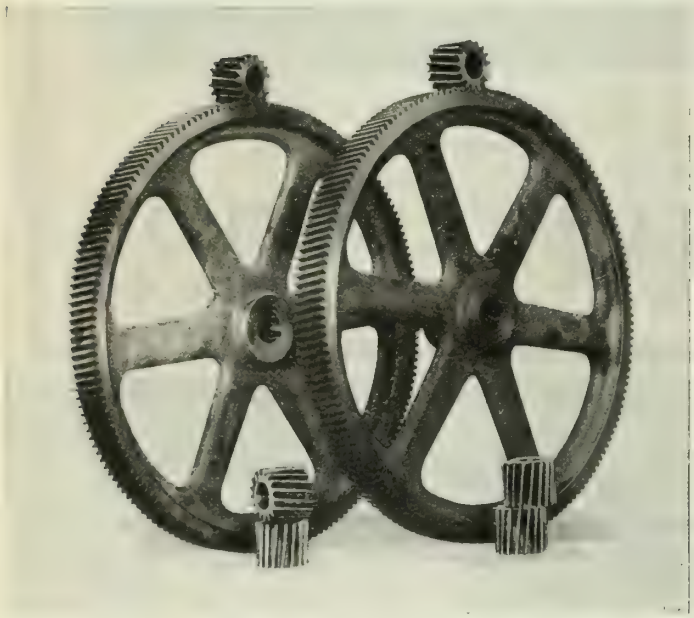
BEST WEATHER STRIP COMPANY, LIMITED BARTONVILLE, Ontario.

Telegraph and Express Address---HAMILTON, Ontario.

Single Helical Gears

also called

"Spiral Cut Spur Gears"



With a helix angle of 5 to 7 deg. there is almost no end thrust, but a considerable improvement in smoothness of action and quietness.

Hamilton Gear & Machine Co.

76 Van Horne St. TORONTO

GRANT, HOLDEN, GRAHAM, Ltd.

G. H. G. Polar Sleeping Robes

made to stand the most severe climates.
Filled with the best quality Down
and lined with Wool Kersey.

Covered with Waterproof Duck

Head Office and Factory:

147-151 Albert Street, Ottawa, Ont.

Branch Factories: Vancouver, B.C. and Hull, Que.

E. G. M. Cape & Company

Engineers and Contractors
General Building Construction

Some buildings recently completed or in course of construction:—

Factory for Northern Electric Company: Office Building and Shipbuilding Plant for Canadian Vickers, Limited; Liverpool & London & Globe Insurance Company's new building: Atlantic Sugar Refinery, St. John, N.B.; Ross Pavilion, Royal Victoria Hospital; Reinforced Concrete Storage for The John Bertram & Sons Company, Limited, Dundas, Ont.; The Military Hospital at Ste. Anne de Bellevue, Que.; New Buildings for Can. Connecticut Cotton Mills, Sherbrooke, Que.; New Buildings for Brown Corporation, La Tuque, Que.; Additions to old Medical Bldg and Library for McGill University.

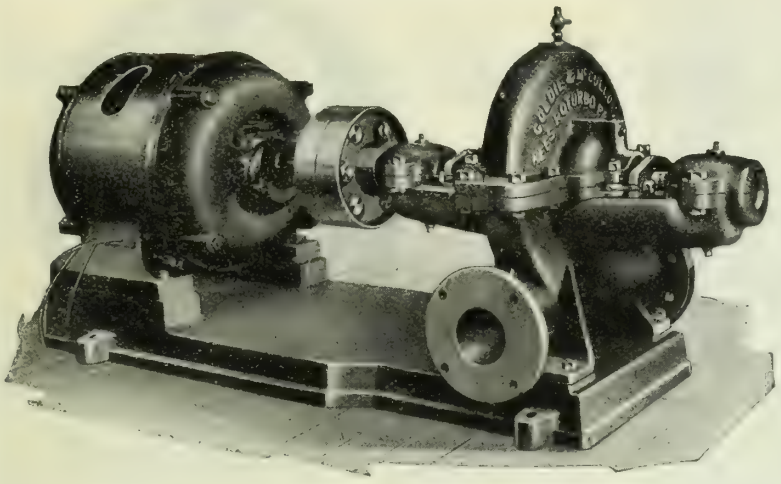
Estimates and tenders furnished on all classes of Construction Work.

Head Office:

920 NEW BIRKS BLDG. PHILIPS SQUARE

MONTREAL

Remember The Journal when buying apparatus.



This type is built for capacities up to 1000 Imperial Gallons per minute.

"V" TYPE REES RoTURBo

Patent Pressure Chamber Pumps

These Pumps embody the advantages of our several Rees **RoTURBo** Patents and improvements. They are very compact and, like all other types of Rees Pumps, are self-regulating and highly efficient.

Rees RoTURBo Pumps are built in all sizes and to suit any pumping condition

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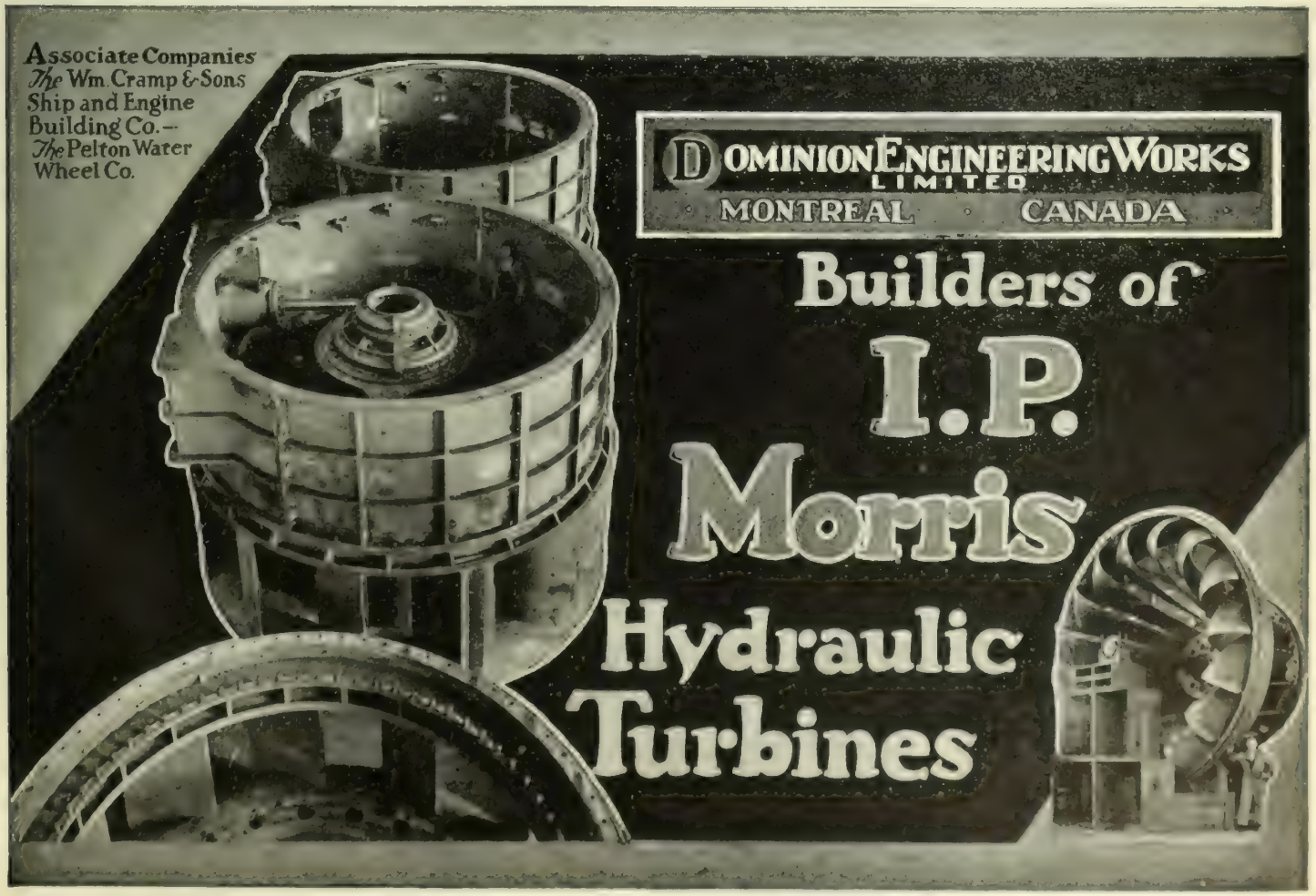
BRITISH COLUMBIA AGENTS: Robt. Hamilton & Co., Vancouver, B.C.



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Dunlop Belting and Hose

for the

Pulp and Paper Industry

"Admiration" Belting and Hose have qualities peculiarly suitable to Pulp and Paper mill work.

It will pay you to use **"Admiration"--** the Belt with the *Pure Gum Elastic Friction.*

"Gibraltar RedSpecial" Belting and Hose are known for their suitability for all uses.

DUNLOP

BELTING HOSE PACKING

and General Mechanical Rubber Products For Every Purpose.

C N C

Avoid Preventable Losses Use the Right Brushes

There is a correct type of brush for every motor and generator. Correct brushes reduce commutator wear and losses due to "tie-up."

Let us help you choose the right brushes. By years of experience in making brushes, we have learned just which type of Columbia Pyramid Brush is best for each use.

Whether your brush equipped units number one or a thousand this service is at your command. Avail yourself of it.

CANADIAN NATIONAL CARBON CO.
Limited

MONTREAL TORONTO WINNIPEG

MG8

MacKinnon Steel Co.

LIMITED

SHERBROOKE, QUEBEC

—

Structural Steel

AND

Steel Plate Work

BUILDINGS - BRIDGES
TANKS

—

Forward enquiries to Department E.

Estimates promptly furnished.

Strongest and Most Durable

A PEDLAR Culvert of a capacity which has been correctly figured for the work it has to do will serve successfully for many years.

PEDLAR'S "PERFECT" TONCAN METAL CULVERTS

are made from a pure iron with copper content which gives the greatest resistance to all corrosive agents present in the soil or atmosphere. This material — TONCAN METAL — is of heavy gauge, deeply corrugated and thoroughly galvanized. Every year Pedlar's Culverts grow more popular with engineers for both highway and railway drainage. We also manufacture Steelcrete, Metal Lath, Metal Roofing and Siding, Rib Fabric, Floor Tyle, etc.

Write for Culvert Booklet "E.I."

The PEDLAR PEOPLE Limited

ESTABLISHED 1861

26 Nazareth St., Montreal, Que.
Executive Offices: Oshawa, Ontario.
Factories: Oshawa, Ont. and Montreal, Que.

Branches:

St. John, Ottawa, Toronto, Hamilton,
London, Winnipeg, Calgary, Vancouver.

HALIFAX:- 136 Lower Water St.,
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EVERYTHING IN SHEET METAL

ELLIOTTS METAL CO. LTD.

BIRMINGHAM - ENGLAND.

COPPER

SHEETS

PLATES

TUBES

FREE TURNING ROD

REDRAWING ROD

BRASS

CANADIAN REPRESENTATIVES:

Openshaw & Bennet Ltd.

416 Phillips Place — Montreal.

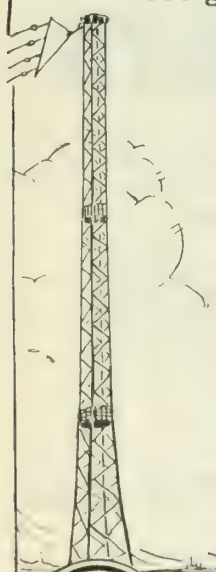
All Equally Good!

You take no chances when you buy a Marconi Radio Outfit—our test room standards take care of that.

First, each little accessory is individually tested; next, each component part, then each unit; and finally each complete receiver is examined for mechanical and structural defects and tested out on actual long range reception. And our test room standards are high—none higher.

This is just one of the reasons why thousands of our receivers are giving absolute satisfaction in all parts of the country; working regularly, day in and day out, and operated by people who are not radio experts but who want the best that radio offers without fuss and bother.

The nearest Marconi Dealer will be glad to put you on the high road to the joys of real radio. An enquiry will not obligate you in any manner.



The Marconi Wireless Telegraph Company of Canada Limited

MONTREAL

VANCOUVER · TORONTO · HALIFAX · ST. JOHN'S, Nfld

This Splendid Plant and Equipment FOR SALE

AIR COMPRESSORS

Item 4025 — 8 — "Can-Ingersoll Rand" Compressors — 1053 cubic feet capacity — cross compound — belt driven.

Item 4026 — 5 — "Sullivan" Compressors — 1100 cubic feet capacity — angle compound — belt driven.

BOILERS

Item 3000 — 2 — Locomotive Type Boilers — 60 H.P. on skids.

CHANNELLERS

Item 4024 — 14 — "Sullivan" Type VW-61 Channellers — Duplex.

CONCRETE MIXERS

Item 3004 — 15 — "Ransome" Mixers — 1 cubic yard capacity, electric driven — on skids.

Item 3005 — 3 — "London" Mixers — 1 cubic yard capacity, electric driven on skids.

CONVEYORS

Item 9006 — 1 — "Stephens-Adamson" Conveyor 702' centres — 30 inch.

Item 9007 — 2 — "Robins" Conveyors — 600' centres — 24 inch.

DRILLS

Item 4016 — 20 — "Can-Ingersoll Rand" Submarine Drills — Type H66.

Item 4017 — 40 — "Sullivan" Tripod Drills — Type FP-3.

Item 4021 — 5 — "Canadian Ingersoll Rand" Tripod Drills — Type LG54.

Item 4022 — 8 — "Canadian Ingersoll Rand" Tripod Drills — Type LG53¼.

Item 4018 — 50 — "Sullivan" Hammer Drills—Type DP33.

Item 4019 — 10 — "Canadian Ingersoll Rand" Jackhammers BCR-430.

Item 4020 — 15 — "Canadian Ingersoll Rand" Jackhammers DDR-13.

Item 4023 — 12 — "Oldham" Plug Drills — Type L.

HOIST

Item 9196 — 2 — "Mead Morrison" Electric Hoists — Double Drum — with 80 H.P. Motors.

Item 3007 — 6 — "Marsh Engineering Works" Electric Hoists — Double Drum — with 75 H.P. Motors.

Item 9197 — 1 — "Maine" Electric Hoist — Double Drums — with 37 H.P. Motor.

LOCOMOTIVES

Item 4005 — 1 — "American" Saddle Tank — 18 x 24 cyls. — 57 Tons.

Item 4003 — 2 — "Montreal Loco. Works" Saddle Tank — 10" x 14" cylinders — 18 Tons — standard gauge.

Item 4002 — 2 — "Pennsylvania" Switchers — 17" x 24" cyls. — 40 Tons — with 8 wheel Tenders.

Item 3009 — 5 — Electric Locomotives 500/600 volt D.C. — 50 Tons.

SHOVELS

Item 4001 — 1 — Model 60 "Marion" — 2½ yd. — 70 Tons.

Item 4000 — 1 — Class C-45 Atlantic—2½ yd.—65 Tons.

Item 3011 — 2 — Model 103C "Bucyrus" Electric—4½ yd.

Item 3012 — 3 — Model 225B "Bucyrus" Electric 6-8 yd.

SNOW PLOW

Item 3013 — 1 — "Can. Car & Fdry. Co." Standard R.R. Snow Plow.

TRACTORS

Item 3015 — 4 — "Fordson" Gasoline Tractors complete.

We list above only a few of the interesting items we have available. We have an immense stock of Contractors' Tools and Accessories and will be glad to send our "Sales Inventory" upon request.

HYDRO SALVAGE SYNDICATE

P. O. BOX 109, NIAGARA FALLS, ONT.

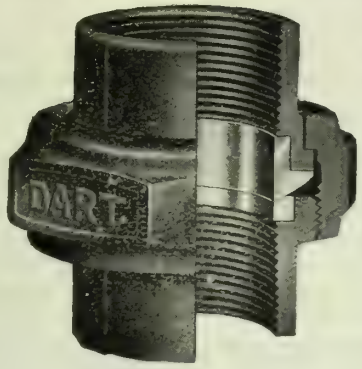
(operated by)

Canadian Equipment Co. Ltd. Montreal — F. H. Hopkins & Co. Ltd. Montreal — Toronto

Firms advertising in The Journal are considered as absolutely reputable.

DART UNIONS

NEVER LEAK



SOLD BY
YOUR JOBBER
MANFRD BY
DART UNION CO. LTD.,
TORONTO

John Erskine, B. Sc., A.M.E.I.C.
General Manager.

William Farrar,
President.

The Mohawk Sand & Gravel Company, Limited

Capacity—25 cars per day

Sand, 1″ and 2″ Crushed Gravel, Pea Gravel, Crushed Pit Run Gravel

Can ship by T.H.B., C.P.R., G.T.R., M.C.R.

Material Test Sand contains less than 1% of loam.

Box 336 **Brantford, Ontario**

JENKINS *Bronze Gate* VALVES

"Type K"
(Standard Pattern)

The Type "K" valve shown here is so proportioned and so well built that it will give maximum service under the severest tests it may be put to.

The body is Globe shaped, which with the even distribution of the metal ensures great rigidity and strength—preventing distortion due to strain or shock.

The metal itself is of the highest quality, the spindle being of Manganese Bronze. All parts are carefully machined to gauge.

The customary Gate Valve troubles are unknown where Jenkins Type "K" Models are installed. The simplicity of the closing mechanism make for easy operation and lasting trouble-free service. These valves being of the split-wedge type may be operated in any position without danger of the discs jamming.

Calalog No. 9 describes these valves in detail.

Write for free copy.

JENKINS BROS., LIMITED

Head Office and Works:
103 St. Remi St., - MONTREAL

Sales Offices:
TORONTO - - VANCOUVER

European Branch:
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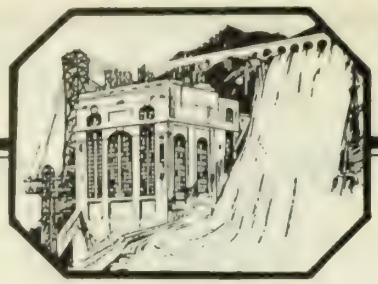
Factories: MONTREAL BRIDGEPORT ELIZABETH

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864



Invest in Hydro-Electric Securities.

It is generally admitted that no business rests upon a sounder foundation than that of favorably located water-powers. Engineers with their technical knowledge are well able to appreciate this fact.

If they examine our list of hydro-electric securities they must admit that we have used the utmost discrimination in our selection of offerings.

A complete list of offerings will be mailed on request.

We offer a thoroughly satisfactory investment service by mail.

NESBITT, THOMSON & COMPANY
Limited,
145 St. James Street, Montreal.
Toronto, Hamilton, London, Ont. Winnipeg.
266

WATER-POWERS
—IN THE—
PROVINCE OF QUEBEC

To obtain authorization for the utilization of water-powers in the Province of Quebec, application should be made to the Honourable Minister of Lands and Forests.

They are granted under emphyteutic leases, the conditions of which are upon the following lines:

1.—Duration of the lease, from 25 to 50 years, according to the importance of the water-power.

2.—Payment of a yearly rental which does not vary during the term of the lease.

3.—An additional yearly charge of 50c per HP developed.

4.—The above charge (Art. 3) is subject to revision, every 10 years.

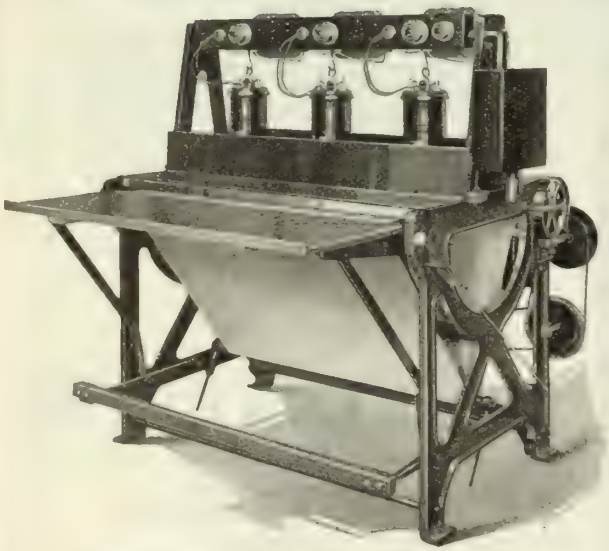
5.—A delay of two years is granted for beginning works and of two further years for producing power.

6.—The lessee is under obligation to make a deposit in money or in securities, as a guarantee of good faith in the carrying out of the contract.

7.—The grantee must submit plans of his works mills, etc., to the Dept., previous to their installation.

For further information, please write to the Dept. of Lands and Forests, P.Q.

Minister: Honourable Honoré Mercier;
Deputy-Minister: Elz. Miville Dechêne;
Chief of Hydraulic Service: Arthur Amos, A.M.E.I.C.



THE CANADA CONTINUOUS ELECTRIC BLUE PRINTING MACHINE

THE FASTEST MACHINE MADE
ECONOMICAL—SIMPLE—STRONG

Write for full particulars to the manufacturers

J. FRANK RAW CO. Limited
56 ADELAIDE ST., EAST
TORONTO, ONT.

THE VULCAN IRON WORKS, LIMITED

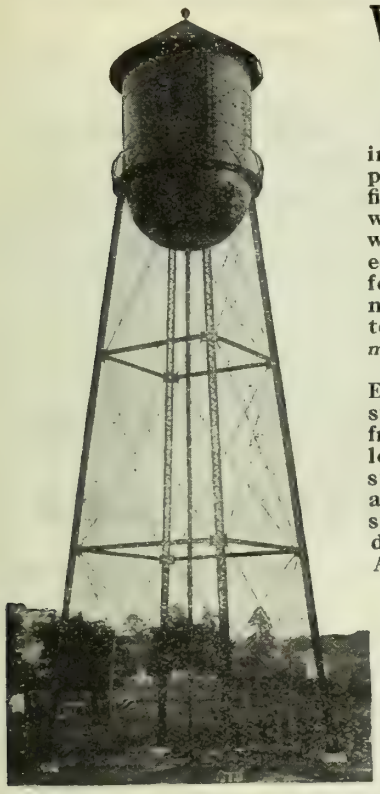
Established 1874

WESTERN CANADA'S PIONEER IRON WORKS.

Fire Hydrants,
Road Drags,
Snow Plows for attaching to Motor Trucks.
Municipal Castings (Iron and Brass)
Structural Steel
Boilers and Steel Plate Work
Iron and Steel Forgings
Steel Tanks of every description
Electric Steel Castings

Our facilities enable us to give prompt and efficient service

The Vulcan Iron Works, Limited,
WINNIPEG, MAN.



Water and Fire Protection

Man cannot live safely in communities without proper fire protection. And fire protection means water. First there must be water stored and distributed so it will be available for effective use in time of need. You *must* be protected against fire. You *must* have water.

A Canadian - Des Moines Elevated Steel Tank will store any amount of water from 30,000 to 1,200,000 gallons and deliver it at sufficient pressure to meet any emergency. Gravity supplies the pressure. No dependance on machinery. Always ready, always sure.

Write today for full details.

Canadian Des Moines Steel Co., Ltd.
265 Inshes Ave., Chatham, Ont.
Dept. No. 65—70 St. James St. Montreal, Que.

CANADIAN DES MOINES

TORONTO UNIVERSITY KNOWS THE COMFORT AND CONVENIENCE OF DUNHAM VACUUM HEAT

The original gravity steam system in use in this building was very unsatisfactory because of non-circulation in many rooms. In 1912 it was changed to a Dunham Vacuum System. Since that time Dunham has been steadily replacing old equipment in the other buildings and has been specified for many new buildings. Satisfaction of this sort is worthy of your investigation.

C. A. DUNHAM CO., LTD.
TORONTO, ONTARIO.
HALIFAX, VANCOUVER, WINNIPEG, OTTAWA, MONTREAL, CALGARY.
LONDON, Eng.: 18 St. Thomas St., S.E. 1.

The DUNHAM REG. TRADE-MARK
HEATING SERVICE
MADE IN CANADA

Robert W. Hunt & Co.
Limited

CONSULTING and INSPECTING ENGINEERS, CHEMISTS and METALLURGISTS

Expert inspection and tests of all structural materials and mechanical equipment.

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Branches: Toronto Vancouver London, England

STANDARD - STEEL - SERVICE

STEEL BUILDINGS & BRIDGES
GIRDERS, COLUMNS, TRUSSES
—STOCK STEEL—
PLATES, SHAPES & BARS

Standard Steel Construction Co.
LIMITED
WELLAND, ONTARIO

REINFORCED CONCRETE PIPE FOR WATER SUPPLY LINES
IS
Permanent, Flexible .. and Watertight ..

CANADA LOCK JOINT PIPE,
LIMITED
65 Pleasant Boulevard, Toronto, Ont.

BEST EDISON STORAGE BATTERIES FOR

MINING AND INDUSTRIAL LOCOMOTIVES
INDUSTRIAL AND COMMERCIAL VEHICLES
SWITCH CONTROL — SIGNAL SYSTEM
LIGHTING RADIO
BATTERY CHARGING AND CONTROL APPARATUS
CANADIAN REPRESENTATIVES
H. S. POWLEY & CO.,
85 FLORENCE ST. TORONTO, CANADA

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The Peirce

The insulator thread of the Peirce bracket withstands frost action, and saves your insulators.

Long Life and Happiness in every Peirce Specialty.

ASK YOUR JOBBER

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HAMILTON, CANADA.

Canadian Tie and Lumber Co.
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511 Temple Building,
Toronto, - Ontario

Phone Main 1151.

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MONTREAL WINNIPEG

Analyses and Tests of all Materials including Steel, Brass, Coal, Oils, Water, Ores, Sands, Cement.

Specialists for Industrial Chemical Problems, Cement and Asphalt Construction Work, Steel Inspection and Water Supply.

"The Largest and Best Equipped Commercial Laboratories in Canada"

ESTABLISHED 27 YEARS

Request for Institute Records

To the Members of The Institute

In order to make the Year Book and List of Members of the greatest possible value to the membership, it is earnestly requested that you kindly fill in the return slip.

In many cases we have not on our records the official positions of our members and it is hoped that all members will return the slip, filled in, at the earliest possible date.

FRASER S. KEITH, Secretary.

*Name in full*_____

*College degrees*_____

*Military titles and honours (including dates of enlistment and demobilization)*_____

*Firm and position*_____

*Mailing address*_____

Economical Water Supply

ALONG with many other Canadian cities, Hamilton, Ont., has adopted De Laval geared steam turbine driven centrifugal pumps for the municipal water supply. The photograph shows a De Laval unit recently installed. The pumping end consists of two De Laval pumps connected in series and driven by a De Laval multi-stage steam turbine. This unit supplies 12,000,000 gal. per day against 300 ft. head.

The De Laval turbine driven pump was selected because it is the most economical means of handling water when all operating costs including fixed charges are considered. The apparatus is simple and easy to care for.

Have you a copy of our book, W-103?

De Laval Steam Turbine Co.

Turbine Equipment Co., Ltd., 73 King St. West, Toronto.
The E. Laurie Company, 243 Bleury Street, Montreal, Quebec. 258

HORTON TANKS

For Municipal service and protection

THE advantages derived from the use of a Horton Elevated Steel Tank may be divided into the increase reliability of service, preparation for emergencies, financial benefit to the town and the individual and general advantages to the town and its inhabitants.

By the use of the Elevated Tank the pressure on the system is kept nearly uniform, the service need never be interrupted, and there need never be a period in the day when water is scarce.

In case of fire or accident to the pumps, the reserve in the tank is always available; it is practically independent of external conditions; it is ready on the instant, there is no apparatus to get out of order, and the force of gravity always produces the same requisite pressure.

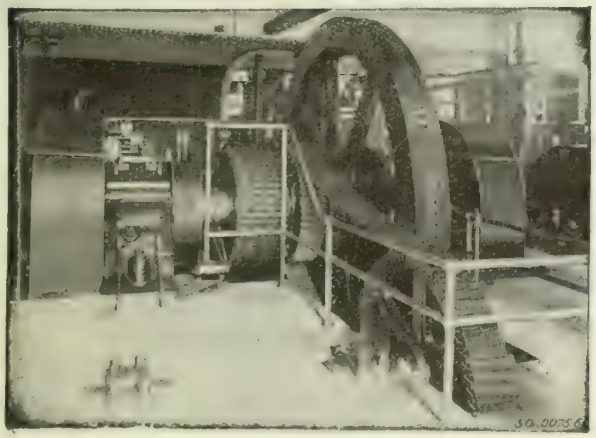
Pumping into a tank is more economical than pumping directly into the street mains. Besides, due to the fact that it is necessary to pump but part of the time, there is a large direct saving in fuel and attendance cost, and there is also ample opportunity for the care and repair of the pumps.

In general, a good elevated tank is a valuable asset to any city; it protects the lives and property of its citizens; it reduces their rate of taxation and their insurance; it gives them a strong sense of security and makes their city a better place in which to live.

HORTON STEEL WORKS Ltd.

BRIDGEBURG, ONT. 156 Janet Street
MONTREAL, QUE. 1016 Bank of Toronto Bldg.

244



Morse Silent Chains

(1000 and 500 H.P. Morse Silent Chain Drives from Engine to Lineshaft.)

TELL US YOUR TRANSMISSION PROBLEMS

JONES & GLASSCO REG'D.

CANADIAN AGENTS

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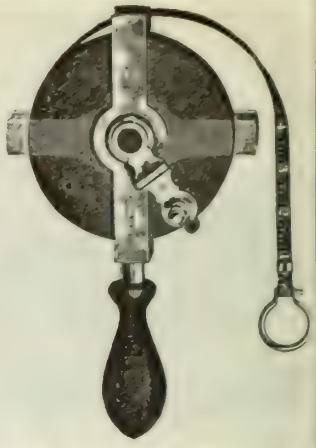

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Electric Motors—Robbins & Myers. Brantford, Ont.

Magnet Wire and Varnished Insulations. Acme Wire Co., New Haven, Conn.

Rawlplugs—Inventions Ltd., Montreal.

Electrical Porcelain—Federal Porcelain Co., Carey, O.

Telephone and Signal Systems—Samson Electric Co., Canton, Mass.

Dominion Engineering Agency Limited

President: D. M. FRASER

24 Adelaide Street, East - Toronto, Ont.

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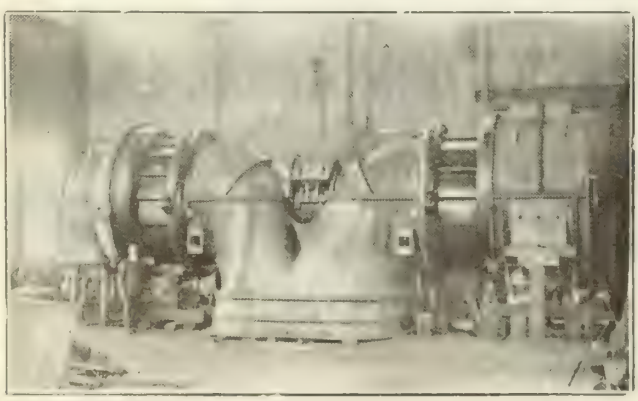

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OUR HYDRAULIC TURBINES ENSURE A SOUND INVESTMENT.

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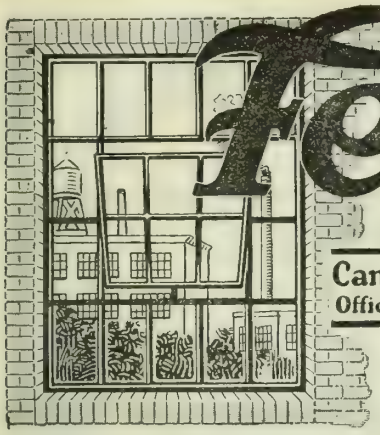

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WORKS: SULPHIDE, ONT; CAPELTON, QUE; BARNET, B.C.

Men of influence consult Journal advertising.

Purchasers' Classified Directory

A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 58

A

Acids:
Nichols Chemical Co., Ltd.
Air Brakes:
Canadian General Electric Co., Ltd.
Air Coolers:
Laurie and Lamb.
Alumina Sulphate;
Nichols Chemical Co., Ltd.
Ammonia Controlled Water Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Ammonia Valves and Fittings:
Crane Ltd.
Anchorage Equipment:
Midwest Canada, Ltd.
Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd
Arches, Flat:
Combustion Engineering Corp., Ltd.
Asphalt:
Imperial Oil Ltd.
Ash Handling Equipment:
Combustion Engineering Corp. Ltd.
Automatic Air Valves:
Jenkins Bros., Ltd.
Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Taylor Stoker Co., Ltd.
Automobiles:
Ford Motor Co., of Canada, Ltd.

B

Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.
Balls, Steel:
Canadian S.K.F. Co., Ltd.
Bar Benders:
Koehring Co., of Canada, Ltd.
Bar Cutters:
Koehring Co., of Canada, Ltd.
Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.
Beams:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Bearings, Ball:
Canadian S.K.F., Co., Ltd.
Openshaw & Bennett, Ltd.
Bearings, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Bearings, Roller:
Canadian S.K.F. Co., Ltd.
Belting:
Dunlop Tire and Rubber Goods Co., Ltd.
General Supply Co., of Canada, Ltd.
Jones and Glassco, Regd.
Blowers, Centrifugal:
De Laval Steam Turbine Co.
Blue Print Machinery:
Instruments Ltd.
J. Frank Raw Co., Ltd.
Boilers:
E. Leonard & Sons, Ltd.
Waterous Engine Works Co., Ltd.
Boilers, Heating:
Engineering & Machine Works of Canada, Ltd.
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.
Boilers, Marine:
Engineering & Machine Works of Canada, Ltd.
Boilers, Power:
Engineering & Machine Works of Canada, Ltd.
Boilers, Portable:
E. Leonard & Sons, Ltd.
Boilers, Return Tubular:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Bolts:
British Empire Steel Corp., Ltd.
Steel Co., of Canada, Ltd.
Books:
John Wiley & Sons, Inc.
Renouf Publishing Co.
Bridges, Highway:
Hamilton Bridge Works Co., Ltd.
Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Broadcasting Equipment:
Marconi Wireless Telegraph Co., of Canada, Ltd.
Northern Electric Co., Ltd.
Bucket Loaders:
Mussens Ltd.
Builders Supplies:
Jno. E. Russell Co., Ltd.
Building Papers:
Barrett Co., Ltd.
Buildings, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
MacKinnon Steel Co., Ltd.

C

Cars, Dump:
Hydro Salvage Syndicate.
Mussens Ltd.
Car Dumpers:
Canadian Mead-Morrison Co., Ltd.
Car Equipment Specialties:
Dominion Insulator & Mfg. Co Ltd.
Car Pullers:
Canadian Mead-Morrison Co., Ltd.
Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.
Casements, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Castings:
William Kennedy & Sons, Ltd.
Castings, Brass:
Engineering & Machine Works of Canada, Ltd.
Superheater Co., Ltd.
Castings, Bronze:
Engineering & Machine Works of Canada, Ltd.
Castings, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Castings; Ferro-Alloy.
Canadian Steel Foundries, Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Engineering & Machine Works of Canada, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
Castings, Steel:
Canadian Steel Foundries, Ltd.
Catenary Materials:
Dominion Insulator & Mfg., Co. Ltd.
Cement, Dealers:
Jno. E. Russell Co., Ltd.
Cement Gun:
General Supply Co., of Canada, Ltd.
Cement, Manufacturers:
Canada Cement Co., Ltd.
Cement, Waterproofing:
Dominion Tar & Chemical Co., Ltd.
Chains:
Link-Belt, Ltd.
Chains, Silent:
Jones and Glassco, Regd.
Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Chemist, Industrial:
Milton Hersey Co., Ltd.
Chimneys:
Combustion Engineering Corp. Ltd.
Circuit Breakers:
Dominion Engineering Agency, Ltd.
Coal:
British Empire Steel Corp., Ltd.
Coal Handling Equipment:
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Link-Belt, Ltd.
Coke:
British Empire Steel Corp., Ltd.
Cooling Air Filters:
Midwest Canada, Ltd.
Compressor Filters:
Midwest Canada, Ltd.
Compressors:
General Supply Co., of Canada, Ltd.
Compressors, Air:
Canadian Westinghouse, Co., Ltd.
Hydro Salvage Syndicate.
Compressors, Ammonia:
Taylor Stoker Co., Ltd.
Compressors, Centrifugal.
De Laval Steam Turbine Co.
Concrete Inserts, Continuous:
Midwest Canada, Ltd.
Concrete Mixers:
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Hydro Salvage Syndicate.
Koehring Co., of Canada, Ltd.
Mussens Ltd.
Condensers, Synchronous & Static
Canadian General Electric Co., Ltd,
Condensite Celoron Silent Gears.
Diamond State Fibre Co., of Canada Ltd.
Construction Material:
Northern Electric Co., Ltd.
Contractors:
E. G. M. Cape & Co.
Chick Contracting Co., Ltd.
E. O. Leahey & Co., Ltd.
Randolph MacDonald Co., Ltd.
Contractors' Plant and Supplies.
F. H. Hopkins & Co., Ltd.
Controllers, Electric:
Canadian Westinghouse Co. Ltd.
Conveyors:
Canadian Mead-Morrison Co., Ltd.
Combustion Engineering Corp., Ltd.
Conveyors, Belt and Screw:
Link-Belt, Ltd.
Conveyors, Portable Belt:
Mussens Ltd.
Couplers, Car and Locomotive:
Canadian Steel Foundries, Ltd.
Cranes, Locomotive:
Canadian Link-Belt Co., Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Cranes, Travelling:
Dominion Bridge Co., Ltd.
Creosote Oils:
Barrett Co., Ltd.
Dominion Tar & Chemical Co., Ltd.
Cross Arm Braces, Steel:
Burlington Steel Co., Ltd.
Crushed Stones:
Jno. E. Russell Co., Ltd.
Culvert Pipe:
Canada Lock Joint Pipe, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Pedlar People, Ltd.
Culverts, Metal:
Pedlar People, Ltd.
Culverts, Road:
Canada Lock Joint Pipe, Ltd.

D

Damp Proof Coating:
Dominion Tar and Chemical Co., Ltd.
Damper Regulation:
Under-Feed Stoker Co., of Canada, Ltd.
Derricks:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Dies:
Pratt & Whitney Co., of Canada, Ltd.
Doors, Fireproof:
Canadian Metal Window and Steel Products, Ltd.
Draughting Supplies:
Instruments, Ltd.
J. Frank Raw Co., Ltd.
Dredges:
Canadian Mead-Morrison Co., Ltd.
Drill Chucks:
Canadian S.K.F., Co. Ltd.
Dumb Waiters, Electric:
Turnbull Elevator Co., Ltd.

E

Economizers:
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada Ltd.
Electrical Appliances:
Northern Electric Co., Ltd.
Electrical Instruments:
Instruments, Ltd.
Electrical Supplies:
Northern Electric Co., Ltd.
Elevator Safety Gates:
Turnbull Elevator Co., Ltd.
Elevators, Freight:
Turnbull Elevator Co., Ltd.
Elevators, Passenger:
Turnbull Elevator Co., Ltd.
Elevators, Push Botton:
Turnbull Elevator Co., Ltd.
Enamels, Acid & Fume Resisting:
Dominion Paint Works, Ltd.
Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.
Engines, Gas and Oil:
Canadian Fairbanks-Morse Co., Ltd.
Engines, Steam:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Laurie and Lamb.
E. Leonard & Sons. Ltd.
Excavators:
Engineering & Machine Works of Canada, Ltd.
Excavators, Dragline:
Koehring Co., of Canada, Ltd.
Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.
Expanded Metal:
Pedlar People Ltd.

F

Fan Engine Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.
Fence Posts, Steel:
Burlington Steel Co., Ltd.
Fibre, Hard Vulcanized:
Diamond State Fibre Co., of Canada, Ltd.
Fillers, Wood and Metal:
Dominion Paint Works, Ltd.
Filters, Air:
Midwest Canada, Ltd.
Fire Alarm Apparatus:
Northern Electric Co., Ltd.
Fireproofing, Hollow Tile:
Interlocking Tile Co., Ltd.
Fish Paper:
Diamond State Fibre Co., of Canada, Ltd.
Floortyle:
Pedlar People, Ltd.
Forgings:
British Empire Steel Corp., Ltd.
Dominion Bridge Co., Ltd.
Friction Clutches:
Dodge Manufacturing Co., Ltd.
Fuel, Oil:
Imperial Oil, Ltd.
Furnaces, Automatic:
Under-Feed Stoker Co., of Canada, Ltd.

G

Gasoline:
Imperial Oil, Ltd.
Gauges:
Pratt & Whitney Co., of Canada, Ltd.
Gear Reductions:
Hamilton Gear & Machine Co.
Gears:
Dominion Engineering Works Ltd.
Hamilton Gear & Machine Co
Link-Belt, Ltd
Gears, Machine Cut:
Jones and Glassco, Regd.

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HAMILTON CANADA

"Close up" of a rail part of which has passed through the slitting mill. Showing how the rail is slit into three separate parts—the head, web and flange.

The Re-rolled Argument

Rail Steel Reinforcing Bars are sometimes referred to as being "re-rolled." This term applied to Rail Steel is a misnomer.

Send for This Valuable Book—FREE

The first and only authoritative and comprehensive treatise on concrete Reinforcing Bars and containing most important information on the manufacture, qualities, and use of Rail Steel Bars.

In rolling Rail Steel Bars, the rail is separated into three parts, the head, web and flange; and these parts are treated individually as billets and rolled into bars, or other sections. The Rail Steel Bar is the result of a continuation of the rolling process, and is in no sense a "re-rolled" product.

The objection to the term "re-rolled" is that it permits confusion of Rail Steel Bars with bars re-rolled from various kinds of scrap, shell discard, etc.

It is important to note that the A.S.T.M. Specification A-16-14 covers "Rail Steel Concrete Reinforcement Bars," and no mention is made of "re-rolled" bars. Furthermore, under "Process" this specification stipulates that the "bars shall be rolled from standard section Tee Rails."

Rail Steel Bars are not "re-rolled" bars, and if you specify bars to meet A.S.T.M. Specification A-16-14, no undesirable re-rolled material can be substituted.

Purchasers' Classified Directory

For Alphabetical List of Advertisers see page 58

Gears, Silent, Waterproof:
Diamond State Fibre Co., of Canada, Ltd.
Gears, Double Helical:
De Laval Steam Turbine Co.
Generators:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Grab Buckets:
Canadian Mead-Morrison Co., Ltd.
Ground Joints Unions:
Dart Union Co., Ltd.

H

Hangers:
Dodge Manufacturing Co., Ltd.
Heaters, Boiler Feed-Water:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Heating Material:
Crane Ltd.
Hoisting Engines:
Canadian Mead-Morrison Co., Ltd.
Mussens Ltd.
Hoists, Electric:
Hydro Salvage Syndicate.
Taylor Stoker Co., Ltd.
Hoists, Hydraulic:
Turnbull Elevator Co., Ltd.
Hoists, Mono-Rail:
Taylor Stoker Co., Ltd.
Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.

I

Industrial Electric Control:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.
Insulated Rail Joints, Continuous
Rail Joint Co., of Canada, Ltd.
Insulating Compounds:
Dominion Tar & Chemical Co., Ltd.
Insulation, Fibre and Celoron:
Diamond State Fibre Co., of Canada, Ltd.
Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
Barrett Co., Ltd.

K

Kerosene:
Imperial Oil Ltd.

L

Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency Ltd.
Lighting Equipment, Industrial and Street:
Canadian General Electric Co., Ltd.
Locomotives:
Mussens Ltd.
Locomotives, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd.
Hydro Salvage Syndicate.
Lubricating Oils & Greases:
Imperial Oil Ltd.

M

Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Hydro Salvage Syndicate.
Charles Walmsley & Co., (Canada), Ltd.
Machinery, Special:
Dominion Engineering Works, Ltd.
Marine-Machinery:
William Kennedy & Sons, Ltd.
Material Handling Plants:
Canadian Mead-Morrison Co., Ltd.
Measuring Tapes:
Lufkin Rule Co., of Canada, I td.
Merchant Bars:
British Empire Steel Corp., Ltd.
Metal Lath:
Pedlar People, Ltd.
Trussed Concrete Steel Co. of Canada, Ltd.
Milling Cutters:
Pratt & Whitney Co., of Canada, Ltd.
Mining Machinery:
William Kennedy & Sons. Ltd.
Motors:
Canadian Fairbanks-Morse Co. Ltd.
Dominion Engineering Agency Ltd.
Motor Cars:
Ford Motor Co., of Canada, Ltd.
Motors, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co. Ltd.
Motor Oils:
Imperial Oil Ltd.
Motor Trucks:
Ford Motor Co., of Canada, Ltd.

N

Nails:
British Empire Steel Corp., Ltd.

O

Oil Burning Equipment:
Combustion Engineering Corp., Ltd.
Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

P

Packing:
Dunlop Tire & Rubber Goods, Co., Ltd.
Paints, Acid Resisting:
Dominion Paint Works, Ltd.
Paints, Anti-Corrosive:
Dominion Paint Works, Ltd.
Paints, Concrete:
Dominion Paint Works, Ltd.
Paints, Damp-proof:
Dominion Paint Works, Ltd.
Paints, Graphite:
Dominion Paint Works, Ltd.
Paints, Machinery:
Dominion Paint Works, Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd
Dominion Paint Works, Ltd.
Paper Mill Machinery:
Dominion Engineering Works, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
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Pinions:
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Pipe, Concrete:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Pipe Couplings, Union
Dart Union Co., Ltd.
Pipe Fittings:
Crane Ltd.
Pipe, Lead:
Steel Co. of Canada, Ltd.
Pipe Lines:
Canada Lock Joint Pipe, Ltd.
Pipe, Lock Joint:
Canada Lock Joint Pipe, Ltd.
Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
General Supply Co., of Canada, Ltd.
National Iron Corp., Ltd.
Pipe Lock Bar:
General Supply Co., of Canada, Ltd.
Pipes, Reinforced Concrete:
Canada Lock Joint Pipe, Ltd
Pipes, Wrought Iron:
Crane Ltd.
Pitch:
Dominion Tar & Chemical Co., Ltd.
Plates, Brass and Copper:
Openshaw & Bennett, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co.,Ltd.
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
Power Apparatus:
Northern Electric Co., Ltd
Power Plant Equipment:
Instruments, Ltd.
Propellor Wheels:
Wm. Kennedy & Sons, Ltd
Publishers:
John Wiley & Sons, Inc.
Renouf Publishing Co.
Pulleys:
Canadian S.K.F. Co., Ltd.
Dodge Manufacturing Co., Ltd.
Pulleys, Fibre:
Diamond State Fibre Co. of Canada, Ltd.
Pulp Grinders:
Engineering & Machine Works of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulp Mill Deckers:
Engineering & Machine Works of Canada, Ltd.
Pulp Mill Machinery:
Waterous Engine Works Co., Ltd.
William Hamilton Co., Ltd.
Pulpwood Machinery:
Canadian Mead-Morrison Co., Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pulverized Fuel Systems:
Combustion Engineering Corp., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Pump Governors:
Under-Feed Stoker Co., of Canada, Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks Morse Co. Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Charles Walmsley & Co., (Canada), Ltd.
Pumps and Condensers.
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil,
Taylor Stoker Co., Ltd

R

Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Marconi Wireless Telegraph Co. of Canada, Ltd.
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Ties:
Canadian Tie & Lumber Co., Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Receptacles, Fibre:
Diamond State Fibre Co., of Canada, Ltd.
Recording Instruments:
Combustion Engineering Corp., Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Reservoir Fittings:
Guest & Chrimes, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Materials:
Dominion Tar & Chemical Co., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
Road Tar:
Dominion Tar & Chemical Co., Ltd.
Roofing Cement:
Dominion Tar & Chemical Co., Ltd.
Roofing Material:
Dominion Tar & Chemical Co., Ltd.
Roofings, Metal:
Pedlar People Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Rolling Mill Rolls:
Canadian Steel Foundries, Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Rope Wheel:
Dodge Manufacturing Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Rubber Goods, Mechanical:
Dunlop Tire & Rubber Goods, Co., Ltd.
Jenkins Bros., Ltd.
Rules Steel and Wood:
Lufkin Rule Co., of Canada, Ltd.

S

Safes:
Goldie & McCulloch Co., Ltd.
Sash, Steel:
Canadian Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Machinery:
Waterous Engine Works Co., Ltd.
William Hamilton Co., Ltd.
Scales:
Canadian Fairbanks-Morse Co., Ltd.
Screening Equipment:
Link-Belt, Ltd
Charles Walmsley & Co., (Canada), Ltd.
Sewer Pipe:
Canada Lock Joint Pipe, Ltd.
Jno. E. Russell Co., Ltd.
Shaftings:
Dodge Manufacturing Co., Ltd.
Shafting, Anchorage:
Midwest Canada, Ltd.
Sheets:
Steel Co., of Canada Ltd.
Sheating:
Barrett Co., Ltd.
Shingles, Prepared Asphalt:
Barrett Co., Ltd.
Skip Hoists:
Canadian Mead-Morrison Co. Ltd.
Smoke Stacks:
Engineering & Machine Works of Canada, Ltd.

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ROTHERHAM (ENG).

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VALVES for Water, Gas and Sewage.

Bateman and Moore's AIR VALVES.

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Standpipes, Draw-Off Valves, Filter Valves, etc.

PENSTOCKS, WATER LEVEL RECORDERS, FLAP VALVES, PRESSURE GAUGES, TESTING APPARATUS.

— Canadian and U. S. Representatives —

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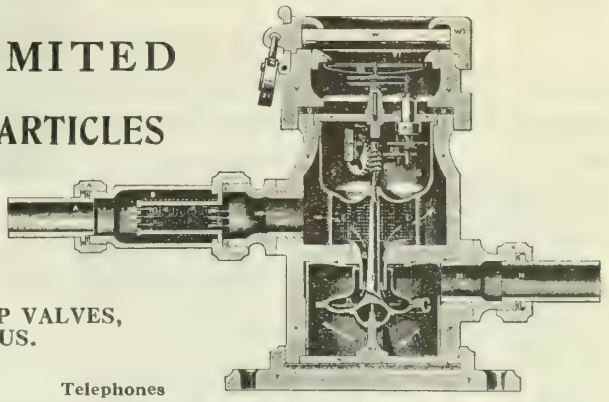

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